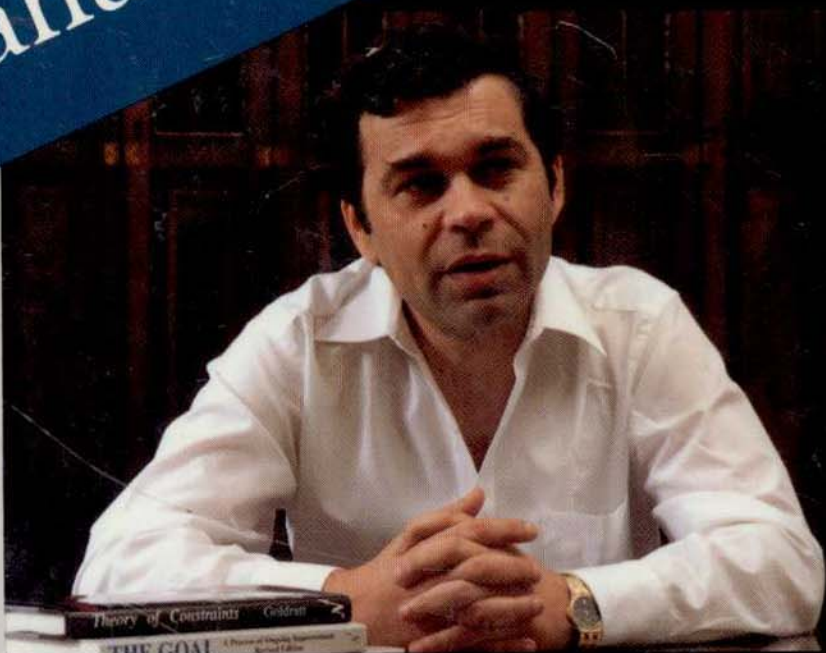


he Novel That Is
Changing American
Business

SECOND REVISED EDITION

THE GOAL

Eliyahu M. Goldratt
and Jeff Cox



A
Process
of
Ongoing
Improvement

"Recommended for anyone with an interest in the state of the American economy."

Publishers Weekly

"...A small but growing number of managers at some of the world's biggest manufacturers are agreeing with him..."

Business Week

"An Israeli shakes up U.S. factories."

Fortune

"A factory may be an unlikely setting for a novel, but the book has been wildly effective..."

Tom Peters

THE GOAL

**A Process of Ongoing Improvement
SECOND REVISED EDITION**

By
Eliyahu M. Goldratt
and
Jeff Cox

North River Press, Inc.

For more information on the concepts presented in this book or additional copies please contact:

Avraham Y. Goldratt Institute
442 Orange Street
New Haven, CT 06511
Tel: (203) 624-9026

Additional copies can also be obtained from your local bookstore or the publisher: **North River Press**

Box 567
Great Barrington, MA 01230
Tel: (800) 486-2665

First Edition Copyright © 1984 Eli Goldratt
Revised Edition Copyright © 1986 Eli Goldratt
Second Revised Edition Copyright © 1992 Eli Goldratt

All rights reserved. Except for the usual review purposes, no part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information retrieval system, without the written permission of the publisher.

Manufactured in the United States of America

Library of Congress Cataloging-in-Publication Data

Goldratt, Eliyahu M., 1948–

The goal: a process of ongoing improvement.

I. Cox, Jeff, 1951– .II. Title.
PR9510.9.G64G6 1986 823 86-12566
ISBN 0-88427-061-0

THE GOAL

SECOND REVISED EDITION

Other North River Press Books by
Eliyahu M. Goldratt

The Race (with Robert E. Fox)
Theory of Constraints
The Haystack Syndrome

INTRODUCTION TO THE REVISED EDITION

The Goal is about science and education. I believe that these two words have been abused to the extent that their original meanings have been lost in a fog of too much respect and mystery. Science for me, and for the vast majority of respectable scientists, is not about the secrets of nature or even about truths. Science is simply the method we use to try and postulate a minimum set of assumptions that can explain, through a straightforward logical derivation, the existence of many phenomena of nature.

