Sustaining Accelerated Rates of Improvement

by

Valerie Feliberti

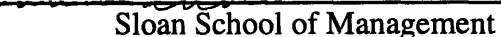BS Chemical Engineering, Massachusetts Institute of Technology, 1989

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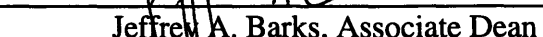Janice A. Klein, Senior Lecturer
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ABSTRACT

Many companies have turned to accelerated rates of improvement as a strategy to achieve their goals. The benefits of adopting accelerated rates of improvement include achieving a competitive advantage over competitors as well as realizing economic advantage in improving the overall process and products and developing better new products. This thesis examines the challenges within an organization in adopting accelerated rates of improvement as a strategy for achieving goals. It is hypothesized that to sustain the accelerated rate of improvement over time the key elements to an organization are Customer Focus, Organizational Culture, Organizational Capabilities, Work Alignment, and Leadership. The key to this model is the interaction between these areas.

The research for this thesis was performed at the Eastman Kodak Company's Paper Support Division. This organization had some experience achieving accelerated rates of improvement on individual projects, but was interested in determining the requirements necessary to support the sustainment of these rates as an organization.

The second part of the thesis explores the implementation phase of the model within the Paper Support Division. The implementation method utilized was to work with the management group of the division to develop its model. The environment within the division was a culture in a state of transition as new management structure and personnel were being introduced. The benefits of implementing in this fashion were to generate a shared vision of an organization supporting accelerated rates of improvement as well as to generate management support of the strategy.

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Lastly, I dedicate this work to my motivation and son, Christopher.

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1. Introduction

Many corporations have turned to total customer satisfaction as a method for increasing their financial performance. Supporting this strategy is an improvement program focused on the customer. Some of these improvement programs are now setting ambitious goals related to the rate at which the improvements are made. These accelerated rate of improvement programs are seen as a method for edging out the competition. The competitive advantage is derived from the implication that an organization is able to achieve the improvements at a significantly faster rate than its competitors.

This thesis is about how an organization supports its corporate strategy of sustaining accelerated rates of improvement as a normal mode of operation. This thesis hypothesizes that there are certain elements that are needed within an organization to allow the continuous achievement of accelerated rates of improvement. This thesis is not focused on what is needed to achieve an accelerated rate of improvement on a particular project or on a particular process. Instead the focus is on what is needed to sustain the rate of improvement over time.

This thesis hypothesizes that the Organizational Infrastructure needs to support the strategy of sustaining accelerated rates of improvement. This infrastructure needs to include not only the management process but also the culture of the organization where the culture is defined as the normal process and actions of the organization. The infrastructure also needs to address the knowledge transfer and learning needed to support sustaining the accelerated improvement rates. This thesis hypothesizes that a key to sustainment is to raise the knowledge transfer and learning to the organizational level.

This thesis will also cover the implementation of an organizational model for sustaining the improvement rate. An important piece of any strategy or problem solving development is the implementation. In this case it is the implementation of the model within an organization that has an existing program.

1.1 Why companies are looking to sustain accelerated rates of improvement:

1.1.1 Economics

Companies are looking for ways to achieve a better financial performance. As a methodology to achieve this companies are focusing on customer satisfaction. In this way customer needs are providing the definition for future products and are thus pulling through the organization the evolution of product development. As customers become more satisfied they in turn respond by increasing their purchase of product which then corresponds to company growth in terms of volume and/or market share.

All processes have a cost that is derived from reworking of the product or a process accommodation of the product. These costs can be referred to as the cost of poor quality (cost of quality). Another way to think of the cost of quality is the cost of not producing the product correctly the first time through the process. This cost affects the product's manufacturing cost. Improvements in the process aimed at reducing the cost of poor quality could increase the profit of the company through decreases in the manufacturing cost and the gain in lost capacity.

1.1.2 Competitive Advantage

The competitive advantage is that the organization is improving its product and process at such a rate that makes it difficult for competitors to maintain the pace. Take for example companies that are on the same playing field, in terms of the technology, the market, and customer responsiveness. A company that is able to sustain an accelerated rate of improvement would develop an edge over its competitors by its ability to respond to market needs faster. This faster response would be due to better understanding of the process and its impact on the product. The product alterations desired by the market could be determined quicker because of the understanding of process capability.

1.2 Thesis Data

The basis of this thesis is the research done at the Eastman Kodak Company's Paper Support Division located at Kodak Park in Rochester, New York. An examination of the

improvement program at the Paper Support Division consisted of participation on accelerated rates of improvement teams, monitoring of other teams, observation of how the division supports the teams, and interviews with people in and outside of the division. From this work a hypothesis was developed identifying the key elements needed within an organization to support the sustainment of accelerated rates of improvement.

1.3 Improvement Programs

Many companies have improvement programs based upon the success of Deming's work in Japan. In the United States, Motorola has successfully implemented its improvement program which is referred to as their six sigma program. Motorola began its program in 1985, and its motivation was survival of the company. They focused on quality of their products as part of their turn around strategy of improving the way they serve their customers. The Quality Program at Motorola was developed internally. Their six sigma challenge is focused on a five year goal to approach the standard of zero defects, and to be the best-in-class in everything that they do. Six sigma refers to statistical terminology that describes process variability. The expectation of a six sigma process is an excursion rate (defects outside of its specification) of less than a few parts per million.

Kodak has had a quality program for many years. Recently they have developed a new program called the 10x program. The program is called 10x after its goal of achieving an order of magnitude improvement every 3 years. Kodak began their program in 1995. The 10x program supports Kodak's mission of achieving total customer satisfaction which would then lead to superior financial performance and increases in market share. Although this program is based upon Motorola's six sigma program, the program is being developed internally, and it is being driven by its current Chief Executive Officer, George Fisher, who is an ex Chief Executive Officer of Motorola.

Both six sigma and 10x refer to process excursions that can result in defects. Six sigma refers to the performance of a process, where sigma is a measurement of the distribution

of the measurement around the mean. A process that has its data distributed within six sigma of it mean implies a defect rate of less than a few parts per million.

1.4 Sustainment Hypothesis

The key to achieving accelerated rates of improvement over time lies at an organizational level. Focusing on team designs is necessary for the achievement of goals. However, the environment in which the team operates and is supported is hypothesized to be critical for the sustainment of the improvement rates. The key elements for an organization model for sustaining accelerated improvement consists of five areas: work selection and alignment, organizational capabilities, organizational culture and support, customer focus, and leadership.

1.4.1 Work Selection and Alignment

The Work Selection and Alignment focuses on the activities that an organization decides to support. The work should be focused on the customer, both existing and future as well as both internal and external. Also the work should be aligned with the process, both production and business, needs. In other words, organizations should be working on jobs that provide customer satisfaction as well as those that will result in process improvement.

1.4.2 Organizational Capabilities

The organization needs to develop capabilities that will support the work selection. The capabilities developed also will contribute to the evolving organizational culture. The organizational capabilities are derived from individual capabilities to a certain extent. The capability for improving the process may lie in having technical expertise in certain production process technologies. The organization can have the competence for process improvement through having individuals who are experts in certain process technologies. However, this would not be an organizational competence if an individual departs and the expertise in that certain process technology is gone. In this case the competence resided in the individual and not the organization. An organization may have the capability to improve processes by having experts or non experts within the organization who not only share their experiences but learn from them. In this case when an individual leaves all

knowledge and experience from that individual is not lost but has been internalized within the organization through the sharing or transferring of the knowledge.

1.4.3 Organizational Culture

The culture of the organization is a major role in the sustainment of the improvement rate. The culture determines how the organization will react in times of crisis, and how it approaches problems to fulfill customer needs. The culture necessary to achieve accelerated rates of improvement needs to support the customer focus environment as well as the process improvement environment. Addressed in the culture will be communications within the organization, including the distribution of information, the development of goals, and knowledge transfer. The organizational culture also impacts the problem solving approaches utilized and the way that decisions are made and implemented.

1.4.4 Customer Focus

Customer focus is obviously the focal point for an organization aimed at total customer satisfaction. However, there is debate over defining who is the customer as well as the customer needs. The debate gets fueled further when there are conflicting demands placed on a product from different customers.

1.4.5 Leadership

The driver in any program is the leadership of the organization. The leadership reinforces or helps shape the culture of any organization through its actions and expectations. The leadership of an organization thus defines the values that are deemed important for the organization. This definition is also expanded to include the focus of an organization.

1.5 Implementation

Once this model was determined, the research then focused on the method for implementation of the model. The implementation portion was done in conjunction with the management team of the Paper Support Division. The implementation plan utilized did not involve sharing the work that was done in developing the model. Instead it was chosen to lead the management team in the development of its own model.

During the research at Kodak, the division underwent changes in its management structure which included new members on the management team, a new division manager, and new management positions. One of the tasks facing the new management team was the development of next year's 10x program. An opportunity thus presented itself to work with the leadership team in the development of this program to develop an organizational model of the infrastructure needed to sustain accelerated rates of improvement.

1.6 Outline of the Thesis

The thesis will be divided into 4 sections:

1. Background on accelerated rates of improvement
2. Model of organizational elements needed to support the sustainment of accelerated rates of improvement
3. Implementation of the model within an organization
4. Overall results, conclusions, and recommendations

1.6.1 Section One

The first section of the thesis will describe the background of accelerated rates of improvement. This will include a brief description of how Kodak approaches its improvement program. The Kodak system used the Motorola Six Sigma program, which will also be explained, as a model. Included in this discourse will be a brief discussion on various models for achieving the accelerated rates of improvement.

1.6.2 Section Two

Section Two of the thesis will then cover the development of the model describing the organizational element needed for supporting accelerated rates of improvement. This will cover in depth the issues faced by Kodak and why the elements are important to the sustainment model. Examples from the Kodak Paper Support Division will be utilized to show how the organization supported the improvement program.

1.6.3 Section Three

For implementing the model within an organization, the base case will be the situation presented at the Kodak Paper Support Division during the development of their 1997 improvement program. The first chapter of this section will describe the issues being

faced as well as the overall objective of the implementation plan. The next chapter will focus on the steps used for developing the program. This will include the correlation between the course of action chosen and the objectives of the implementation plan.

1.6.4 Section Four

The final section will start with a review of all of the results. This will include the model of the elements needed for sustaining accelerated rates of improvement and the implementation of the model with the management team. Conclusions from the work done at Kodak will then be outlined. This will be followed by recommendations for model implementation within an organization.

2. Background

This thesis is trying to address the sustainment of 10x rates of improvement. The problem statement and thus the data that is the basis of the thesis originates with the Paper Support Division of the Eastman Kodak Company in Rochester, New York.

2.1 The Problem Statement

Eastman Kodak has established a corporate goal of reducing the defects per unit by a factor of 10x over three years. The division found that it was able to achieve 10x rates of improvements for specific projects, especially when additional resources were allocated and/ or the project operated outside the normal mode of operation. The Paper Support Division needed an analysis of its operational and improvement processes to identify the opportunities to meet the 10x goals for a sustained period of time. This thesis work also outlines the process utilized to begin the implementation of the infrastructure within the Paper Support Division.

2.2 The Paper Support Division

The Paper Support Division is a manufacturing unit within the Eastman Kodak Company's Kodak Park site in Rochester, New York. The division supplies paper based supports for imaging products. The Kodak Consumer Imaging and Professional and Printing Imaging Business units market the division's main family of products. The manufacturing operations in the division are Papermaking and polyethylene extrusion onto the paper web. For the main product the entire production process takes place across four process steps: paper making, resin coating (polyethylene extrusion), sensitizing, and finishing, Figure 2.1.
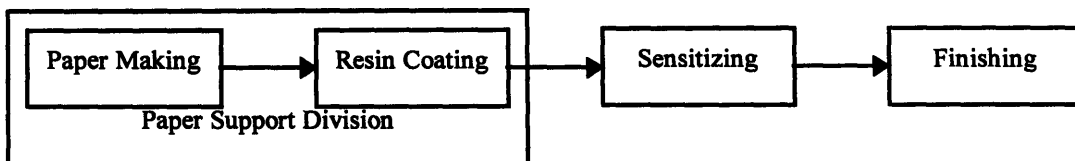
Figure 2.1 Photographic Paper Production

The sensitizing and finishing operations are handled by different divisions, depending upon the product family, of Eastman Kodak. The sensitizing operations mainly consists of the application of light sensitive emulsion onto the paper web. The finishing operation is the cutting and packaging of the paper stock into rolls that are sized for customer use.

The division has the responsibility of supplying the paper stock for the company. As part of its strategy, the division both manufactures paper and contracts outside suppliers to fulfill the total paper demand.

The division has four operating areas, the East and West operations. The names are geographical references to the locations on the Kodak Park site. The East operation was the original manufacturing area for the paper stock and in general its machinery is older than that in West Operations. The East and West operation have both Papermaking and resin coating.

The East Papermaking machine is much smaller in both capacity and size of the product. This machine produces paper for the Advance Imaging Media Market (ink jet and thermal printing as well as black and white) and uses any excess capacity to produce color photographic paper, which is the highest volume product for the division. There is some question as to how long this Papermaking machine will continue to operate because of its age and size. The West Papermaking machine only produces color photographic paper products. Both the East and West resin coating operations apply the polyethylene coating on the paper web for all of the division's products.

