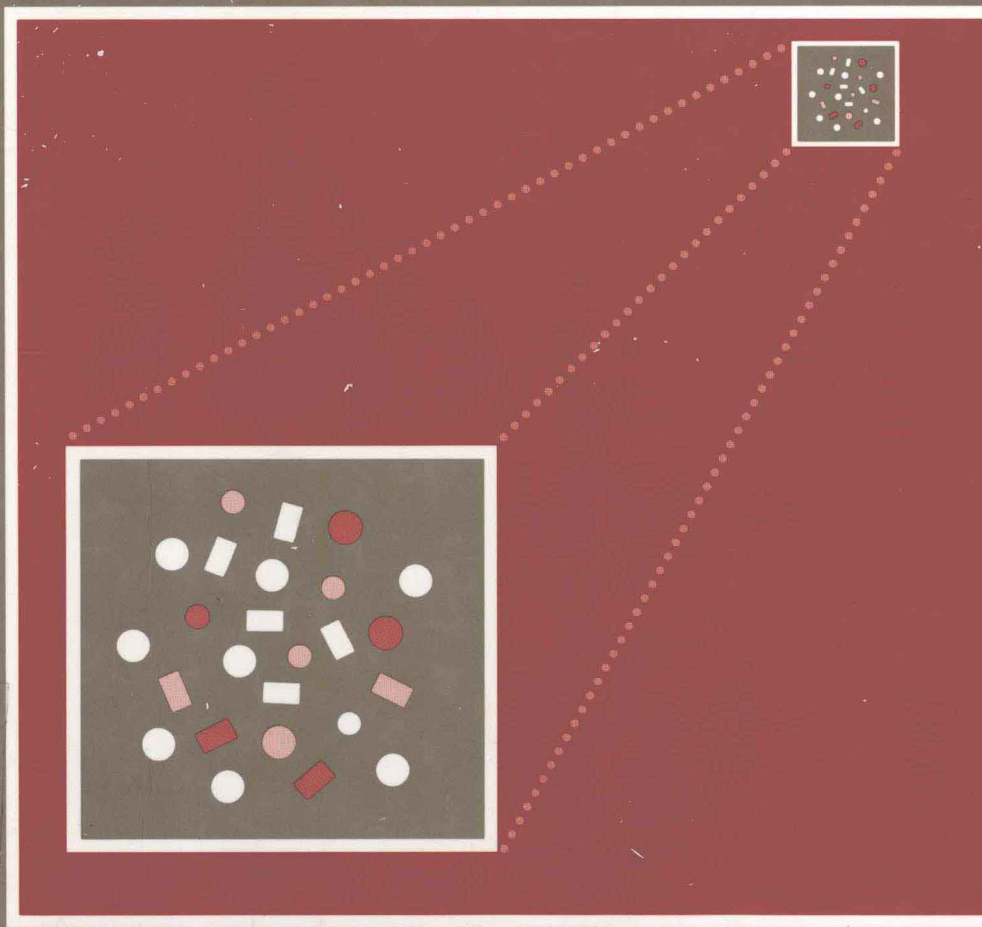
Continuous Improvement in Operations

A Systematic Approach to Waste Reduction

Edited by Alan Robinson



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Foreword

We hear a lot about the "Silo Syndrome" these days and how the walls of these silos are the physical, mental, and organizational barriers that preclude the kind of revolutionary improvement that is required to remain competitive in the marketplace. To effectively implement the value-adding management process as a strategy for continuous improvement, we should have an understanding of the silo syndrome and, more importantly, how these silos were created. With this understanding, the dismantling of the silos can become a strategic part of a continuous improvement process.

First, ask a few questions about your management structure to trigger your thought process. Before you answer them think about your management process or structure, beginning with a customer inquiry and ending when a check is deposited in the bank.

1. Is your management process vertically or horizontally integrated, or, to ask that question another way, do you manage vertically or horizontally?
2. How and where does your customer fit into your management structure?
3. Does your management structure allow you to focus on the customer or simply on elements within the structure?

The answers to these questions will show you how deeply you are embedded in the silo syndrome. Before continuing, let's shift gears for a moment and look at the value-adding management process as a strategy and then come back to this subject.