The Law of Conservation of Energy of physics is not truth. It is just an assumption that is valid in explaining a tremendous amount of natural phenomena. Such an assumption can never be proven since even an infinite number of phenomena that can be explained by it does not prove its universal application. On the other hand, it can be disproved by just a single phenomenon that cannot be explained by the assumption. This disproving does not detract from the validity of the assumption. It just highlights the need or even the existence of another assumption that is *more* valid. This is the case with the assumption of the conservation of energy which was replaced by Einstein's more global—more valid—postulation of the conservation of energy and mass. Einstein's assumption is not true to the same extent that the previous one was not "true".

Somehow we have restricted the connotation of science to a very selective, limited assemblage of natural phenomena. We refer to science when we deal with physics, chemistry or biology. We should also realize that there are many more phenomena of nature that do not fall into these categories, for instance those phenomena we see in organizations, particularly those in industrial organizations. If these phenomena are not phenomena of nature, what are they? Do we want to place what we see in organizations to the arena of fiction rather than into reality?

This book is an attempt to show that we can postulate a very small number of assumptions and utilize them to explain a very large spectrum of industrial phenomena. You the reader can judge whether or not the logic of the book's derivation from its assumptions to the phenomena we see daily in our plants is so flawless that you call it common sense. Incidentally, common sense is not so common and is the highest praise we give to a chain of logical conclusions. If you do, you basically have taken science from the ivory tower of academia and put it where it belongs, within the reach of every one of us and made it applicable to what we see around us.

What I have attempted to show with this book is that no exceptional brain power is needed to construct a new science or to expand on an existing one. What is needed is just the courage to face inconsistencies and to avoid running away from them just because "that's the way it was always done". I dared to interweave into the book a family life struggle, which I assume is quite familiar to any manager who is to some extent obsessed with his work. This was not done just to make the book more popular, but to highlight the fact that we tend to disqualify many phenomena of nature as irrelevant as far as science is concerned.

I have also attempted to show in the book the meaning of education. I sincerely believe that the only way we can learn is through our deductive process. Presenting us with final conclusions is not a way that we learn. At best it is a way that we are trained. That's why I tried to deliver the message contained in the book in the Socratic way. Jonah, in spite of his knowledge of the solutions, provoked Alex to derive them by supplying the question marks instead of the exclamation marks. I believe that because of this method, you the reader will deduce the answers well before Alex Rogo succeeds in doing so. If you find the book entertaining maybe you will agree with me that this is the way to educate, this is the way we should attempt to write our textbooks. Our textbooks should not present us with a series of end results but rather a plot that enables the reader to go through the deduction process himself. If I succeed by this book to change somewhat your perception of science and education, this is my true reward.

INTRODUCTION

“The Goal” is about New global principles of manufacturing. It’s about people trying to understand what makes their world tick so that they can make it better. As they think logically and consistently about their problems they are able to determine “cause and effect” relationships between their actions and the results. In the process they deduce some basic principles which they use to save their plant and make it successful.

I view science as nothing more than an understanding of the way the world is and *why* it is that way. At any given time our scientific knowledge is simply the current state of the art of our understanding. I do not believe in absolute truths. I fear such beliefs because they block the search for better understanding. Whenever we think we have final answers progress, science, and better understanding ceases. Understanding of our world is not something to be pursued for its own sake, however. Knowledge should be pursued, I believe, to make our world better—to make life more fulfilling.

There are several reasons I chose a novel to explain my understanding of manufacturing—how it works (reality) and why it works that way. First, I want to make these principles more understandable and show how they can bring order to the chaos that so often exists in our plants. Second, I wanted to illustrate the power of this understanding and the benefits it can bring. The results achieved are not fantasy; they have been, and are being, achieved in real plants. The western world does not have to become a second or third rate manufacturing power. If we just understand and apply the correct principles, we can compete with anyone. I also hope that readers would see the validity and value of these principles in other organizations such as banks, hospitals, insurance companies and our families. Maybe the same potential for growth and improvement exists in all organizations.

Finally, and most importantly, I wanted to show that we can

all be outstanding scientists. The secret of being a good scientist, I believe, lies not in our brain power. We have enough. We simply need to look at reality and think logically and precisely about what we see. The key ingredient is to have the courage to face inconsistencies between what we see and deduce and the way things are done. This challenging of basic assumptions is essential to breakthroughs. Almost everyone who has worked in a plant is at least uneasy about the use of cost accounting efficiencies to control our actions. Yet few have challenged this sacred cow directly. Progress in understanding requires that we challenge basic assumptions about how the world is and why it is that way. If we can better understand our world and the principles that govern it, I suspect all our lives will be better.