2.2.1 Papermaking

The Papermaking operation transforms woodpulp into rolled paper stock, see Figure 2.2. The woodpulp is purchased and brought to either the East or West Papermaking operations. The pulp, chemicals and water are placed into a hydropulper where a slurry is made. The pulp slurry is sent to the stock preparation area where it is refined and diluted. The slurry is then pumped to the paper machine for paper formation and the first step in

water removal. Water is removed from the paper by three methods: gravity, squeezing, and heat. The stock is first deposited on the wire, a continuous belt of mesh material, of the paper machine. Foils, inclined blades of plastic, created a pressure differential that pulls water from the stock and drains through the wire. At the end of the wire the paper web is sent to the press section. As the paper is moved through rollers that press the sheet for water removal, the paper web is protected by a continuous belt of felts. The drained water is collected for reuse in the stock preparation area.

The paper web then travels to the dryer section where the paper comes in contact with double rows of steam heated cylinders. Continuous belts of felt hold the paper in contact with the cylinder. The paper is then fed to the size press section, where chemical sizing is added to aid in water resistant qualities of the product. The paper is pressed further in the calendar section. This section consists of a set of rollers which are designed to improve the surface finish of the paper. The paper is then sent to the reel where it is wound onto the spool. The reel of paper is then rewound into smaller rolls at the winder section and then sent to either raw stock storage or directly to the resin coating operation.

The West Papermaking area also has two paper web recovery systems in the event of equipment failure. The paper machine and wet press area have the couch broke recovery system and the dryer section, size press section, and calendar area feed into the paper recovery system. These recovery systems are also fed back to the stock preparation area.

2.2.2 Resin Coating

The raw materials input into the resin coating process are the raw paper stock, polyethylene resin, and chemicals for antistat and printing, see Figure 3. The polyethylene resin is transported by rail and is stored in silos ready for transport to the extruders. The raw paper stock is first unwound and fed into a series of coaters and dryers. A print and laminate are applied to the wire side as well as antistat. Laminate is applied to the face side. Some of the products have a certain finish to the paper which is a surface treatment applied by the type of rollers utilized in the process. Defects in the

paper are detected as the paper runs through a scanner after the coating steps. The edges
of the paper are trimmed and the width of the paper is slit, depending upon the product
requirement. The paper is wound onto a roll at the winder where samples are taken for
quality control. The rolls are then placed into resin coated storage for shipment to the
Sensitizing process.

2.2.3 The Kodak 10x Program

The 10x program was initiated through a directive of the Eastman Kodak Chief Executive
Officer, George Fisher. Mr. Fisher had come to Kodak after serving as Motorola
Company's Chief Executive Officer. The basis of this program is Motorola's Six Sigma
program. The program is part of the strategy for fulfilling Kodak's mission and
achieving its fundamental objective.

We will build a world-class, results-oriented culture based on our five key values:

- Respect for the Individual
- Uncompromising Integrity
- Trust
- Credibility
- Continuous Improvement and Personal Renewal

through which we will grow more rapidly than our competitors by providing
customers and consumers with solutions they want to capture, store, process,
output and communicate images to people and machines anywhere, anytime.

We will derive our competitive advantage by bringing differentiated, cost-
effective solutions – including consumables, hardware, software, systems and
services – to the marketplace quickly and with flawless quality through a diverse
team of energetic employees with the world-class talent and skills necessary to
sustain Kodak as the World Leader in Imaging.

In this way, we will achieve our fundamental objective of:

Total Customer Satisfaction

and our consequent goals of:

Increased Global Market Share and Superior Financial
Performance
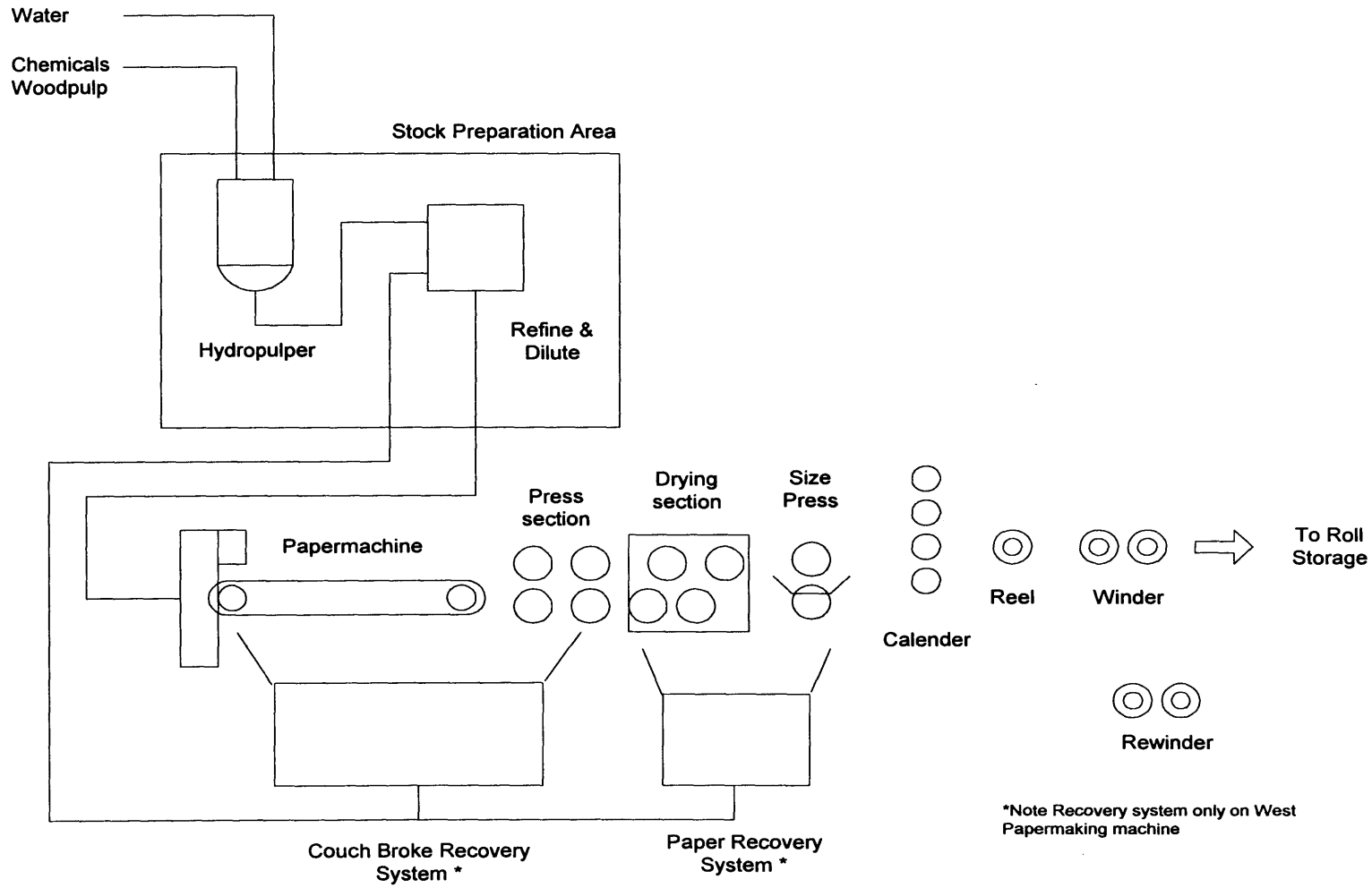
Figure 2.2 Papermaking Process at Paper Support Division

Chemical Storage

Resin Storage

Raw Stock Storage

Unwinder   Coater *   Dryer   Coater *   Dryer   Winder

To Resin Coated Storage
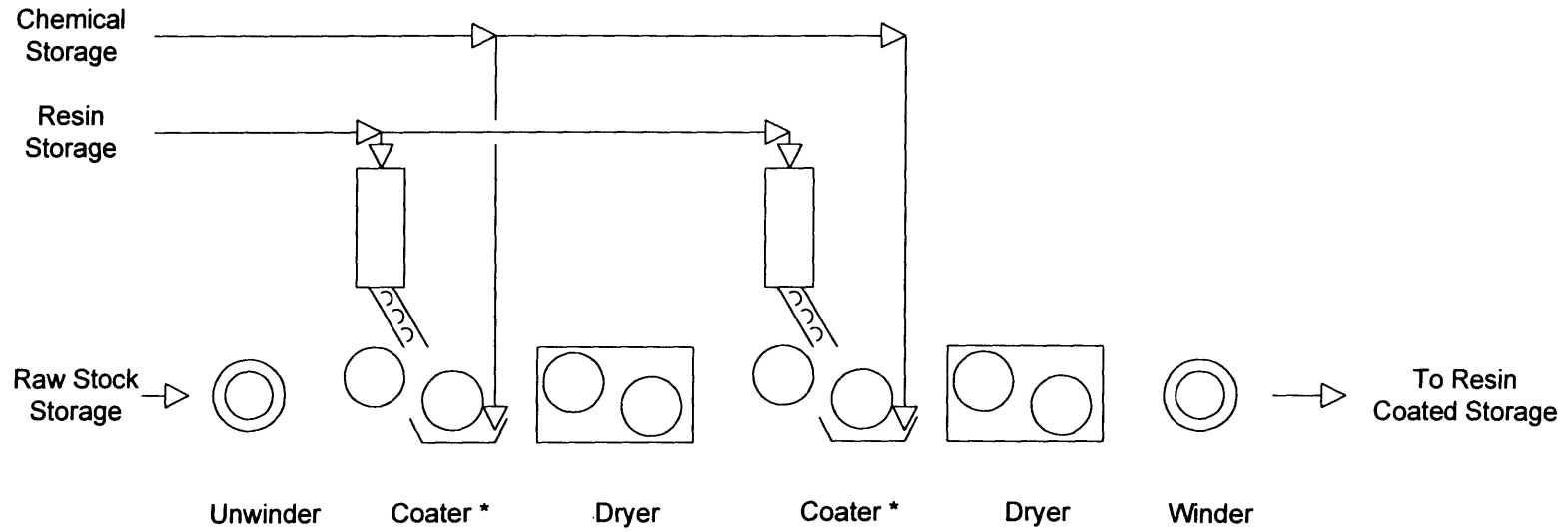
*Note: Coaters apply printing, antistat, or laminate to the paper web

Figure 2.3 Resin Coating Process at Paper Support Division

The goal of Kodak's program is to achieve 10x rates of improvement over 3 years. The expectations of the program is driven from the upper management of the Eastman Kodak Company. "Global Performance Expectation, established by George Fisher and the Corporate Policy Committee, call for a 10x rate of quality improvement every 3 years, with a minimum performance level of six sigma quality achieved throughout the corporation before the end of the decade."[1]

The program is focused on defect, cycle time, and cost of quality reductions. The program has a Worldwide 10x Coordinator. The divisions within Kodak Park each have at least one 10x DPU coordinator and may have a 10x Cycle Time coordinator. Outside Kodak Park each of the divisions has a 10x Quality Manager responsible for development of the program.

The Paper Support Division had three 10x Defect Reduction coordinators. Each coordinator was a coach for the three operating departments: East Operations, West Papermaking, West Resin Coating.

2.2.3.1 Defect Reduction

Defect reduction is aimed at improving the product and customer satisfaction. There is some difficulty in defining exactly what a defect is. A defect can be defined differently by various people, such as different customers - external versus internal. The Motorola training material states that a defect is any mistake that results in Customer dissatisfaction. Kodak's training material, Getting Started with 10x, has several definitions of a defect:

> Any variation of a product or service which, if not caught, prevents it from meeting the needs of the customer. A product or process error that could result in customer and/or shareholder dissatisfaction. Any non-conformance, interruption of the flow, or intervention of the flow.

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[1] DeCecca, Hansen, et al. "A Roadmap to Six Sigma within the Eastman Kodak Equipment Community" (New York: Eastman Kodak)

The metric for measuring the defect reduction has been established by the 10x program to be a defect per unit (DPU) number, where a unit is defined as the normal or natural production unit for that area. The units used in the Paper Support Division are rolls of paper. The defect measure was created to define how capable processes are in producing products that meet customer needs. This measure is calculated by the following equations:

$$DPU = \frac{ProductDefects + ProcessDefects}{UnitsProduced}$$

The actual decision of what is the defect measure is left up to the division to decide. Kodak has published some information to help give guidance in this decision.[2]

2.2.4 Cycle Time

The cycle time is the time it takes form the start of the process to the final end result. For example Total Customer Cycle Time is the time from the receipt of a customer order to shipment to the customer. This would therefore include the procurement cycle and manufacturing cycle times.

2.2.5 Cost of Quality

Cost of quality is referred to as the total cost associated with not doing things right the first time through the system. There are four categories that make up the cost of quality: prevention costs, appraisal costs, internal failure costs, and external failure costs. Prevention costs are costs associated with planning and training to prevent errors from occurring. Appraisal costs are the testing costs used to determine the effectiveness of the prevention. Failure costs are costs which would disappear if every product was made and every service was performed correctly. Internal failures occur before the product is shipped or delivered to the customer. External failure occurs after shipment or delivery.[3]

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[2] Mary Arter, Renee Boone, et al. *"10x Defect Reduction Metric: A Working Guide"* (New York: Eastman Kodak, 1994)

[3] Ron Heidke, Sue McLaughlin, et al. *"Cost of Quality, Management Overview"* (New York: Eastman Kodak, 1994)

The Cost of Quality is a measure of the improvement effort. Cost of quality can be used as a verification measure for the improvement efforts, since theoretically improvements made in defect and cycle time reduction should also yield reduction in the cost of the product. Kodak calculates the Cost of Quality along product flows instead of at a particular production area.

2.2.6 Six Sigma

Statistically defined, sigma is a measurement unit that, for certain distributions, describes the width about any process or procedure mean. A process achieving six sigma has a process variability that lies within six sigma of the process specification. This implies an expectation of having a defect rate of less than a few parts per million. Six sigma's emphasis is on reducing product variance or defects.