The value-adding management process of Just-In-Time Manufacturing, Total Quality Control, and Total Employee Involvement is a simple, uncomplicated management strategy that directs focus on the customer and emphasis on cycle-time reduction through the total elimination of waste in the factory and in the non-factory workplace. Although simplistic in nature, it is complex to understand and even more complex to implement. Essentially, it requires that we think completely differently about how we manage our business. Managing differently means significant and revolutionary change from the top to the bottom of the corporation. Only through revolutionary change can we experience revolutionary improvement. Change of this magnitude requires extraordinary leadership, a knowledge base to provide the understanding, and an uncompromising commitment. With increasing competition in the 1990s and into the 21st century, from all corners of the globe, Western-world industry recognizes that change is essential not only for continued growth and prosperity but in fact, in most cases, to survive. Additionally, the expectations of our customers are continuing to rise at an unprecedented rate as they feel the competitive pressure to continuously improve. The decade of the 1990s will certainly be one of total customer satisfaction or beyond to total customer delight. Do we really understand the magnitude of change that must take place, what that change represents, how to refocus our energies? Do we have the leadership, the knowledge, and the courage to address and manage the process of change? First, we should understand the change that has taken place that got us to where we are today.

These thoughts take me back 30 plus years and help me understand the transition from a small company to a large corporation, from simplicity to complexity, and from a horizontal to a vertical management structure. Additionally, they help me understand the challenges we must face, beginning today and every day in the future.

In the late 'fifties and early 'sixties, when many of today's Fortune 500 companies were much smaller and on a high growth-rate curve, the management structure seemed more horizontal. The management was close to the factory floor and more focused on the customer. The management, manufacturing, and support

personnel were more aligned with the product being produced. Essentially, most of the processes producing that product were in the same factory, or, as we know it today, were integrated.

The quality and service were good, the cycle times were much shorter and the P&L looked much brighter. Most of the human resources were relentlessly focused on moving both the product and the information towards the customer. There were few conflicting priorities and few conflicting goals. The morale was good, and you could watch teamwork in action. There was a clear sense of direction. We were truly focused on the customer, we were in a horizontal management structure.

As companies began to grow more rapidly, expansion of their resource base was inevitable. It was thought to be more cost effective to specialize by process and to move like processes into factories of their own. Some refer to them as focused factories, but in fact we changed the concept of manufacturing from a product to a process focus. As this expansion continued and picked up speed and as more and more factories were put into operation, something significant began to happen with the management process. It began to move away from the factory floor. As the business continued to expand, management continued to move further and further away.

As this transition evolved, more and more information was needed to manage the business. This process grew larger and larger like a snowball rolling down the side of a mountain. Concurrent with this transitional period the computer industry, which was in its infancy, gained sufficient justification and motivation to move ahead. The computer manufacturers shifted into high gear and the computer age as we know it today was well on its way. During this time many new departments of just about every discipline were added to the organizational structure, more information was necessary and more employees were required to properly organize, manage, and disperse that information.

By this time the management process had moved out of that horizontal position, away from the product process into what seemed to be the beginning of a transition to a vertical management process. This transitional period can now be documented as a significant management milestone of negative impact, and one that we would long pay a heavy price for. We were now process

focused with the management aligned in a vertical direction. But during this transitional period, the product process continued to flow in a horizontal direction, always toward the customer.

In the vertical structure the management process is functionally oriented and is managing the information up and down through departments, functions, divisions, and groups. This is characterized as the typical silo syndrome, and today it is alive and thriving. The silo syndrome encourages employee containment in separate work entities. Therefore, each has priorities and goals that are focused within that work entity, which most times are in conflict with the priorities and goals of the neighboring silos and the corporate silo. In this work setting we are most concerned with operating our silos or work entities efficiently, without regard for the next silo or what happens between the silos or in the remaining part of the company.

The silo syndrome introduces enormous waste into the management process. Waste is characterized as activities that do not add value to the product or service that we sell to the customer: waste such as poor communications, waiting time, transportation of products and information or non-essential information, lost motion, inventory of products and information, defective products, over production, and, most importantly, the waste of unused employee creativity.

When the management process is vertical and the product process is flowing horizontally, the result is many crossroads. Each crossroad is characterized as a silo and enormous quantities of waste are introduced into the process at each one. Therefore, in corporations where organizational structures employ the concept of a department, function, division, or group, there could be hundreds or perhaps thousands of crossroads and silos. Companies have reported that as much as 15% to 25% of their human resources are either managing or working waste. The value-adding management concept employed as a corporate strategy quickly leads the corporation to discover what these wastes are and how to eliminate them. Implementation of the concepts and techniques of this strategy begin a journey of continuous improvement through the elimination of waste. As the journey progresses many benefits begin to accrue. Most obvious is an improvement in the quality of work, cycle time reduction, quicker response to the customer,

increased inventory turns, cost reduction, and improved employee morale. The list of benefits seems to be never ending. The goals of increasing market share and improving profits through total customer satisfaction certainly become more realistic and, in fact, within grasp.