Good luck in your search for these principles and for your own understanding of "The Goal."

ABOUT THE AUTHOR

Eli Goldratt's ten-year-old crusade to change manufacturing from an art to a science is bearing fruit. Eli's reputation as a slaughterer of sacred cows began in 1979 when the introduction of his computerized scheduling system disproved the myth that finite scheduling doesn't work.

This work led to the realization that the current measurements used on the shop floor are a major stumbling block to improvement and led to the almost unavoidable next development step. But when he attacked "Cost Accounting as enemy number one of productivity," he should have generated great resistance. Instead, Eli was warmly welcomed by both manufacturing and financial people. Many companies are now abandoning efficiencies and questioning other uses of cost accounting for making decisions. Today Eli's process of ongoing improvement is increasingly recognized as a powerful, viable holistic approach in which other methods—such as MRP, Just in Time, Statistical Process Control—are synergistically matched.

It seems appropriate that a man characterized as unconventional but also full of common sense should disguise *The Goal*, a manufacturing text book, as a novel or, as some say, a love story. It's also fitting that it should become an underground best seller in board rooms, universities and on the factory floor. However, it was not anticipated that *The Goal* would be passed along to and avidly read by spouses. Nor was it anticipated that people in more than a dozen different countries would claim that the book was written about their plants and their families.

Eli's second book (co-authored with Robert Fox) expands on the technical aspects of shop floor management. He is also the author of *The Haystack Syndrome: Sifting Information Out of the Data Ocean* and *The Theory of Constraints*.

Today Eli devotes all his time to the Avraham Y. Goldratt Institute (named after his late father) to enhance the rate at which knowledge is generated and disseminated.

THE GOAL
SECOND REVISED EDITION

1

I come through the gate this morning at 7:30 and I can see it from across the lot: the crimson Mercedes. It's parked beside the plant, next to the offices. And it's in *my* space. Who else would do that except Bill Peach? Never mind that the whole lot is practically empty at that hour. Never mind that there are spaces marked "Visitor." No, Bill's got to park in the space with my title on it. Bill likes to make subtle statements. So, okay, he's the division vice-president, and I'm just a mere plant manager. I guess he can park his damn Mercedes wherever he wants.

I put my Buick next to it (in the space marked "Controller"). A glance at the license as I walk around it assures me it has to be Bill's car because the plate says "NUMBER 1." And, as we all know, that's absolutely correct in terms of who Bill always looks out for. He wants his shot at CEO. But so do I. Too bad that I may never get the chance now.

Anyway, I'm walking up to the office doors. Already the adrenalin is pumping. I'm wondering what the hell Bill is doing here. I've lost any hope of getting any work done this morning. I usually go in early to catch up on all the stuff I'm too busy to do during the day, because I can really get a lot done before the phone rings and the meetings start, before the fires break out. But not today.

"Mr. Rogo!" I hear someone calling.

I stop as four people come bursting out of a door on the side of the plant. I see Dempsey, the shift supervisor; Martinez, the union steward; some hourly guy; and a machining center foreman named Ray. And they're all talking at the same time. Dempsey is telling me we've got a problem. Martinez is shouting about how there is going to be a walkout. The hourly guy is saying something about harassment. Ray is yelling that we can't finish some damn thing because we don't have all the parts. Suddenly I'm in the middle of all this. I'm looking at them; they're looking at me. And I haven't even had a cup of coffee yet.

When I finally get everyone calmed down enough to ask what's going on, I learn that Mr. Peach arrived about an hour before, walked into my plant, and demanded to be shown the status of Customer Order Number 41427.

Well, as fate would have it, nobody happened to know about Customer Order 41427. So Peach had everybody stepping and fetching to chase down the story on it. And it turns out to be a fairly big order. Also a late one. So what else is new? Everything in this plant is late. Based on observation, I'd say this plant has four ranks of priority for orders: Hot . . . Very Hot . . . Red Hot . . . and Do It NOW! We just can't keep ahead of anything.