3. The Situation at Paper Support Division

The data obtained about the existing situation within the Paper Support Division was generated mostly from interviews and observations. The researcher also was able to participate with a 10x DPU project team and interact with the 10x coordinators.

3.1 10x Program

The division's program was focused on the defect reduction portion of the 10x program. Cycle time reduction was being handled at a product flow level.

3.2 1996 Program

The 1996 10x program in the Paper Support Division focused on defect reduction. There was no formal cycle time initiative within the program itself. A decision was made on a product flow level that cycle time would be examined as an entire flow as opposed to work being done within the division. Cost of quality was not being used as a normal part of the program. Cost of quality was a reporting metric that was done to fulfill a corporate requirement.

The program was focused on projects in the production processes only. Other opportunities in the supporting processes were not pursued.

3.2.1 The Coordinators

The division had three coordinators that drove the 10x program. These coordinators had responsibilities along the operating areas (East Operations, West Papermaking, West Resin Coating). One of the coordinators acted as a liaison with the corporate 10x program for transfer of information and requirements to and from the division.

3.3 Project Selection

The project teams were selected using an integrated pareto that had been developed by the coordinators in conjunction with the leadership team. This pareto was used by the Operating Departments and the Strategic Technical Manager to rank how well existing and potential projects matched the demands of the organization. From this list the

managers then discussed which projects the organization would support under the 10x program.

This pareto had the projects broken up into four categories: Product design concerns, Shareholder Satisfaction, Delivery, and DPU/ Quality. Product design issues consisted of projects aimed at improving a particular product characteristic. Shareholder Satisfaction projects added value to the division through potential increases in financial performance. These projects included improvements in equipment reliability, material management, and capital assets utilization. The Delivery projects were aimed at improving the runtime of the machines. DPU/ Quality projects addressed customer concerns that affected either product characteristics or process concerns. These customers included not only the end customer but also internal customers such as the next downstream process.

The projects were ranked using an index of high, medium, and low as to how well they addressed each of the decision criteria of: End Customer, Cost of Quality, and Flow Partners. The end customer referred to the end user of the final product resulting from the entire operation (after the Finishing Step). The Cost of Quality decision was based on how much of an expected impact the project would have on reducing the Cost of Poor Quality. The Flow Partners categories referred to how well the project addressed the concerns of the other divisions within the entire product production process. There was no indication that one criteria had a higher weight of importance than another.

The three Operating Department and the Strategic Technical Managers rated the projects that each thought best matched the decision criteria. Each project's operating area was identified. The leadership team met without the coordinators and determined which projects would be 10x projects. Sixteen project teams were identified. There were four teams in each operating area. This decision was made consciously by the leadership team.

3.4 Project Team - Resourcing

Once the project teams were selected, the leadership team identified the project team sponsors, coaches and leaders. The team sponsors were a member of the leadership team. The coaches were the 10x coordinators. The team leaders were either existing or identified by the team sponsor.

3.4.1 Mixed Team Designs

The sixteen project teams varied in how they were structured. Project A had a cross functional team that had a project manager who had considerable experience as an engineer and supervisor with the division, a couple of staff engineers - one of them being a 10x coordinator, operator representative, technical expert from the research and development group, and supplier representatives. Project B's team consisted of one member who had broken away from the original project team to pursue an alternative path from the original team. This one member was able to accomplish the goals of a 10x rate of improvement. Project C in the East Operations had a process engineer as a project leader and a team consisting of an operating crew for a production line. Project D's team became very heavily resourced. This resourcing consisted of staff engineers, maintenance and operations personnel, research and development personnel. This team had been around for many years looking into the same issue. In the past year the issue escalated to a crisis status within the division. This status was imposed on the project because of the issue's impact on the production capacity of the division.

It did not appear that any of these team structures correlated with an increase in probability of success for the project by itself.

3.4.2 Mixed Support

For the most part the sponsor was the area manager where the project was located. However, there were a couple of projects that had a sponsor that was not the area manager. The interaction between the teams and the sponsors ranged greatly. Some of the teams had regular one on one interactions with their team sponsor. A few teams had rare contact with the sponsor. In order to see the sponsor, one of the team leaders had to

wait outside the sponsor's office to get an audience. Leadership team participation on the project teams was sparse. Team members did not see any member of the leadership teams attending any of their normally scheduled meetings.

The roles and responsibilities of the team sponsors, coaches, and leaders were not made clear to any of the groups of team members. The coaches felt they were a resource that some teams did not utilize. Part of this seemed to come from a lack of communication on what was expected of a team coach and what resources the coach could provide to the teams. The coordinators support of the teams was mixed also. The coaches were aligned with the projects in their operating departments. Some of the teams did not want to communicate with the coordinators, and thus the interaction was limited to monthly reporting information. One of the coordinators also wore the hat of a 10x project team leader. Another coordinator was an active member of one of the 10x project teams.

3.5 Project Team - Methodologies

Various team leaders were interviewed about how they approached problem solving in general. The goals were to determine if there was a formal approach taken and if there was an expectation by the division's management that a formal approach be undertaken. The results were mixed. Many teams utilized a formal process for root cause analysis, examples include "How-Why", process mapping, etc. This analysis seemed to be used predominantly for identifying a path forward. However, after the path forward was established the teams did not seem to continue using a method to solve the problem.

The management of the division did not have a consistent expectation about using formal problem solving approaches. The management team endorsed training on various problem solving methods for people within the division. However, the use of the methods did not appear to be expected in talking about the different solutions.

Once an existing project team had been "elevated" to a 10x DPU team, there was not a visible difference in how the teams approached the problems. The same paths forward were being followed, and the same tools utilized. There did not seem to be a conscious

effort to change how the teams were approaching and examining the problem even though there was a change in the goals for the team.

The problem solving approach emphasized by the management team seemed to be aimed at rectifying the current situation and not towards long term process understanding. The focus seemed to be aimed at getting the problem to a point where the process could continue operating and then the worker's time could be focused on the next hot item on its list.

The individuals also focused their efforts on work that would impact their performance evaluation. The performance evaluations emphasized working on many projects and not really on in depth work in one particular area.

3.6 Project Team - Capabilities
The Paper Support Division's 10x training was focused primarily on the 10x DPU teams. When the training program was outlined a decision was made to concentrate the training on the 10x teams. Most of the team leaders had project management training. Most of the staff engineers also had been exposed to training on various problem solving methodologies.

The team makeup also defined the team capabilities. Most of the teams consisted of members having a lot of experience within the operating process of the project. Some teams seemed to rely heavily on past experiences for sources of solutions.

3.7 Project Teams - Perceptions
In speaking with various team leaders and team members the perceptions of the 10x program became apparent. There was a general feeling throughout the division that the 10x DPU program is just another program of the month. There had been a lot of initiatives in the quality arena for quite some time. The previous initiative seemed to be

focused on a particular methodology for approaching problems, such as the Quality Leadership Process.[4]

The team members interviewed did not feel that there was full commitment to the program. The projects did not seem to be aligned with the priority of the operating departments. This was reflected in the amount of support and emphasis the project received from management. Also the operating manager would sometimes emphasize projects other than the 10x projects. One of the 10x DPU projects was put on hold due to the needs of the operating process.

The individual team members all seemed to be overloaded in their work responsibilities. The interviewed people did not receive feedback on how to prioritize their individual work. The perception was that when a new problem came along it was just added to the list without any project removal. It seemed that projects kind of just faded until they became an important issue again or were solved.

The individuals were expected to prioritize their own work. The organization was in the process of implementing a strategy of having an empowered work force. Individuals were expected to volunteer for the work they wanted and also to prioritize the work. A source of conflict arose when an individual's priority did not match a team's priority.

The project teams did not feel any expectation from the division to change how the problem was being approached when a project was named a 10x project. The division in general placed a lot of emphasis on experience within an operating area. Past experiences within the division appeared to drive a lot of the behavior of the teams. Solutions for current problems were often sought from the past without a lot of emphasis on innovation. Also previous experiences with what management would or would not approve influenced the future course of actions and recommendations made by the teams.

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[4] *"Quality Leadership Process"* (New York: Eastman Kodak Company, 1990)

When the teams developed their own DPU measures, the teams did focus on identifying product and process based measures. However, this combined measure did not add value to the teams. The issue here was focused around which type of process should be measured- the production process or the process of problem solving. Some of the teams had process measures that were based on the problem solving process (behavioral activity, like investigation when the production shut down) and not the production process. The intent of having a process based measure was to relate the production process to the product and focus on production process understanding. Thus, most teams only calculated the DPU measure when it came time to reporting because the final measure was confounded and added little value to the actual performance measurement.

3.8 The Division- Perception

Outside of the 10x teams, understanding about 10x was low. Most people were familiar with 10x in introductory terms, but few seemed to understand what it meant. Most people felt that 10x is a program for the production area and did not see how 10x impacted their own job.

The concept of accelerated rates of improvement was viewed as a program and not as a part of the business strategy. The driver of the 10x program within the division appeared to be the 10x coordinators. The coordinators recommended a lot of the strategy and structure of the program.

3.9 Metrics

The metrics for success in the 10x Defect Reduction area were in terms of defects per unit (DPU) and Cost of Quality. The defects per unit were defined at the divisional level and were rolled up across product flows. The Paper Support Division defined a unit as being a roll of paper. The defects were defined in terms of product and process based measures. Management and the coordinators made a decision that defects would consist of 50% product and 50% process based measures. The intent seemed to be to get the measure focused on the production process instead of the product characteristic.

The product based measures were for the most part product characteristics such as roll length conformance and photophysical defects. Process based measures were not as straight-forward. The issue really centered around defining a process. Process had not been formally defined and left up to interpretation by the different project teams. Some teams defined the process to be the production process. A couple of the teams defined process as the activities the project team did in investigating the problem.

The issue here is that the metrics became confounded. The DPU measure did not truly reflect improvements in the process or the actual defect. As a result it was understandable when the teams felt that the DPU metric added little value to the teams. Most teams only viewed the DPU metrics for reporting, not for problem solving.

It was found that the DPU measures were not verified with other measures. For example the Cost of Quality measure, although a much more aggregate measure than an individual project, should give an indication if improvements were being achieved that resulted in gains toward the savings opportunity presented in the Cost of Poor Quality. The division had a monthly report that included results other than DPU such as customer external conformance and financial performance based on the annual operating plan. Although these other measures were calculated and reported, there were not any efforts seen comparing the different measures for correlation on a regular basis.

4. Model Building

In order to analyze the language data collected from the interviews and observations, a KJ (Kawakita Jiro) diagram[5] was made. The purpose of this analysis was to put some framework around the language data for identification of the areas to be addressed by an organization.

4.1 KJ Analysis

The question posed for the KJ diagram, see Figure 4.1, was "Why is the Paper Support (PSu) Division DPU (defect per unit) program only achieving limited success?" Following the guidelines for generating a KJ diagrams, "facts" from the interviews and observations were noted in a one sentence format.

These statements were then grouped together according to common images presented in the statements. Eleven groupings were made from the statements. Title statements were then generated for the groups. The title statements were a statement about the image presented in the grouping. These title statements were:

1. 10x is not viewed as being a business strategy.
2. Perception that the 10x DPU projects portfolio does not match the division's strategy.
3. Leadership team's focus and direction directly impacts the work effort.
4. Application of resources do not match 10x DPU projects needs.
5. Perceptions drive team behavior and organizational support to the teams.
6. Communications play a major role in project focus, approach, and knowledge sharing.
7. Leadership team role is a major guiding factor for 10x teams.
8. 10x DPU measures add little value to problem solving.
9. Individual and team metrics focus problem solving efforts.
10. Problem solving is not aimed at long term process understanding.
11. Limitations due to experience and capabilities limit success.

Because of the number of title statements, these titles were then grouped again to get to the next level of abstraction in the data presented. These 11 titles were placed into 3

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[5] Shiba, Graham, and Walden *A New American TQM* (Oregon: Productivity Press 1993)

groupings. After this grouping another set of titles was generated summing up the

information in the title groups. These sets of title are:

1. 10x needs to be a part of the division's strategy and depends upon the focus of the leadership team and the application of the division's resources. (titles 1-4).
2. The division's culture and structure directly support the 10x effort (titles 5-7).
3. Metrics drive problem solving effort which is limited by the capabilities within the division (titles 8-11).

The relationships between the title groups were indicated by arrows. It was determined

that each of the groupings was dependent upon each other with no one area being solely

an input or output to another area.

Based on the final titles and the relationships an overall conclusion was then generated.

This conclusion was:

> 10x needs to be integrated into the division's strategy, culture , and metrics for success.

4.2 Cultural Analysis

The organizational structure and culture in place at the beginning of the investigation

period was used for the cultural analysis. The new management group and structure,

which was installed towards the end of the investigation period was not included as a

part of this analysis. It should be recognized that the culture of the organization is

expected to change as the result of this new group, due to the change in leadership. The

leadership can impart the changes from its personal expectations and definition of values.

To examine the culture within the Paper Support Division, a cultural analysis was

performed using the techniques developed by Ed Schein for uncovering an organization's

culture.[6] The division's artifacts, espoused values and basic underlying assumptions were

listed and then analyzed. Schein's definition of artifacts, espoused values and basic

underlying assumptions are listed in Table 4.1. For the Paper Support Division, the

Why is PSu 10x DPU
Program only achieving
limited success?

10x needs to be integrated into the
division's strategy, culture, and
metrics for success.

10x needs to be a part of the
division's strategy and depends
upon the focus of the leadership
team and the application of
the division's resources.

The division's culture
and structure directly
support 10x effort.