Let's now go back to the subject of the silo syndrome and think about our challenge for the future. If you fundamentally agree with what was discussed, then our challenge is clear: we must dismantle the silos. The first step in doing that is turning the management process 90 degrees, back to a horizontal position, to once again realign it with the product process. With this accomplished, all of our energies can be relentlessly focused on moving both the information and the product toward the customer.

It sounds easy, but how do we turn this giant process called management 90 degrees? We begin by forming product focused teams into small business units. The small business unit will include a structure that begins at the top of the organization and ends on the factory floor. This structure will require participants of every engineering and administrative discipline to effectively lead and manage the business unit.

The next step is to empower the team to be self managed. In a self-managed team environment, all participants are associates of equal stature; that includes the factory floor workers. All participants take part in the decision-making processes and are expected and encouraged to contribute to the process of continuous improvement. This change in the management structure immediately dismantles the silos. Next is to integrate the team and the manufacturing of the products as closely as is possible in the same work area. As a result there are no conflicting goals or priorities. There is only one mission; focusing all energy to move information and products to the customer in the shortest time, at the least cost and with the best quality.

As we continue to improve in these areas we also will continually improve our value to our customers. This will lead to total customer satisfaction or perhaps even beyond, to total customer delight.

This brings us full circle. Can we move from complexity back to simplicity? From the large corporation syndrome back to the small company mentality? Do only the essential things, recognize

and eliminate waste, bring management back to the factory floor? Sure we can, and it is essential that we do so to continue to stay in front of our competition, to create additional wealth for our companies, and most importantly, to secure our future.

I believe history repeats itself. I also know that all of the things that we need to do and become, we already have done and have been.

The Introduction by Alan Robinson and the subsequent chapters of this book provide the understanding that is essential to effectively organize and implement a journey of continuous improvement. This journey is without a road map and is certainly without an end.

You can begin by committing yourself to a journey of continuous improvement.The value-adding management process as a strategy will provide the tools and techniques to start you on the way. The journey of continuous improvement requires that we set goals and objective for ourselves, the teams, and the business unit. Then select measures that will drive the process and measure the improvement. The last and perhaps the most important prerequisite is that the unit head and members of the management team make an unyielding commitment to provide leadership. It is essential that management demonstrate that commitment and support for the strategy of continuous improvement with an education and training process that provides a fundamental understanding of the value-adding management concepts, tools, and techniques.

Education and training are most effective when they are integrated with the implementation process. In addition to formal education and training, self study should be encouraged and motivated by fostering creative dissatisfaction with what we know. Education in these two forms leads to aggressive improvement of both the individual and the organization.

With the silos dismantled, the teams formed to pursue common goals, armed with the education and training for continuous improvement and with excelling leadership, your organization will see results that will show a continual increase in your market share and achievement of your financial objectives.

This book is highly recommended to managers as well as to academia; all will greatly benefit by understanding what is provided herein. As new graduates infuse the work place in what I believe to

be the "Modern Industry of Tomorrow," they will be better equipped to more aggressively contribute and to significantly enhance both their work life and their personal life accordingly.

G. Richard Earhart
Director of Manufacturing Development
AMP Incorporated

Publisher's Message

Ninety-five percent of lead time is estimated in many manufacturing processes to be non-value adding activity. At least thirty percent of the cost of defense contracts is estimated to be spent on waste. Some estimate that eighty percent of hospital administrative and clinical procedures is redo work. Waste reduction is the single most critical focus managers need to have. It is the key to Japanese manufacturing methods and the cornerstone of continuous improvement.

Alan Robinson has once again made a superb reader for us. *Continuous Improvement in Operations: A Systematic Approach to Waste Reduction* introduces business and engineering students as well as managers to the processes of Just-In-Time, *kaizen*, and Total Employee Involvement. This well-structured text offers a compendium of selections from Productivity Press's best works to combine the principles of such industry leaders as Henry Ford, Taiichi Ohno (creator of JIT), Shigeo Shingo (creator of Single-Minute-Exchange-of-Die), and Seiichi Nakajima (creator of TPM).

Robinson's introduction integrates the developments of these manufacturing gurus within a two-fold theme — elimination of invisible waste in the work place and the creation of an adaptable work environment that welcomes and fosters employees' ideas. He provides an historical and global perspective on the development of the management systems that employ these methods. In demonstrating that much of Japanese management philosophy was originated by Americans such as Deming, Juran, and Ford, Robinson underscores that there really are no cultural barriers to these systems.