As soon as he discovers 41427 is nowhere close to being shipped, Peach starts playing expeditor. He's storming around, yelling orders at Dempsey. Finally it's determined almost all the parts needed are ready and waiting—stacks of them. But they can't be assembled. One part of some sub-assembly is missing; it still has to be run through some other operation yet. If the guys don't have the part, they can't assemble, and if they can't assemble, naturally, they can't ship.

They find out the pieces for the missing subassembly are sitting over by one of the n/c machines, where they're waiting their turn to be run. But when they go to that department, they find the machinists are *not* setting up to run the part in question, but instead some other do-it-now job which somebody imposed upon them for some other product.

Peach doesn't give a damn about the other do-it-now job. All he cares about is getting 41427 out the door. So he tells Dempsey to direct his foreman, Ray, to instruct his master machinist to forget about the other super-hot gizmo and get ready to run the missing part for 41427. Whereupon the master machinist looks from Ray to Dempsey to Peach, throws down his wrench, and tells them they're all crazy. It just took him and his helper an hour and a half to set up for the *other* part that everyone needed so desperately. Now they want to forget about it and set up for something else instead? The hell with it! So Peach, always the diplomat, walks past my supervisor and my foreman, and tells the master machinist that if he doesn't do what he's told, he's fired. More words are exchanged. The machinist threatens to walk off the job. The union steward shows up. Everybody is mad. Nobody is working. And now I've got four upset people greeting me bright and early in front of an idle plant.

"So where is Bill Peach now?" I ask.

"He's in your office," says Dempsey.

"Okay, would you go tell him I'll be in to talk to him in a minute," I ask.

Dempsey gratefully hurries toward the office doors. I turn to Martinez and the hourly guy, who I discover is the machinist. I tell them that as far as I'm concerned there aren't going to be any firings or suspensions—that the whole thing is just a misunderstanding. Martinez isn't entirely satisfied with that at first, and the machinist sounds as if he wants an apology from Peach. I'm not about to step into that one. I also happen to know that Martinez can't call a walkout on his own authority. So I say if the union wants to file a grievance, okay; I'll be glad to talk to the local president, Mike O'Donnell, later today, and we'll handle everything in due course. Realizing he can't do anything more before talking to O'Donnell anyway, Martinez finally accepts that, and he and the hourly guy start walking back to the plant.

"So let's get them back to work," I tell Ray.

"Sure, but uh, what should we be working on?" asks Ray. "The job we're set up to run or the one Peach wants?"

"Do the one Peach wants," I tell him.

"Okay, but we'll be wasting a set-up," says Ray.

"So we waste it!" I tell him. "Ray, I don't even know what the situation is. But for Bill to be here, there must be some kind of emergency. Doesn't that seem logical?"

"Yeah, sure," says Ray. "Hey, I just want to know what to do."

"Okay, I know you were just caught in the middle of all this," I say to try to make him feel better. "Let's just get that setup done as quick as we can and start running that part."

"Right," he says.

Inside, Dempsey passes me on his way back to the plant. He's just come from my office and he looks like he's in a hurry to get out of there. He shakes his head at me.

"Good luck," he says out of the corner of his mouth.

The door to my office is wide open. I walk in, and there he is. Bill Peach is sitting behind my desk. He's a stocky, barrel-chested guy with thick, steely-gray hair and eyes that almost match. As I put my briefcase down, the eyes are locked onto me with a look that says *This is your neck, Rogo*.

"Okay, Bill, what's going on?" I ask.

He says, "We've got things to talk about. Sit down."

I say, "I'd like to, but you're in my seat."

It may have been the wrong thing to say.

"You want to know why I'm here?" he says. "I'm here to save your lousy skin."

I tell him, "Judging from the reception I just got, I'd say you're here to ruin my labor relations."

He looks straight at me and says, "If you can't make some things happen around here, you're not going to have any labor to worry about. Because you're not going to have this plant to worry about. In fact, you may not have a job to worry about, Rogo."

"Okay, wait a minute, take it easy," I say. "Let's just talk about it. What's the problem with this order?"