Metrics drive problem
solving effort which is
limited by capabilities within
the division.

10x is not viewed as being a business strategy. Perception that 10x DPU projects portfolio does not match division strategy Leadership team focus and direction directly impacts the work effort.	Perceptions drive team behavior and organizational support to the teams. Communications play a major role in project focus, approach, and knowledge sharing. Leadership team role is a major guiding factor for 10x teams.	10x DPU measures add little value to problem solving. Individual and team metrics focus problem solving efforts. Problem solving not aimed at long term process understanding. Limitations due to experience and capabilities limit success.

August, 1996

PSu = Paper Support Division
DPU = defect per unit

Figure 4.1 KJ Analysis of Language Data

Table 4.1 Definitions for Cultural Analysis[7]

Artifacts	Visible organizational structures and processes
Espoused Values	Strategies, goals, and philosophies
Basic Underlying Assumptions	Unconscious, taken-for-granted beliefs, perceptions, thoughts, and feelings

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[6] Ed Schein, *Organizational Culture and Leadership* (San Francisco, CA: Jossey-Bass, 1992)
[7] Ditto

artifacts, espoused values, and basic underlying assumptions were described from the researcher's point of view of the organization during the time period of the investigation. To provide context to these areas, the environment of the organizational development is also described, again from the researcher's point of view.

Richard Beckhard and Reuben Harris have done much work on the transformations of organizations and why they occur. Part of their work deals with defining what is the present state of the organization, the desired future state, and then the process steps needed to transform from the present to the future. [8] The current environment within the Paper Support Division did not appear to have a stable culture. The state of the organization appeared to be a transition state.

4.2.1 Artifacts

The artifacts examined consisted of the Paper Support Division's architecture, language, technology and projects, projects, manner of dress, published lists of values, observable rituals, and organizational processes.

Architecture: The Paper Support Division had four operating areas that were spread among three buildings on the Kodak Park site in Rochester, New York. The East building was the original building that produced the paper for the Eastman Kodak company and thus contained some of the oldest equipment and process technology of the division. This building was located among the oldest buildings of the Eastman Kodak Company, where there was space allocated for not much more than necessary traffic between the buildings. The building was a multi-floor building with offices spread out among the various floors located away from the process areas. This one building housed both operating areas for the East side. The staff for the East side was spread out among the offices, but was aligned with the operating processes that it supported. The layout of the furniture and offices was utilitarian with little attempt to update the architecture.

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[8] Richard Beckhard and Reuben Harris, *Organizational Transitions* 2nd edition (Canada, Addison-Wesley, 1987)

The two other buildings were located on the West side of the Kodak Park site, where the buildings were newer. These two West buildings were located next to each other with a bridge connecting the two buildings on the second floor. Each building housed one operating area for the division. Since one building handled paper making and the other the resin coating process the bridge served for transfer of product as well as people traffic. Both of these buildings were similarly laid out pertaining to the staff. There was a sense of rank of people within the division. Predominantly, the staff was placed in one large open area with cubicles for the workers. Individuals who were supervisors or had a certain level of seniority had spaces that were larger than the cubicles of the staff and in some cases offices with doors. The managers of the division had personal offices with doors. The upper management of the Kodak Park site was located in an older building but was decorated more formally with people in offices along the sides of the building, with windows, and secretaries located in the center of the building in front of the manager's offices.

Manner of dress: There was also a sense of rank in the manner of dress. In general the staff was dressed informally for their daily activities. When there was an occasion to visit with customer representatives or corporate management, the dress became more formal/ business professional orientated.

Language: The language used by the division was one made for insiders, people who "belonged" to the organization. A lot of acronyms were used to describe programs, processes, divisions, and pieces of equipment. The language used to describe areas of the process were specific to the types of machine used. Little effort was made to explain the terminology to people unfamiliar with the process. There was little documentation explaining the acronyms or terminology used. Understanding was gained through personal experience with the process. This indicated that experience was valued.

Technology and products: The technology and products of the organization centered around Papermaking and applying a coat of resin to the paper stock. Papermaking is a

process that has been around for centuries. The technology used in the division for Papermaking is mixed with recent and old. The East Papermaking operations uses technology that was developed at the time of the installation of the machine. Little has been done to update to the state of the art, which is presumably a part of their strategy for this area. While in the West Papermaking area, the technology being used has been updated but does not consist of state of the art. Resin coating utilized more sophisticated technology, regardless of the physical location of the equipment, that matched the needs of its process and strategy.

The technology utilized by the division for its work was not state of the art. The division relied upon a computer system for information transfer. Workers utilized the system for issuing memos, meetings, scheduling, and getting information about and to corporate. Although not state of the art, there were enough terminals located through the division's areas that all workers could access the system on a regular basis. The use of more computer based tools and models for problem solving however, was not as readily available. In order to obtain access to a computer or software there was a rigid process each worker had to go through and budget constraints put limitations on the ease of access to these tools.

The projects chosen for pursuit by the division were aimed at dealing with the current concerns of the product. The department managers contributed towards which projects were to be resourced within the department. These projects may have changed according to the emphasis by the department manager. The department manager in turn focused on projects that would address the pressures placed upon himself. These pressures could originate from the division manager, corporate, or customers. These customers were predominantly internal either being a downstream process or a business unit. The focus appeared to be predominantly centered on providing the required product when it was needed. At times, to meet this focus, conformance of the product to its standards was sometime sacrificed. The customers were called to find out if they would accept product that did not conform in order to meet the shipment, and sometimes the customer would

agree. As a result, there were many projects that were aimed at problems that have existed for long periods of time.

Published lists of values: Around the division there were many poster size hangings of programs that have been implemented. Some of these hangings were descriptive in nature about a particular program or process, while others provided a location for results and progress for a program to be displayed. Some of the program hangings were ones that seemed to have become relics. These were initiatives that were instituted in the past, but have no longer been emphasized or reinforced. There were also posters of missions, visions, principles and values of the division and organization. However, these were also not kept up to date. There was an occasion where a slide of the division's principles was presented. Some questions were asked about where the presenter got the information (from a poster hanging). Statements were made that they were not the most up to date since the management team had worked on revising it, but the revision had not been published.

Observable Rituals: There were many meetings occurring in the Paper Support Division. The management team had a weekly staff meeting that lasted an entire afternoon. The agenda was developed during the week in a joint effort from input from the management staff and division personnel needing input from the management. Part of this staff meeting was used to present projects status, recommendations, and review.

Organizational Processes: The organization had in the recent past gone through a downsizing of its workforce. The organization had also restructured to a much flatter hierarchical system through the elimination of some of the supervisory ranks. The organization was aimed at achieving self- directed work teams. Committees or teams were set up within the division to develop programs on such issues as empowerment and diversity and improvement. Direction for these committees was minimal from the management group. Often these committees had to develop their own strategy and direction and then present to management who would sometimes disagree and then have

the committee present another strategy and direction. The division had an empowerment initiative that was a strategy for achieving self-directed work teams. This initiative was aimed at giving individual workers the capability and authority to make their own decisions.

4.2.2 Espoused Values

The espoused values looked for in the Paper Support Division were those that would explain some of the artifacts observed.

The way problems were approached and solved was investigated. In asking how projects were selected it became apparent that those problems that had the largest emphasis from the division or the business units were attacked. This extended not only at the project selection level but also at an individual priority level. Projects and work were performed that led to the relaxation of pressure on the department. This led to much more of a focus on the department's interest instead of the division's, the product flow's, or the company's interest. Team members pointed out that there was not enough time nor was it valued to seek process understanding when there were so many pressures to meet product demand.

Individuals were responsible for prioritizing their work. This prioritization was influenced heavily by the department manager and the supervising manager of the employee. Individuals tended to focus on those projects that would affect their performance evaluation and on what was important for the department. These evaluations were geared towards the achievement of a lot of different projects with emphasis on team, not individual efforts. Also there were not a lot of individual investigations occurring into the process or products. On the occurrence of an individual initiative of a team project resulting in something positive for the process or product, the individual was not praised for the work, but instead viewed in some disfavor because of not working with the team on the problem. All of this leads individuals into a very conservative problem solving mode of only working on projects that are deemed important by the division.

4.2.3 Basic Underlying Assumptions

There are three major underlying assumptions within the Paper Support Division that impact the organizations ability to sustain accelerated rates of improvement:

- The division aims to satisfy its customer's immediate needs
- Experience in the process is valuable
- Comply with the current system since it will change in a few years.

The division aims to satisfy its customer's immediate needs. The division responds to the most immediate pressures. This response is focused on fulfilling needs as quickly as possible. The management does not generate an expectation for the division to understand the process but only to get the division running in a manner to eliminate the pressures. This expectation leads to remedies being used instead of true solutions that lead to greater understanding. Also the division does not take time in reflection or sharing what has been learned outside of the problem solving team. The team members of a problem solving team shift their focus to other problem solving teams once the original product requirement is being fulfilled. Reports of the work may be generated but time spent on reviewing the process understanding gained or the problem solving approach used is not valued. Also individuals are focused on their own priorities which do not include time spent sharing knowledge or process investigation.

Remedies to problems were sought instead of solutions that eliminated or enhanced process understanding. In speaking with people about the Papermaking process there is a view that the process is still more of an art than a science in the application for this division. This viewpoint seemed to stem from a lack of complete understanding of the impact of the process on the product.

Experience in the process is valuable. The division values experience in the process area. There are instances when a problem has occurred to look to the past for guidance. Looking to the past is valid when understanding the past and then building upon it for the present or future. The risk factor in using the past to solve present problems was the implied confidence that the actions would not harm the current process and the ability to

make product. However, by only seeking possible solutions that have been used in the past, no innovation or breakthroughs are introduced in the process.

Comply with the current system since it will change in a few years. The Eastman Kodak Company and the Paper Support Division have gone through many changes in the organization's structure, workforce level, and organizational processes. The relics of past improvement processes and methodologies can still be seen on the walls of the Paper Support Division. The division's staff have gone through training in these processes as well as training with the organization's structure, the expected behavior, and the values of the organization. This training is then not incorporated into the normal mode of operating for the staff. When a crisis occurs, whether within the production process or a special customer concern, these processes may be placed on hold.

4.3 Conclusion

The KJ analysis showed that for the accelerated improvement program of the Paper Support Division to be successful, it needed to become a strategy of the division and incorporated into its performance metrics and culture. To do this there must be an alignment of the strategy with the culture of the division. To truly be aligned the underlying assumptions of an organization should complement the strategy. In the Paper Support Division, the underlying assumptions do not appear to be aligned. The underlying assumptions of compliance, short term focus, and valuing past experience do not align with accelerated rates of improvement. Accelerated rates of improvement require commitment, especially from the upper management during the beginning of the initiative, long term focus aimed at sustaining the rates of improvement, and valuing innovation. This implies breaking with the past.

5. The Model

This model consists of the elements needed within an organization to support accelerated rates of improvement. The data for this model was based on work done during a six month internship period at Eastman Kodak's Paper Support Division. It is hypothesized that the elements identified from these data can be applied to any organization trying to achieve accelerated rates of improvement. This work, which examined the organization's support for their 10x program (accelerated rate of improvement program), identified five areas for the organization: Customer Focus, Work Alignment, Organizational Capabilities, Organizational Culture, and Leadership, see Figure 5.1.

5.1 Customer Focus

The customer focus element is the focal point of this model. Customer Satisfaction is the objective of Eastman Kodak's mission statement. Part of Kodak's strategy is that by focusing on Customer Satisfaction Kodak's performance will improve and will allow for the achievement of the consequent goals of increased global market share and superior financial performance.

In the Paper Support division, the valuing of customer needs was done informally. There was no formal system that listed, put a value on the need, or ranked the needs. In this model customer focus needs to be taken into account when setting up the organization. Hence, the customer and the customer's needs must be defined. A value and prioritization is needed for these customer needs so that the organization recognizes how, and if, they will address the needs. Being able to value each customer's needs allows the organization to prioritize the needs. This prioritization then can be used in determining how the resources are to be utilized as well as which needs should be addressed.