G. Richard Earhart's Foreword offers the manager's perspective on these systems for reducing waste and fostering employee

involvement. His contribution adds the valuable insight into organizational structure that is needed to succeed in carrying out one's commitment to continuous improvement. He demonstrates the drawbacks of the traditional vertical management hierarchies. This "silo structure" distances manager's from the process and creates an overwhelming obstacle to identifying and eliminating waste in the system. Earhart offers a cross-functional management structure that brings manager's back in direct contact with the process and disperses responsibility for quality outcomes to everyone in the organization.

We are proud of this volume and grateful to all those who contributed to its concept and completion. To Alan G. Robinson, associate professor of operations management at the University of Massachusetts School of Management, Amherst, for editing the volume and for his introduction and first chapter. To G. Richard Earhart, Director of Manufacturing Development of AMP Incorporated, Harrisburg, Pennsylvania, one of the world's leading manufacturers of electrical and electronic connection devices, for his Foreword. To Dick Hannus for the cover design; to Elizabeth Mokas and Paul Obringer for marketing insight; David Lennon and Beverly Ream and the production team at Rudra Press for book design and layout; and to Diane Asay, Marie Cantlon, and Barry Shulak for managing the editorial process.

Norman Bodek
Chairman, Productivity, Inc.

Introduction

Manpower is something that is beyond measurement.
Capabilities can be extended indefinitely
when everyone begins to think.

Taiichi Ohno

In 1989, the MIT Commission on Industrial Productivity published a book entitled *Made in America*, which contained the results of a three-year study of the competitiveness of American industry. One of the study's findings was that:

> *Another area in which U.S. firms have often lagged behind their overseas competitors is in exploiting the potential for continuous improvement in the quality and reliability of their products and processes. The cumulative effect of successive incremental improvements and modifications to established products and processes can be very large and may outpace efforts to achieve technological breakthroughs.*[1]

"Continuous improvement," for which the Japanese term is *kaizen*, has become a distinctive and successful feature of the Japanese management style. One easily identifiable reason for this is Mr. Taiichi Ohno, who pioneered the Toyota Production System, the first Just-in-Time (JIT) system, at Toyota Motor Corporation. Unfortunately, many people still misunderstand

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[1] M.L. Dertouzos, R.K. Lester, R.M. Solow and the MIT Commission on Industrial Productivity, *Made in America*, MIT Press, Cambridge, MA, 1989, p. 74.

Mr. Ohno's system, seeing it merely as a set of tools that allows inventory to be lowered further than was usual before Mr. Ohno came along. But that view is flawed, as Mr. Ohno and his colleagues will tell you in the pages that follow, for the real goal of JIT is *to eliminate all waste*, namely, to get rid of anything that adds to *cost* without adding to *value*. To eliminate each particular case of waste, an improvement must be made. A true JIT system, therefore, is also a system of managing *kaizen*.

Implementing *kaizen* requires three things. First, operating practices must expose new opportunities for improvement. Second, every employee should be made to *want* overall improvement rather than to *fear* it, as is often the case. Third, workers should be trained in practical problem-solving techniques so they are *able* to make improvements. The success stories coming from many manufacturing sectors in Japan, and increasingly from other countries as well, reflect the efforts of people like Mr. Ohno who have thought seriously about the management of *kaizen*, have put their ideas into action, and made them work.

There have probably been more books written about what people refer to as "Japanese production techniques" than about impending depressions, or quick ways to become a millionaire. Only in the last few years, however, have the writings of those Japanese who were or are *directly involved* been translated into English. All but two chapters included here are selected from their books and represent the wisdom and experience that is unique to the developers and inventors themselves. As you will see, the selections deal directly with the problem of how constantly to improve — through good operating practices, employee involvement, and rigorous training — and they aim always for the ultimate goal: the total elimination of waste.

THE LUDDITE REBELLION

The Luddite Rebellion of 1812, which took place in northern England, has come to represent the often difficult problem of introducing new technology or methods into the workplace. Every manager should know the story of the Luddites, as it is an interesting one and contains some valuable lessons.

Some thirty years before the actual uprising, an apprentice called Ned Ludd was beaten, although by whom, or for what, is not known. Ludd so resented this treatment that he destroyed the equipment he was learning to use by smashing it with a hammer. Even though motivated by anger at his punishment rather than at his equipment, the destruction of his machinery became a powerful symbol. When the rebellion started, one of its leaders took the name "General Ludd" as his *nom de guerre*, and his followers became known as "Luddites." Since then the word "Luddite" has come to have the looser meaning of "one who opposes improvements in production methods or technology."