This valuing and prioritization applies to all of the activities undertaken by an organization. Those needed to sustain accelerated rates of improvement should be identified further. This identification step needs to take place in the work selection, which is described further. The customer focus should also be taken into account when

Customer
Satisfaction

Work
Alignment

Culture

Capabilities

Leadership
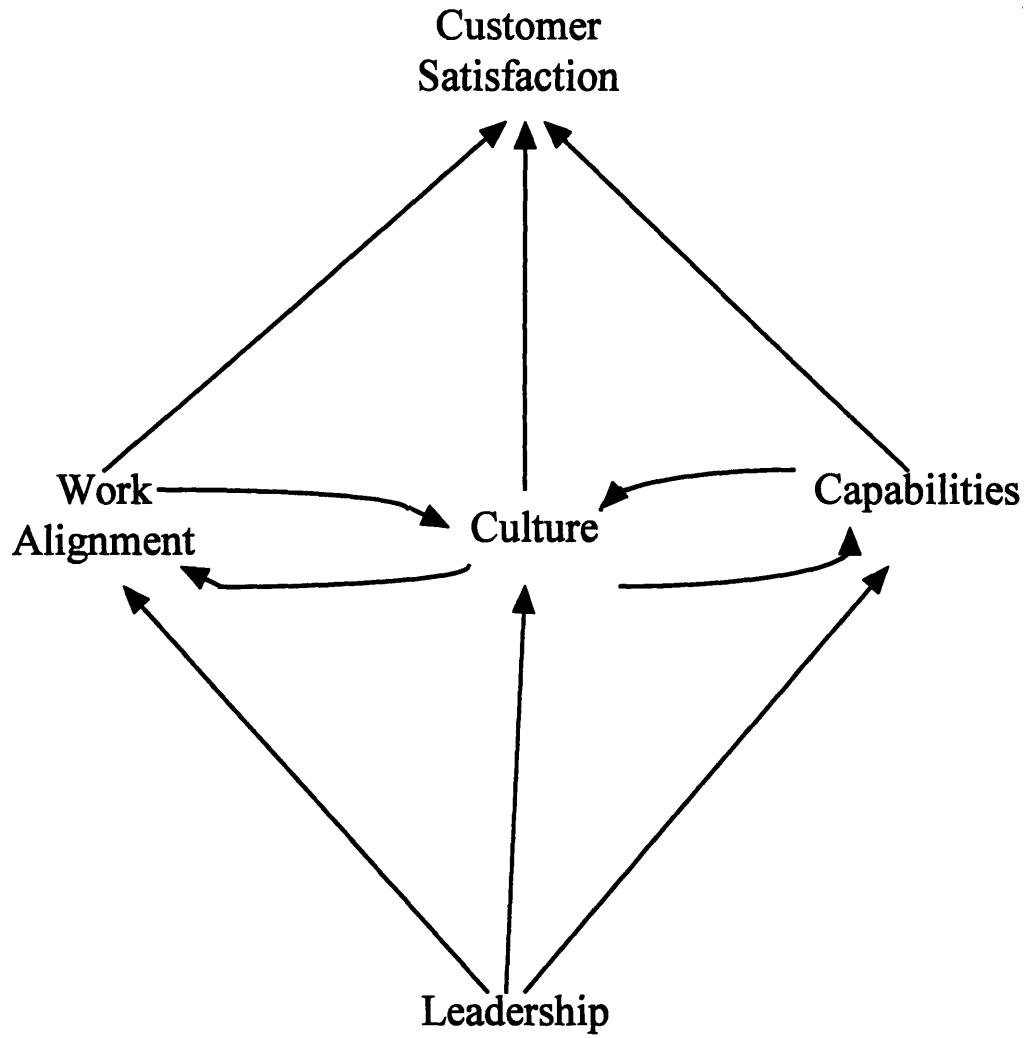
Figure 5.1 Model for Sustaining Accelerated Rates of Improvement

determining the measures of the organization. If the customer is focusing the work, then verification measures should be in terms of customer needs. It is recognized that the project and team measures should be of value to the team's problem solving.

In allowing the customer to focus the organization's work, the organization must be able to effectively translate the customer needs into product specifications and also into terms of the process. The organization must, therefore, attain a capability that allows employees to translate needs into terms of the process.

5.2 Work Alignment

The work selected by an organization needs to be driven by the customer focus, which depends upon the ability of the organization to translate the customer needs into product specifications. Also important in defining the selected work is the understanding of how the production process impacts the product specifications. It is having this foundation of process understanding that will allow the organization to efficiently address the customer needs without sabotaging its process capabilities.

In sustaining accelerated rates of improvement, as opposed to achieving it for a particular project, it should be recognized that there are different ways to proceed. David Upton from the Harvard Business School recognizes that there are three models of continuous improvement initiative, see Figure 5.2. The first method is more of an opportunistic approach. This approach is to drain the current pool of opportunities or "pick the low hanging fruit" of projects. The criteria for selecting projects focuses mostly on the ease of implementation and the speed of the payback (i.e., focus is much more short term). The long term objectives associated with this approach are projected to be inconsistent over time. The performance improvement curve is expected to be convex, having decreasing gains over time. The second model takes a more reactive approach in the selection of projects. This approach concentrates on trying harder to improve the performance on a particular measure and trying to continue to find and possibly stumble on the new opportunities to improve the process. The selection criteria for projects concentrates on

the direct impact the project has on the chosen direction. The objectives with this approach are expected to be consistent over time. This model is expected to have a linear performance improvement curve. The third model is a planned approach for new opportunities for improvement. This model's approach is to "...sow the seeds for new improvement opportunities for the future...and still improve every day..." The selection criteria for projects in this model includes projects that have a direct impact on the chosen direction and provide a platform for future improvement gains. The performance improvement results of this model are expected to be accelerating, with the long term objectives consistent over time.[9]

Model 1,
Opportunistic

Model 2,
Reactive
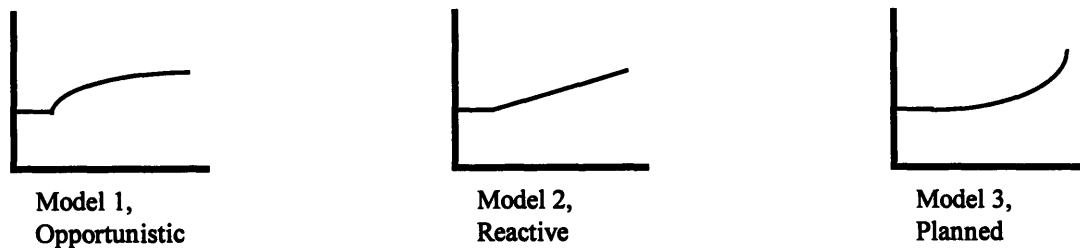
Model 3,
Planned

Figure 5.2 David Upton's Three Models of Continuous Improvement Initiatives

In determining the work the organization undertakes for yielding the improvements, the organization should pick a portfolio of projects that together yield an overall improvement rate for the organization. The portfolio of projects should consist of a clear work focus that takes into account both the customer and different expected pay outs over time.

5.2.1 Clear Work Focus
The work selection needs to balance the needs of all the customers as well as other demands placed on the organization, e.g. environmental regulations, etc. (although these could also be defined as customers). This implies that there is an understanding of the value of each of the customer needs and that the needs are translated into product specifications. Another part of the balance is aligning the work of the organization to

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[9] David Upton, "Mechanisms for Building and Sustaining Operations Improvement" Working Paper, Harvard Business School, Massachusetts, 1996.

these customer needs. This means that the projects or process improvements undertaken need to correlate to customer needs.

The issue here with work alignment is that people who are working on the selected activities need to understand the correlation so they understand the value and priority of the work. This is especially important at the Paper Support Division where the organization was instituting self directed work teams and employee empowerment. These programs resulted in individuals prioritizing their own work. Thus if individuals do not understand the value and prioritization of the work that is selected their work may not align with the needs of the organization or the customer.

As a suggestion for selecting the work, the criteria should include a way of measuring each project's:

- impact on customer requirements
- value added to the business
- impact to the organization's strategy

The use of the criteria is helpful when communicating the work to the rest of the organization and explaining the logic for the selection to both people within the organization and customers.

The communication piece is important for people to understand which work has been selected. It is important for management as well as the team members to understand the expectations for the work and the approach being taken.

5.2.2 Sustainment requires balance

To sustain accelerated rates of improvement over time, the improvement rate for the organization is going to be the results of all of the improvement occurring within the division, including activities that are within and outside of an improvement program. The work that is selected must also balance long and short term goals and project pay out as well as different process focus. In the case of the 10x program, the process has focused on reduction in defects, cycle time, and cost of quality.

In order to sustain accelerated rates of improvement as an organization there needs to be a balance of projects with expected pay outs in various time ranges. Customer needs as well as different project schedules can be put on a time scale. By their very nature some projects will take longer to develop than others. Typically, projects focused on product or process reengineering are expected to take more time than projects focused on incremental improvements in existing processes. This balance implies that the projects in an organization's portfolio should consist of a combination of opportunistic, reactive, and planned. It should be recognized that for the future achievement of gains in performance the biggest payback is in Model 3, Planned projects.

In the accelerated rates of improvement program the work should not be focused along a single improvement category. For example, in the 10x program, improvement is focused along defect reduction, cycle time, and cost of quality. It is feasible that by focusing the work on defect reduction only, cycle time may suffer or the cost of quality may increase due to the results of the improvements. Instead of focusing on one or the other, all three areas should be balanced in order to achieve the global optimum.

5.2.3 Measures

An extension of the work alignment are the measures for success for the work. These measures must also align with the direction of the organization. The metrics that are used to gauge success are very influential in the behavior of an organization. This is true not only for individual performance measures but also for project and organizational measures.

There are many types of measures within an organization. Three that are important within the work selection area are performance, reporting, and verification measures. The important difference among the three is their purpose. The purpose of the performance measure is a way of seeing how well the item of concern is improving. This measure is of high value to the problem solving team because it is the measure that will let them know

not only the achievement of success, but also the rate at which they are achieving it. The reporting measure is a metric given to the organization for their uses. In the 10x program, defects per unit (DPU) was reported at a product level. This measure may be useful at that level, but the value to the team at a day to day level can be debated. However, this does not mean that the reporting measure is not valuable to the team since it verifies the improvement that the team is doing is being seen outside of the immediate scope of the team. Also the reporting measure may be in a format that can be shared with the division's customers. The third measure, verification, is important for the team and the organization. A verification measure would allow the organization to determine if the projects chosen are correctly addressing the customer concerns and are resulting in global optimums, i.e., that the improvement is not being achieved at the detriment of another process or cost.

All three of these types of measures are important at all levels of the organization and are interdependent. The differences in the measures however, should be noted and taken into account when looking at performance.

5.3 Culture

The culture of the organization needs to also support accelerated rates of improvement. Desired cultural aspects include an atmosphere that encourages innovation, employee understanding of the direction and focus of the company, and processes where decisions are driven from data. An innovative atmosphere encourages employees to generate new ideas or approaches. The management of the organization also needs to become comfortable with taking some risks and dealing with decisions whose results are not what was originally expected. It should be recognized that as decisions are made that contain more risk and are uncertain in the results, there are possibilities of failure occurring but also learning about the process or product in a new way.

A clear focus is needed for the workers in the organization. The workers need to be supportive of each other and recognize the importance of the work that is occurring. Clear

direction on the customer needs so that the problem is correctly addressed is also imperative, especially when the company is looking for innovation in the product or process.

Decisions need to be made based on data instead of emotions or tacit experience. In order to continue building from previous learning, the data needs to be available and in a format that the organization understands. The problem solving approaches utilized should be focused towards process understanding with risk evaluation occurring for considered alternatives.

To achieve the large accelerating changes in performance, there is typically an emphasis towards an innovation or breakthrough. As teams develop a capability to generate and develop innovations, this new capability should be transferred to the organization. This transfer can occur by the team members using the same concepts and methodologies used to achieve the breakthrough on the team to achieve breakthrough on activities outside the team. To help embed these capabilities into the organizational culture the management of the organization can develop an expectation that these capabilities will be used on all activities.

This model is leaning towards a culture of a learning organization, where knowledge that is learned in one area is transferred for utilization by the organization.

5.4 Leadership

The leadership of an organization is critical when cultural change is occurring. It is the leadership of the organization that drives the organization towards its direction. The organization's leadership provides the tone, reinforces through actions what is important, and communicates the direction. The tone of the organization is defined through the goals and objectives of the organization. The leadership creates a sense of urgency for the organization through its communication. Employees see what is important through the actions undertaken by the leadership. This applies to both projects and values. For

example, the importance of process understanding can be shown by the questions the management asks during a problem investigation and in the presentation of results, the amount of reflection given to the problem when it is solved, and then how this new understanding is transferred outside of the project team.

Ultimately it is the role of the organization's leadership to define the future state of the organization and communicate that to all employees. The leadership must also direct the organization through a transitional state on its journey to achieve the future state.

5.5 Capabilities

The organization needs to develop both organizational and individual capabilities to support the work alignment, culture, customer focus, and leadership of the model.

5.5.1 Work Alignment and Customer Focus

The capabilities needed for Work Alignment and Customer Focus include:

- the ability to effectively translate customer needs to product specifications
- place a value on customer needs and projects
- understand the impact that the organization's processes have on the project
- plan projects out into the future
- focus on optimization of the process over the division and/ or product flow

Valuation of customer needs and projects requires capabilities in risk valuation and data driven decision making. Project planning needs to look beyond the projects for the coming year and should include some strategic analysis of the needs of the product and process for years into the future. This forward planning should include at least some five year planning with some examination beyond that with the research and development department of the organization.

5.5.2 Culture

The capabilities needed for the culture consist mainly of the ability to generate new and innovative ideas for new areas of improvement, define the needs of the future, and plan for the future. The communications of the organization also needs to support the model,

and need to be open, simple, and focused. The organization needs to be moving together to achieve the improvement at the accelerated rates.

5.5.3 Leadership

The organization needs leadership capabilities focused on defining and directing the organization. The organization's leadership needs to have the ability to create the atmosphere needed to support the model, including an atmosphere that encourages innovation, idea generation, and some risk taking. The leadership team also needs to develop the capability to change the focus of the organization towards planning the future, and not focus in on the current process and products.

5.6 Factors Affecting Model Implementation

Implementing this model within an organization can take many forms. The factors driving the implementation plan include the level of management support, the culture of the organization, the organization's history with improvement programs, and the desired future state of the organization. The implementation plan needs to direct the organization to the future state. It also needs to address the underlying assumptions of the culture.

Management support is needed to reinforce the implementation plan and strategy. This can be done by emphasizing the model's level of importance within the organization. The history of program introduction affects how the organization will receive any new program or strategy. If there are many programs that have been introduced and forgotten, any new program will have difficulty in gaining credibility with the organization in the short term. The level of management support becomes critical in this case.

It is not enough to define the future state. The implementation plan needs to account for the transition state the organization will occupy during its transformation. The transition state needs to provide an environment that continues to motivate the organization to the future state.

An accelerated improvement strategy can take the form of a program to introduce the concepts, the capabilities, the expected values and behaviors, and the desired future state associated with the strategy. However, the model does not stop with the program. The program can be viewed as the training ground for introducing the change to the organization. The organization's culture, defined by the organization's underlying assumptions, must change to support the strategy. Thus, to embed the program and the model into the culture, the underlying assumptions must change to support the model.

6. Implementation

Once the model had been developed, the next step was to determine the method of implementation. An obvious method is to take a very analytical approach and present the model with its data and process development. Another is to compare the model to others and present a hybrid to the organization. A third approach is to use the model as a starting point and then alter the model to customize it to fit the organization. A final option is to use the model as background for a framework for a facilitator, and then facilitate a model development with the organization.

The alternative to chose is really dependent upon the environment of the organization. The method chosen in this case was to work with the Leadership Team of the Paper Support Division to develop their 1997 Accelerated Improvement program (10x Program). The environment at the time of the implementation was one that was poised for change, and the organization appeared willing to change itself. The management of the organization was undergoing change due to new leadership, including a new (to the Division) Division Manager, a new Strategic Resin Coating Manager, and new Department Managers for the East Papermaking and West Resin Coating. There were also shifts among the other positions with the West Papermaking Manager shifting to Papermaking Capital Projects Manager, East Operations Manager shifting to West Papermaking, and the Strategic Manager for the Division shifting focus to Papermaking Strategy for the Division. The attitude of the employees in the division was one of anticipation since changes were expected with the new management team and structure. The environment also wanted a change to the organization, since there was a recognition that the current organizational structure was not supportive of the needs of the division.

6.1 Background

6.1.1 The Leadership Team

At the beginning of the investigation (June 1997) the leadership team for the Paper Support Division consisted of: Division Manager, Strategic Technical Manager, Technical Staff Manager, East Operations Department Manager (both Papermaking and

resin coating), West Papermaking Department Manager, West Paper Coating Department Manager, Capital Flow Manager, and Human Resources Manager. The Division Manager had announced a leave of absence to commence in September 1997. During the investigation period the management structure changed and new positions were added, see Table 6.1.

The leadership team by the end of the investigation period (November 1997) consisted of: Division Manager, Papermaking Strategic Manager, Resin Coating Strategic Manager, East Paper Making Department Manager, East Resin Coating Department Manager, West Papermaking Department Manager, West Resin Coating Department Manager, Technical Staff Manager, Capital Flow Manager, Human Resources Manager, Financial Services Manager, and Papermaking Capital Projects Manager.

6.1.1.1 Division Manager

During the development of the model the importance of upper management support became apparent in achieving success in any program. At the start of the investigation the division manager was about to leave the company for a sabbatical and the replacement had not been named. The tone in the division was one of waiting to see who would come into the division and what new programs would be instituted and emphasized. The existing division manager was supportive of people's initiative in any work, but did not appear to be driving any of the initiatives. The division manager had accumulated a lot of vacation time and, as a result, spent more time out of the office than in the office.

The mood of the employees in the division at that point was a wait and see attitude. The division's employees, especially the 10x DPU project team members, seemed to be waiting for the new division manager to see what would be emphasized and what new programs would be implemented. There was an attitude that the 10x program could possibly fade from the programs being pursued by the division. Not as obvious was an attitude of hope that the new division manager would generate some excitement in the

Table 6.1 Paper Support Division Leadership Team - Changes during Investigation Period

Original Leadership Team	Movement of Original Leadership Team	New Leadership Team	Time in Paper Support Division
Division Manager (left on sabbatical)		Division Manager	brand new - 10x Manager from French facility
Strategic Technical Manager		Paper Making Strategic Technical Manager	>10 years
		Resin Coating Strategic Technical Manager	brand new - Manager at Australian facility
Technical Staff Manager		Technical Staff Manager	>10 years
East Operations Department Manager		East Paper Making Department Manager	brand new - process engineer in Black & White & film
		East Resin Coating Department Manager	>10 years
West Paper Making Department Manager		West Paper Making Department Manager	>10 years
West Resin Coating Department Manager		West Resin Coating Department Manager	brand new- Area manager in Precision Equipment Component Manufacturing
		Paper Making Capital Project Manager	>10 years (with an assignment outside of paper support)
Capital Flow Manager		Capital Flow Manager	2 years
Human Resources Manager		Human Resources Manager	2 years
		Financial Services Manager[1]	5 years

Notes:

1. The Financial Services manager existed within the organization but was previously a part of the management team.

division and provide enough direction to have the division moving in one direction again. However, this attitude was much more reserved and not expressed openly.

The new division manager, who had been in charge of the 10x program for the European Division, was named one month after the existing division manager left on sabbatical. Thus the new division manager had some "hands-on" experience in implementing an accelerated rate of improvement program and had developed a personal model on the organizational design needed to support accelerated rates of improvement. His model for achieving 10x rates of improvement was to focus on defect reduction, cycle time reduction, and process simplification. He worked on developing the management process needed to support this focus. His organizational model was based upon developing thrusts that drove the organization towards its goal. His thrusts included Asset Utilization, Health, Safety & Environmental, Manufacturing Cost Productivity, Manufacturing Excellence, Organizational Excellence and 10x Rates of Improvement.

In coming into the Paper Support Division, the new Division Manager had developed plans for a retreat for the leadership team. The purpose was to establish relationships between the members of the division's management, to begin team building and to determine what type of organization was needed to support the division's strategy and goals.

The division manager was interested in the implementation of the model developed for sustaining 10x rates of improvement. The Manager's desire was to incorporate the development of the 10x program (see next section) for the division with the leadership team development, which included the management process needed to support the 10x program as well as initial team building. The 10x program development was the first area that the entire leadership team worked together on as a unit.

6.1.2 10x Program Development

During the investigation period, the Paper Support Division needed to determine what projects they would support during 1997 to achieve its goals for 10x rates of improvement. The timing of the 1997 10x program development was towards the end of the investigation period, when work was being done on how to implement the Sustaining Accelerated Rates of Improvement Model within an organization.

The goals of the 1997 10x Program Development took on many forms from different constituents. These constituents included the new Division Manager, the Leadership Team, the 10x Coordinators, and the 10x Project team members.

Division Manager
- team building exercise for new leadership team
- begin defining management processes for organization
- define the needs to make the 10x program successful

Leadership Team
- Define the projects for 1997
- Define how the 10x program fits within the division

10x Coordinators
- Get buy in from the leadership team to build management support for the program
- Build ownership of the program by the leadership team
- Define the projects for 1997
- Define the goals for 1997
- Define the roles and responsibilities for the Coordinators, the Leadership Team and the 10x Project Team Members within the 10x Program

10x Project Team Members
- Define the projects for 1997
- Define the goals for 1997
- Prioritize the 10x projects with the projects of the Division

6.2 Implementation Analysis

To determine the alternative chosen for implementation, a stakeholder analysis was performed, see **Table 6.2,**[10] to show where the constituents stood in their support for the 10x program. The categories to rank their support consisted of: No Commitment, Let it Happen, Help it Happen and Make it Happen. The next part of the analysis identified where constituents needed to be for the 10x program to be successful.

Table 6.2 Stakeholder Analysis of Paper Support Division

Key Players	No Commitment	Let it Happen	Help it Happen	Make it Happen
Division Manager				X O
Leadership Team			X	O
10x Coordinators ·			X O	
Team Members		X		O

X -- Current level of support   O -- Needed level of support to be successful

The analysis shows that the Division manager was committed to the division achieving its accelerated rates of improvement, and his experience in developing a 10x program solidified buy in to accelerated rates of improvement. The Division Manager already had developed a personal model on how accelerated rates of improvement fit into an organization and the achievement of the accelerated rates of improvement was a part of an organization's strategy. This level of support was thought to be critical in achieving success at accelerated rates of improvement. The Division Manager, especially new to an organization, provided a lot of the direction, tone, and important values for the organization. Since the level of commitment within the division was low, it was determined that it was critical that the upper management, i.e., division manager and

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[10] Richard Beckhard and Reuben Harris *Organizational Transitions* (Reading, MA: Addison-Wesley, 1987)

leadership team, was committed to the strategy of achieving 10x rates of improvement and would strive to make it happen.

The leadership team was not as committed. Members of the leadership team seemed to be complying with the tenets of the program rather than actually driving the improvement. The leadership team appeared to be very focused on the day to day pressures of their respective departments. Their focus on the division goals seemed to key in on the goals that were outlined to be a part of the division's performance matrix, which the division developed at the start of the year. Since the employees within the departments were very focused on the day to day pressures and the immediate goals of the department, the department manager and the Leadership Team needed to be committed for any program or strategy to be successful. Thus, the Leadership Team needs to shift to the Make it Happen category.

The 10x coordinators, who were responsible for presenting corporate requirements of the program to the division had spent a lot of energy in developing the existing 10x program for the Paper Support Division. Some of the coordinators were concerned about expending more energy without having some direction or idea of the level of support that the leadership team would have for the 1997 10x program. As a result, the 10x coordinators were concluded to have a current level of support of Help it Happen. The amount of influence the 10x coordinators have within the division is limited, since the employees within the division focus on their department's needs. As a result, the 10x coordinators only need to be within the category of Help it Happen.

It was not felt that they needed to be in the category of Make it Happen because of their current role in the division. Since the management team is so influential in the work that occurs within the division, it was felt the commitment really needed to reside with the management team. It is projected that as the division's effort in achieving accelerated rates of improvement proceeds, the 10x coordinators may take a more proactive role with the program, but this role would still be as facilitators.

The 10x project team members were categorized by Let it Happen. The team members did not see any change in emphasis of the projects undertaken because of the 10x status assigned to them. The team members approached and handled the 10x projects similar to non-10x projects. The members felt that the 10x program was a quality initiative and they were not fully convinced that this program had staying power within the company. For an accelerated rate of improvement initiative to be successful, it was determined that the project team members needed to shift to the Make it Happen Category. However, to get this level of commitment from the workers there needs to be commitment and drive coming from their source for focus, i.e., the Leadership Team.

Thus, in considering the implementation plan it was recognized that the first area needed to concentrate on the Leadership Team. The Leadership Team was critical to success. Since they define the strategy and goals for the division, thus providing the direction and defining the processes for achieving their goals. Once the commitment is present within the Leadership Team, it is felt that then commitment can spread within the departments of the organization.

7. Implementation Process

The analysis used to determine the implementation of the model on sustaining accelerated rates of improvement within the Paper Support Division included a stakeholder and environmental analysis. The results of this analysis showed that the implementation needed to concentrate first on building commitment within the leadership team of the division. Because there was also strong support from the new Division Manager, the method utilized was to work with the leadership team to develop the team's own model of supporting accelerated rates of improvement through the development of the 1997 10x program.

7.1 Implementation Method

Acting as a facilitator and a process consultant, a process was outlined for developing the 10x program for the Paper Support Division which followed The Seven Steps Method developed by the Center For Quality of Management.[11] This method was chosen because it's outline included not only the problem definition, problem solving, and implementation phases, but it also included an evaluation of the solution, standardization into the normal mode of operations, reflection of the process utilized to generate the solution and development of future plans. The standardization, reflection, and future plan development were thought to be of importance since the problem had to deal with organizational design and had a huge potential for impacting the culture of the organization.

It should be recognized that The Seven Steps Method is a tool that is utilized typically as a reactive problem-solving methodology when there needs to be a correction made to a plan.[12] The plan for the Paper Support Division was the existing 10x Program. Since the existing plan was not bringing the desired results, the problem solving was reacting to that deficiency.

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[11] Shoji Shiba, and Alan Graham and David Walden, *A New American TQM* (Oregon: Productivity Press, 1993)
[12] Ditto

7.2 Implementation Procedure Utilized

A problem solving team was made up of the leadership team and the 10x coordinators. This team had a total of 13 members plus the facilitator. The overall goal was to develop the 1997 10x program for the Paper Support Division. The steps utilized are outlined in Table 7.1. Due to time constraints, the work with the Leadership Team only proceeded to Step 4 - Solution Planning and Implementation. However, there is an expectation that enough buy in to the process was generated that the Leadership Team would continue with the process.

Table 7.1 Seven Step Method Used to Develop 10x Program for the Paper Support Division

Steps	Purpose	Outcome*
1. Theme Selection	Recognize importance of and define the problem	Goal: Improve the 10x Program for 1997 so that the teams can achieve 10x rates of improvement.
2. Data Collection & Analysis	Investigate features of the problem	Determined that 10x projects chosen were not all achieving their individual goals and goals of the division.
3. Causal Analysis	Find main causes of the problem	Identified 9 major root causes.
4. Solution Planning & Implementation	Take action that will eliminate the causes of the problem	Divided 9 major causes into 4 Sub-groups to develop the design for the 10x program.
5. Evaluation of Effects	Insure that the solution will correct the problem	
6. Standardization	Insure that the cause of the problem is eliminated permanently	
7. Reflection & Future Plans	Review the problem solving process and identify the next problem	

* Due to time constraints the work with the Leadership Team was followed only to the Solution Planning portion.

7.2.1 Theme Selection

The theme selection was developed with the 10x coordinators. The coordinators had the responsibility of determining what were the needs of the Paper Support Program to fulfill the corporate 10x goals and had developed a workshop for the development of the 1996 10x program. The goal for this problem was to improve the 10x program so that the 10x project teams could achieve the 10x goal of a 54% annual improvement rate.

7.2.2 Data Collection and Analysis

As a group, the 10x coordinators and the leadership team reviewed the process used for selecting projects and measures for 1996 and reviewed the DPU (defect per unit) and performance matrix data based on a presentation by the 10x coordinators.