The revolt began when some textile mill owners introduced a new machine to perform a cloth-finishing operation called "cropping." The process of manufacturing cloth at that time involved first weaving, then stretching the cloth on a frame, and finally brushing it with wire brushes to give it a smooth surface and texture. This last procedure, while indeed smoothing the cloth, also left a layer of fluff that had to be skillfully removed, or "cropped," to obtain a good final finish. Croppers used huge shears that sometimes weighed more than fifty pounds, for the heavier the blade was, the smoother the finish. They were tough people, with huge arm and chest muscles, since working with fifty pound blades developed great strength and endurance. The average cropper earned almost *four times* the pay of an ordinary worker. In short, they were the elite of the textile workers and were not about to stand back to let machines take their places.

The croppers' fight against the new machines might have remained an historical footnote if their cause had not also spread to involve ordinary workers. Because Britain was then at war with both France and the United States, and all exports of textiles had been banned for the duration, the industry had fallen on hard times. Textile workers were having difficulty; they were getting less work, or losing their jobs. Trouble was to be expected when the mill owners, who were also struggling, tried to cut costs by introducing machines that could crop in one hour what had previously taken a skilled cropper five hours. Since the textile industry was a major employer, accounting in one area of north England for an estimated 97 percent of the workforce, one sees

how this grave threat to a group like the croppers might act as the spark for the serious disturbance that it did. Masked Luddites attacked mill after mill, murdered owners, and smashed machinery; soldiers and workers were killed.

By the end of the revolt, tens of thousands of regular troops and local militia had been involved in subduing the workers. Although several hundred people had died, the cropping machinery was nevertheless successfully installed and operating. The power of the cloth croppers had been broken, and their livelihood was gone.

RESISTANCE TO CHANGE = WASTE

The Luddite Revolt was, admittedly, an extreme circumstance, but its message is even more true today. Resistance to new technology or improved work methods is both futile and costly. It can, therefore, be very depressing to observe the operations of an organization whose employees, for whatever reason, are not constantly improving products and processes. Consumers today are increasingly cost-conscious and better-informed — the magazine *Consumer Reports*, for example, has a circulation exceeding 5 million — and quickly move to the best products. How can a company without a program of continuous improvement compete against a company with one? Organizations that resist appropriate change abound with examples of inexcusable waste — waste for which someone has to pay.

In February of 1982, President Reagan formed a presidential commission, known as the *President's Private Sector Survey on Cost Control* (PPSSCC), chaired by Mr. J. Peter Grace, a Democrat. The bipartisan commission's mandate was to identify *pure waste* in the Federal Government, that is, waste that all could agree was waste and which, in theory at least, could be eliminated easily.

Some of the findings of the study were quite shocking. For example, 50 percent of federal travel in 1982 occurred at *full fare*, even though government business was large enough to be eligible for big discounts. If the government had paid the same low rates as an average corporation, the savings would have been one billion dollars over three years. In 1982, it cost the Army $4.20 to issue

each paycheck — the average private sector cost was one dollar. The Postal Service used a Treasury account to issue 22.4 million checks in that year, at a cost of slightly over a dollar each. If an ordinary commercial bank had been used where the Postal Service could have negotiated a rate as low as ten cents per check, the annual savings would have exceeded $20 million. In 1982, the cost of processing (not paying) each medical claim at the Veteran's Administration (VA) was about $120, and rose as high as $200 at the Indian Health Service (IHS). In the private insurance industry, the cost to process one claim was between three and six dollars. In addition, 15-20 percent of the payments by the VA and the IHS were made in error — either more than once or for an uncovered service. The possible annual savings from less expensive and more accurate processing were estimated at $1.1 billion. As the commission pointed out, this sum would have paid the medical costs of one million retired couples in 1981.

All in all, the study[2] documented $140 billion per year in pure governmental waste. Ironically, the complete report was more than one and a half million pages long, a total wordage that may account for its quick disappearance from the political scene. Additionally, in my opinion, the report showed a somewhat naive attitude towards public-sector waste, for much of the 'pure' waste was not, in fact, so pure. Special interest groups often stood to gain by it, and could be counted upon to fight change.

Inertia, of course, always impedes change, and sometimes with amusing results. In the Second World War, the British Army Operational Research Group (AORG) was asked to study the operations of the Royal Artillery, to see if more efficient methods of operation could be found. Mr. Omond Solandt, then the director of AORG, explains what happened when the experts showed up:

> *In this case we took movies of the gun unit going into action. Everything looked quite good, except that there was one man who spent a long time just standing still doing*

[2] Partial findings of the study were published in two interesting books, *Burning Money*, by J. Peter Grace, and *War on Waste*, by the PPSSCC; both books were published in 1984 by Macmillan Co., New York.