The review included how the 10x teams were measuring their performance. It was explained that each team had 50% product and 50% process based measures. Some of the teams were using process based measures that came from the production process and had an effect on the product defect being investigated. Other teams had process based measures that were based on team behaviors or activities. It was recognized that the team activities did have an effect on the product defect, but that this impact was very indirect. One of the conclusions reached was that the measures were confounded and it was difficult to determine if the teams were truly improving the performance of the production process. One of the contributors to this problem was that no formal definition of process had been established.

Another outcome of this analysis was that there was no formal comparison between the 10x project teams' DPU data and the performance matrix data. It was recognized that if the production process is truly being improved, there should also be improvement in the division's performance which would show up in the performance data matrix.

7.2.3 Causal Analysis

The causal analysis tool utilized was an Ishikawa Diagram because of the familiarity the people in the Division had with this tool. The question asked for the causal analysis was

the same question used for the KJ analysis, see Figure 4.1, used to develop the

sustainment model, see Figure 5.1, i.e., Why are we [Paper Support Division] seeing

limited success in achieving 10x rates of improvement?

The results of the Ishikawa diagram, see Figure 7.1, included 9 key root causes identified

by the leadership team:

- Lack of understanding of what 10x is
- No understanding of the tools, skills, and capabilities needed to achieve 10x goals
- Lack of definition of defects, units, and opportunities
- Lack of a problem solving approach
- Lack of management processes
- Inadequate criteria for selecting projects and 10x goals and their objectives
- Lack of understanding capabilities and requirements for reviewing and reporting
- Lack of alignment/ priority of 10x and the rest of the organization
- Don't understand the production process well enough

The Leadership Team and the 10x Coordinators determined that these root causes could

fall under four areas for program development: Leadership Process, Management

Process, Selection Process and Problem Solving and Process Understanding.

7.2.4 Solution Planning and Implementation

My investigation, as a facilitator, included working with the Leadership Team and 10x

Coordinators to outline the work needed for the solution and implementation plan, but the

final solution and implementation of the solution were not observed directly.

Since nine root causes had been identified and there was some concern about the time

duration of the task at hand, the group (Leadership Team and 10x Coordinators) divided

up into smaller groups and worked on the four areas needing development: Leadership

Process, Management Process, Selection Process and Problem Solving and Process

Understanding. Each of the four sub-groups had four to six members each. Each person in

the Group was a member of, on average, two sub-groups. The sub-groups were charged

with working on the development in their respective area and making sure they addressed

**Paper Support 10x Process Review
Ishikawa diagram of root cause analysis**

Need Methodology for crisis
recovery, re-engineering, &
continuous improvement

Procedures

Policies

Can accomplish more
outside of the teams

Lack of Problem
Solving Approach

Lack of chain
of responsibility

Not integrated with
management process

10x program is interpreted
from Motorola (widgets
continuous flow)

Th
has nfor
Paper

Loss of voice
or customer

Lack of defining
defects in terms of
product flow

Still haven't formed true teams (still groups)

Lack of a steering
committee

Lack of understanding
capabilities and
requirements for review
& reporting

Just another
measure

10x program is
different from

K/t
get w bout

Separation of
DPU, cycle
time, COQ

Success of the mill is
stronger driver than
the success of
the team

Priority of DPU is not
greater than other issues

Lack of chain
of responsibility

Need to set
example

Supplier's quality
program

10x is viewed as an add

Training is speci
for 10x

Lack of understanding
impact of team
measure to customer

There are competing factors
for individual's attention

Not clear who
needs to be a part
of the review process

Lack of Leadership
Team training

Lack of
Supplier training

Teams
achieve
goals

Definition of
defects, units,
opportunities

Lack of alignment
of team measures
with business needs

Lack of a mentoring process for the teams

Lack of defined
roles and
responsibilities

The review process is not frequent

Not enough
focus on team process

Lack of individual flexibility

Lack of
Team training

Measures nfounded
and use urposes

Lack of
defined formal
process

Implemented so
that teams can
show progress

od
teams

Lack of validity of
measure

Lack of management processes

Lack of alignment/
priority of 10x and
rest of organization

People don't see
a transfer of
skill

Available but in
an obtuse way

Why are we seeing
limited success in
achieving 10x rates of
improvement?

Have a complex integrated manufacturing process

Lack of valuing
risk

Lack of Process
Knowledge

Lack of
Information

Tra Lack of understanding
what 10x is

No expectation for using
problem solving tools

High cost of testing

Cause & effect
determination
difficult

One failure
affects the
entire process

Pressure of the crisis

Risk to the
business

No understanding
of tools, skills,
capabilities
needed

Need to differentiate
between contin. imp.

Limited pilot
facility

Can't justify cost
of facility

Don't understand
production process
well enough

Don't have a
process control
strategy

Risk Aversion

con

Training

re-eng, & crisis
recovery skills

Gap between
leadership
vision and 10x

Results are not
scaleable to
production unit

Reward
Structure

Past
Experiences

Lack of
accountability

Lack of dset/understanding

Accessibility of Process

Barriers/ Validity
of world class
measures

Lack of
work plan

Lack of targeted
goals

Whose measure
does it affect?

Prioritization

The amount
of visibility of
the activity

Lack of Priority
Alignment to the
goals

Viewed
as Labor
Reduction

Not running to
true capacity

Lack of
headroom

Capability of Existing km

Lack of commitment/
ownership of goals at
LT level

Lack of
awareness

m of
Month
dd-on)

Unwilling to
prioritize activities

Overaggressive
on runtime
improvements
(plan vs.
capability)

Crisis situation

Strategy is to
run to capacity

Technology
barrier for
achieving 10x

A lot of crisis
management
occurring

We fix things but don't eliminate the cause

Lack of
alignme
goals

None of the previous activities
went away

Missing value
driven
decisions

Limits on
investment

Lack of predictive
maintenance

Need both short
& long term
approaches

10x program is int ied)
from Motorola- did om within
Kodak

No process for
identifying
consequences

Plant

Lack of cause &
effect knowledge

People

The program Kodak doesn't
has not evolved what 10x is
Paper Support ut

The time that the Leadership
Team spends towards 10x

It's just another
measure

Management Processes include:
Problem Solving Approaches
Definition of Defects, units,
opportunities (measures)
How the leadership team
drives improvement
Steering Committee
Review processes (understanding
the requirements)
Reporting mechanisms
Organizational structure & teams
Selection of 10x goals
Methodology for selecting projects

Lack of alignment/
priority of 10x and
rest of organization

Inadequate criteria for
selecting projects & 10x
goals & objectives

By: Paper Support Leadership Team
        10x Coordinators

Facilitated by :   Valerie Feliberti
                     September 18, 1996
                     Kodak Park

• Major root cause

Key root cause -
-identified for reversal in 1997

Figure 7.1 Ishikawa Diagram developed at the Paper Support Division for the 10x Program Development

the root causes. The sub-groups would then present their findings to the overall group to achieve consensus.

It was established from the start that with this methodology (i.e., working in sub-groups and presenting to the larger Group) that the larger Group trust the people in the sub-group. It was also established that the sub-group had the responsibility to present its work to the larger Group in a manner that would allow the larger Group to understand the process used and to gain a comfort factor in order to give consensus on the work.

7.2.4.1 Leadership Process

The sub-group addressing the Leadership Process focused on three areas for program development:

- Defining a mindset on what is 10x
- Defining what is a defect and a unit
- Determining the capabilities needed by the Leadership Team and the Division's Organization to support 10x

The Leadership sub-group was facilitated through the development of a KJ diagram to develop the mindset centered on what is 10x. Its work was shared with the larger Group who reviewed and developed consensus around the mindset. Its answer to what 10x is "10x is a mindset that drives remarkable rates of continuous & breakthrough improvements through focus on our customers' key requirements."

The sub-group also developed a definition of what is a defect within the Paper Support Division. This discussion centered on the difference between the demands of the existing products and the needs of future products. The definition of a defect is "Product features, characteristics or performance that fail to meet customers' key requirements."

The capabilities needed by the management and the organization to support 10x rates of improvement were done after the investigation period. The sub-group was utilizing the work being done by the other three sub-groups as inputs for defining the capabilities and

recognized that to support 10x rates of improvement the management needed to develop the right capabilities.

7.2.4.2 Management Process

Originally this sub-group was based upon a grouping of the major root causes that centered around a lack of organizational process supporting the 10x program. This sub-group started its work a little later than some of the other sub-groups. Based on the discussion from some of the previous work of the Leadership Team, especially the mindset statement, the subgroup developed a goal that was very specific "Define the management processes that support breakthrough methodologies."

The individuals in this group had many discussions centered on the types of project the organization should focus on to achieve 10x rates of improvement. The discussion was similar to the concepts summarized earlier by David Upton and the different models for achieving continuous improvements, see Figure 5.2.[13] This sub-group had determined that the organization needed to concentrate on breakthroughs or reengineering efforts to achieve the 10x rates of improvement. This implies that the sub-group was focusing on Upton's proactive model for achieving improvements by developing opportunities and focusing on the future state of the organization.

The definition of the management process was also performed after the investigation period. However, this sub-group recognized it needed to come to terms with what are the implications to an organization when adopting a focus on breakthroughs and innovations. To do this, the sub-group planned to have someone from Kodak's Management Services organization, who had done extensive research in this area, come and talk about breakthrough thinking. The sub-group then was planning to schedule a workshop with the leadership team to train them in breakthrough thinking. After this workshop, the sub-

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[13] Upton, David. "Mechanisms for Building and Sustaining Operations Improvement" Working Paper, Harvard Business School, Massachusetts, 1996.

group then planned on outlining the management processes needed to support this type of breakthrough or innovative thinking.

7.2.4.3 Selection Process

The sub-group charged with the Selection Process defined its purpose as "Develop the process to select projects aimed at customer key requirements, and identify the customers, the measure, and the projects for reporting 10x." Many issues came up in the discussions with this subgroup. One of them centered around the selection of projects and a desire to develop a robust process for selecting projects that could be used not only for picking 10x projects but all the activities of the division. There was a concern raised about expanding the efforts outside of the current problem solving activity of the 10x program because of the lack of a rigid process used to select the activities of the division. It was felt that to develop a selection process for the activities of the division was much greater effort than what was necessary for the task at hand. The extent of the information needed or the documentation needed to select projects, whether for 10x or for the division, depends upon the amount of accuracy needed and the complexity of the decision being made.

Although this sub-group's work was done after the investigation period, this activity was critical to the 10x program development. It was also the most time constrained because the output was the process needed to determine the projects that the division would support. The work to be done included identifying the steps needed to select the projects, defining the decision criteria for the projects, defining the needed information, and defining how measures would be developed by the project teams.

7.2.4.4 Problem Solving & Process Understanding

This sub-group was charged with determining the organizational structure and process needed in order to promote process understanding and problem solving approaches that were aimed at 10x rates of improvement. This sub-group recognized that process understanding was a weak area within the division, in part, due to the day to day pressure emphasis that was prevalent within the division.

Most of this sub-groups work was done after the identification period. It was recognized that this activity could be postponed and separated from the immediate time pressures of identifying and resourcing the 10x project teams for 1997. However, the Leadership Team wanted to follow through with their commitment of completing all of this development work by December of 1996. As a result, this sub-group plan was to outline the strategy to change the division's focus from meeting the day to day pressures and develop understanding about the production process.

7.3 Summary

Unfortunately, the researcher did not have the opportunity to complete the 10x program development work with the division's management. However, the researcher felt that the management accomplished the most critical portion of the work, i.e., developing management understanding and support for 10x rates of improvement. This work provides the foundation for continuing the program development and beginning the transition of the program's concepts to the entire division. The management retreat also strengthened this foundation through the definition of the thrusts and the desired state of the organization. The success of the 10x program, however, is not guaranteed. The foundation appears to be present, but the follow through of the implementation is up to the Leadership Team.

8. Assessment

8.1 Implementation Method

One of the main criteria for choosing the 10x Program development as a method of implementing the concepts of the sustainment model was to build management support. The result of this method did begin the foundation for building that support. The concepts discussed during the development were also similar to those concepts discussed in the sustainment model.

8.1.1 The Positive

Working as a facilitator with the Leadership Team of the Paper Support Division led to a couple of key positive results which build the foundation for future work towards sustaining accelerated rates of improvement. These two areas centered around:

- the division's management working as a group
- the development of a shared mindset

8.1.1.1 Working as a Group

Taking a problem solving approach towards the 10x Program development allowed the management to work as a group toward a common goal. While it was recognized that the management will work together in developing the organization, this was the first task where they came together as a group (since the management of the organization had been restructured). The problem solving approach gave some structure to their discussions and towards the program development.

As a side effect of the process, the management went through some team building. Through this work, they began developing a history of working together on a problem. Relationships between the members of management were also being developed through this process. This team building is important when starting change within an organization because the management team is presenting itself as a group with shared understanding and history among its members.

The management also developed experience with using some analysis tools for causal analysis and solution development. This leads towards development of individual capability using the tools and also understanding the purpose and use of the tools. The management can also use this experience in its future development of organizational capabilities needed to support 10x rates of improvement.

8.1.1.2 Developing a shared mindset

Choosing the Seven Steps Method as the problem solving method gave a weakness orientation which allowed the management team to reflect and review the existing 10x program and its requirements. The discussion allowed for questioning of assumptions about the 10x program and brought out insight on how the departments are functioning within the Division. The discussions during the problem solving process also involved explorations of each individual's model on the requirements of a project team or organization to achieve accelerated rates of improvement.

Working with the management group allowed for the generation of a collective vision on what the organization needs to do to support achieving accelerated rates of improvement. The problem solving methodology allowed for some great discussion around 10x rates of improvement, including the development of their own model on what 10x rates of improvement meant and on the types of projects needed to achieve the improvement rates. This development of a shared mindset has built a foundation for future organizational development.

8.1.2 The Downside

There were a few areas that could be improved and should be taken into account when using a process consultation method for implementing change and new ideas. These areas include:

- Large problem solving team
- Consensus as a method of decision making
- Preconceived Solutions
- Scope of the solution

8.1.2.1 Large problem solving team

Having thirteen team members was difficult for arranging meeting times and allowing time for discussion. The discussion time in any problem solving needs to allow time for expression of ideas and also include an environment that allows for participation by all the members. Maintaining this balance as well as the time constraints on individual schedules was difficult.

Ideally the team should range from four to eight members. One possible alternative is to break up the thirteen member group into two smaller groups working in parallel. However, the disadvantage to this is the loss of opportunity for the entire management to work as a group and develop their relationships and history. The history of people working together provides the foundation for more collaborative efforts because experience is gained on how individuals approach problems and their ethics and values come through in their actions.

8.1.2.2 Consensus as a method of decision making

Within the existing Paper Support Division's culture is consensus building. The America Heritage Dictionary defines consensus as:

Consensus - 1. Collective opinion. 2. General agreement or accord.[14]

While this may be a good method for developing agreement for a decision among a group of people, it does not insure commitment. There is nothing included in the definition that implies that commitment is reached with a consensus. Working with the Leadership Team in the 10x Program development, the causal analysis process requires the identification of the key root causes of the problem. The next step of the problem solving process, solution planning and implementation, then focuses on reversing the key root causes. Typically the key root causes are limited to two or three of the major root causes identified. Working with the Leadership Team in the 10x program development, which included using consensus for decision building, led to nine key root causes being undertaken into the next step, rather than two to three. The researcher felt that the team

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[14] *American Heritage Dictionary* 2nd edition (Boston, Massachusetts: Houghton Mifflin Company, 1985)

members agreed to nine root causes because those nine were made up of causes individuals in the group felt were the key cause. However, there was resistance in the group to focus the causes down to two to three because it meant that some of the individual's opinion on the key root causes would not be addressed.

Also, within the Paper Support Division achieving a consensus did not result in commitment by all of the leadership team members. There appeared to be more compliance for the decision and at times some resistance. There were occasions when decisions were revisited and questioned as the group tried to proceed with developing the 10x program. One example of this concerned the definition of what is 10x. The development of this vision included discussion on the types of projects needed to achieve 10x rates of improvement (reactive - continuous improvement types and/ or proactive-innovative and breakthrough types). The assumption about the types of projects the division would support was revisited in the work to define the management processes and the selection process needed to support 10x rates of improvement. The amount of discussion needed to reach consensus with this large group took a lot of time but total buy in was not achieved by all of the members.

When a decision is being made, discussion does need to occur to develop buy in and generate understanding of the concept, as well as the individual's position about the concept. But, once a decision is made, it is just as important that the decision is respected for future work. If the decision is continuously revisited, progress will not proceed. This is not to say never revisit the process. It is important to reflect upon the process and the decisions that were made, but this should be done judiciously with respect to time and the importance of the decision to the overall progress.

A collective opinion is needed by the management of an organization in determining the direction towards which an organization will proceed. An understanding of the involved individual's position is helpful so that a clear focus can be given to the workers within an organization.

8.1.2.3 Preconceived Solutions

One of the pitfalls to avoid in any problem solving effort is the introduction of preconceived solutions during the root cause analysis. The causal analysis portion of any problem solving effort should be purely exploratory, allowing the data to speak for itself. During the development of the Ishikawa Diagram with the Paper Support Division, there were solutions being voiced instead of concentration on determining the key root causes. Part of these solutions were aimed at existing problems within the department instead of the problem at hand (i.e., limited success at achieving 10x rates of improvement). Also, upon some reflection of the causal analysis, some of the root causes that were identified on the Ishikawa Diagram were felt to be old "red herrings" or problems that had been preexisting within the departments. This is not a criticism of the process used, but, however, another example of the culture within the division. The researcher felt that the search for the solutions during the causal analysis was a result of searching for past experience related to solving the root causes.

8.1.2.4 Scope of the solution

During the solution planning for the Selection Process sub-group, there were discussions on which work was being selected: all of the work activities for the division, the work that was only directed at 10x Improvement goals, or only the work that would be reported as 10x Improvement activity. There were members of the group that wanted the scope of the solution to be towards the entire organization, while others wanted to focus on the 10x Improvement Program. The objective of the work was only towards the 10x Improvement program. However, there was definitely an impact on the total organization. Some of the root causes identified related to the organizational structure and culture. The time constraints placed on developing the improvement program did not allow for a complete investigation of the organizational structure and culture, only identification of what was needed for an organization to support the 10x program design.

8.1.3 Facilitator

The use of a facilitator in any problem solving methodology is helpful. It is important that the facilitator is versed in the use of different analysis tools for problem solving. There is

some question if the facilitator should have first hand experience in solving similar problems as the one being presented for solution. A facilitator who does have first hand experience can assist the problem solving process by asking questions aimed at the problem itself. The facilitator has to walk a fine line to avoid influencing the analysis with personal experience.

8.2 Comparison of Sustainment Model to Implementation Process Work

The model that was developed from the individual investigation focused on five areas of the organization, 'the organization's focus, the leadership, the culture, the work selection and alignment, and the organizational capabilities. The Implementation work done with the Paper Support Division's management identified four groups: Management Processes, Selection Process, Problem Solving & Process Understanding, and Leadership Process. The overlap between the work in the sustainment model and the Leadership Team is shown in Table 8.1.

Table 8.1 Overlap between the Sustainment Model and the Implementation Work

Sustainment Model	Match with Implementation Work
Customer Focus	Leadership, Management, and Selection Processes
Culture	Management and Leadership Processes and Problem Solving and Process Understanding
Organizational Capabilities	Management and Leadership Processes
Work Alignment	Selection Process
Leadership	Leadership Process

8.2.1 Customer Focus

The model talks about using the customer as a way to focus and prioritize the activities within a division. The 10x development work also uses the customer in a similar manner. In the statement about the 10x mindset, as well as the purpose statements for the Selection sub-group, the customer is used as the focus:

- 10x is a mindset that drives remarkable rates of continuous & breakthrough improvements through focus on our customers' key requirements.
- Selection Process purpose: Develop the process to select projects aimed at customer key requirements, and identify the customers, the measure, and the projects for reporting 10x.

8.2.2 Culture

The culture of the organization was brought up in many of the discussions with the Leadership Team, both in the 10x program development and the management retreat. Although no formal analysis occurred on the existing culture or on the culture needed to support 10x rates of improvement, the Leadership Team recognized that some of the methods used by the division to approach its activities did not match with the concepts discussed about the 10x program. This work did not appear to include a formal plan outlining the current culture and identifying the future culture.

8.2.3 Organizational Capabilities

Both the model and the 10x Program Development recognized that the organization needs to develop capabilities that will support accelerated rates of improvement. The model advocates that to sustain the accelerated improvement rates the key capabilities need to reside within the organization, not just within the employees. The development work was beginning to identify the capabilities needed by individuals within the Paper Support Division, both at the project team level and the management level.

8.2.4 Work Alignment

The ideas presented within the model and the development work were similar. Both works touched upon the idea that there are different types of projects that exhibit different improvement rate curves. The model recognizes that there will most likely be a portfolio of different types of projects occurring within an organization to sustain the improvement

rate. The 10x Program development alternated between the portfolio of projects and an emphasis on planned type of projects, see Figure 5.2.

Both the model and the program development work touched upon the need for a clear work focus. This clear work focus included both the communication piece and the work selection. The development work concentrated on the selection of projects only for the 10x Program, while the model focused on the entire organization. The model also touched upon the three different types of metrics, Performance, Reporting, and Verification. The 10x Program development work touched upon the different type metrics, but did not go into details on the differences and how each type would apply to the 10x Program.

8.2.5 Leadership

The 10x Program development work dealt with leadership issues within the Leadership Process sub-group. This work concentrated on developing a shared mindset among the division's management. This overlaps with the model work in the recognition of the importance of building commitment to accelerated rates of improvement among the management group of an organization. The model goes further to address the impact of the organization's leadership to the organization's environment and focus.

8.3 Conclusions

The 10x Program Development reinforced a lot of the concepts of the Sustainment Model. The researcher was particularly pleased by this because the sustainment model was based on observations and interviews of the people within the division. This was done without the direct involvement or input of the management team. The program development also began building the management support needed to support an accelerated rate of improvement effort.

The researcher however does have a concern about the level of commitment by the management team. The researcher left the division before the 1997 10x Program was

completely developed. The researcher was unable to observe the interactions between the

day to day pressures of the division and the goals of the 10x Program.

9. Conclusions

The main conclusions drawn from this investigation of the key elements needed to sustain accelerated rates of improvement and using an implementation strategy of process development can be narrowed to these major points:

1. Use programs as training grounds.
2. Embed the concepts within the culture.
3. Leadership drives improvement.
4. Different strategies to achieve improvement rates.
5. The sustainment model is integrative.
6. Need for a cost effectiveness analysis of program.
7. Measuring the success of the strategy.

9.1 Use programs as training grounds

Accelerated Improvement Programs (such as the 10x Program) can be viewed as training grounds for sustaining accelerated rates of improvement on many fronts. This implies that the program creates the desired culture for an organization for sustaining the accelerated rates. This includes the way projects are resourced by the organization, how problems are approached, how communication occurs among the projects and the organization, and values that are reflective of the desired organization. To transfer these learnings outside the program, the organization's management needs to generate an expectation that the concepts and methods used in the program should be expanded outside the program and into the normal activities. The researcher recognizes that this concept is not limited to accelerated rates of improvement, but can be applied to any strategy of organizational change activity.

9.2 Embed the concepts within the culture.

To sustain the improvement rates, the concepts surrounding accelerated rates of improvement need to be embedded within the culture of an organization. The issue here is to move beyond the achievement of accelerated rates of improvement on particular projects and sustain it as an organization. Organizational sustainment requires commitment along all the lines of the organization.

9.3 Leadership drives improvement

The organization's leadership sets the tone and creates the sense of urgency. The leadership, not only generates the expectation of the important values, but also reinforces through actions what is important. The leadership of the organization typically resides in its upper management ranks. Thus, there needs to be a commitment from the upper management since they provide the vision, help define the organization's values, and provide the resources to an organization. For the strategy of achieving accelerated rates of improvement to be successful, management support is critical, especially middle management. The middle management takes the vision provided to them and then defines goals necessary to achieve the vision. The middle management are also in constant contact with the employees who are actually working to achieve the goals in their day to day activities. The employees rely on the middle managers to provide the clear focus for their work. This does not imply that the middle management are defining the goals of the employees in detail. Instead they need to define how their departments fit within the vision and how their goals impact the vision and assist the employees by providing resources necessary for the achievement of the goals.

9.4 Different strategies to achieve improvement rates.

There are different strategies for achieving accelerated rates of improvement. The ones discussed here include the traditional continuous improvement methods of reactive and opportunistic projects, planned or breakthrough projects, and a balanced portfolio of the different types of projects. The main point is that there are different methods of achieving improvements, see Figure 5.2. The different types of projects support different organizational objectives. There should be alignment in the types of projects chosen and the overall vision of the organization. For example, if the organization chooses to focus on planned (breakthrough) projects, then the organization needs to have a vision of its future.

9.5 The sustainment model is integrative

The model for sustaining accelerated rates of improvement is an integrative model. This means that the value of the whole is greater than the sum of the parts. It is hypothesized

that if an organization works to install each of the elements of the model without recognizing the links, there is a lost opportunity from the synergy that can be gained. Installing a program without recognizing the potential for expansion into the entire organization may result in a loss in opportunity of application of learnings.

9.6 *Need for a cost effectiveness analysis of program*

Before any company undertakes an accelerated improvement strategy, the costs to the organization must be weighed against the expected gains. Factors that should be considered are the business environment, the maturity of the industry and the products, the maturity of the production processes and the level of available resources. An outcome of this type of analysis may be to only implement a program for a few of the processes. The caution with implementing a program on only a few of the organization's processes is the possibility of a misalignment with the overall strategy.

One of the drivers not touched upon in this thesis is how to apply resources to accelerated rates of improvement. A question that organizations must answer is the degree to which they are justified in going after accelerated rates of improvement in all processes, across all fronts. Part of the analysis to answer this question is the cost effectiveness of the program. However, another part is overall strategy and goals of the organization. The organization must first be able to answer what business is it in and how it will position itself within the industry.

Resource issues are also a limiting factor in the breadth of a program. The issues include the availability of the resources and also the capability of the organization. An organization may be more efficient in concentrating its resources in particular areas to achieve its improvements. This may be particularly valid during the introduction of the accelerated rates of improvement strategy.

Conversely the company also needs to define the consequences of not following an accelerated improvement program. A company choosing not to follow any improvement

program should recognize that they are not maintaining a status quo, but are in fact resigning their presence from the marketplace.

9.7 Summary

The issues brought up in this thesis concern organizational alignment with its mission and strategy. If the organization changes its mission and develops a strategy to support it, the organizational culture, activities, and capabilities may also need to change to support the mission.

The current state and the future state of the organization needs definition. To achieve the future state all organizations pass through a transition state. The handling of the transition state is critical for succeeding to the desired future state. A major factor during this organization transition is the leadership of the organization. The leadership needs to continue providing the direction towards the future state and prevent the organization from drifting.

To achieve the future state, the change must occur at the underlying assumption level of the organization's culture. Without this, the changes may only be superficial with only short term success, and sustainment of the changes will not occur.

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