First of all, Bill tells me that he got a phone call last night at home around ten o'clock from good old Bucky Burnside, president of one of UniCo's biggest customers. Seems that Bucky was having a fit over the fact that this order of his (41427) is seven weeks late. He proceeded to rake Peach over the coals for about an hour. Bucky apparently had gone out on a limb to sway the order over to us when everybody was telling him to give the business to one of our competitors. He had just had dinner with several of his customers, and they had dumped all over him because their orders were late—which, as it happens, was because of us. So Bucky was mad (and probably a little drunk). Peach was able to pacify him only by promising to deal with the matter personally and by guaranteeing that the order would be shipped by the end of today, no matter what mountains had to be moved.

I try to tell Bill that, yes, we were clearly wrong to have let this order slide, and I'll give it my personal attention, but did he have to come in here this morning and disrupt my whole plant?

So where was I last night, he asks, when he tried to call me at home? Under the circumstances, I can't tell him I have a personal life. I can't tell him that the first two times the phone rang, I let it ring because I was in the middle of a fight with my wife, which, oddly enough, was about how little attention I've been giving her. And the third time, I didn't answer it because we were making up.

I decide to tell Peach I was just late getting home. He doesn't press the issue. Instead, he asks how come I don't know what's going on inside my own plant. He's sick and tired of hearing complaints about late shipments. Why can't I stay on top of things?

"One thing I do know," I tell him, "is that after the second round of layoffs you forced on us three months ago, along with

the order for a twenty percent cutback, we're lucky to get anything out the door on time."

"Al," he says quietly, "just build the damn products. You hear me?"

"Then give me the people I need!" I tell him.

"You've got enough people! Look at your efficiencies, for god's sake! You've got room for improvement, Al," he says. "Don't come crying to me about not enough people until you show me you can effectively use what you've got."

I'm about to say something when Peach holds up his hand for me to shut my mouth. He stands up and goes over to close the door. Oh shit, I'm thinking.

He turns by the door and tells me, "Sit down."

I've been standing all this time. I take a seat in one of the chairs in front of the desk, where a visitor would sit. Peach returns behind the desk.

"Look, Al, it's a waste of time to argue about this. Your last operations report tells the story," says Peach.

I say, "Okay, you're right. The issue is getting Burnside's order shipped—"

Peach explodes. "Dammit, the issue is not Burnside's order! Burnside's order is just a symptom of the problem around here. Do you think I'd come down here just to expedite a late order? Do you think I don't have enough to do? I came down here to light a fire under you and everybody else in this plant. This isn't just a matter of customer service. Your plant is losing money."

He pauses for a moment, as if he had to let that sink in. Then—bam—he pounds his fist on the desk top and points his finger at me.

"And if you can't get the orders out the door," he continues, "then I'll show you how to do it. And if you still can't do it, then I've got no use for you *or* this plant."

"Now wait a minute, Bill—"

"Dammit, I don't have a minute!" he roars. "I don't have time for excuses anymore. And I don't need explanations. I need performance. I need shipments. I need income!"

"Yes, I know that, Bill."

"What you may not know is that this division is facing the worst losses in its history. We're falling into a hole so deep we may never get out, and your plant is the anchor pulling us in."

I feel exhausted already. Tiredly I ask him, "Okay, what do

you want from me? I've been here six months. I admit it's gotten worse instead of better since I've been here. But I'm doing the best I can."

"If you want the bottom line, Al, this is it: You've got three months to turn this plant around," Peach says.

"And suppose it can't be done in that time?" I ask.

"Then I'm going to go to the management committee with a recommendation to close the plant," he says.

I sit there speechless. This is definitely worse than anything I expected to hear this morning. And, yet, it's not really that surprising. I glance out the window. The parking lot is filling with the cars of the people coming to work first shift. When I look back, Peach has stood up and is coming around the desk. He sits down in the chair next to me and leans forward. Now comes the reassurance, the pep talk.

"Al, I know that the situation you inherited here wasn't the best. I gave you this job because I thought you were the one who could change this plant from a loser to . . . well, a small winner at least. And I still think that. But if you want to go places in this company, you've got to deliver results."

"But I need time, Bill."

"Sorry, you've got three months. And if things get much worse, I may not even be able to give you that."

I sit there as Bill glances at his watch and stands up, discussion ended.

He says, "If I leave now, I'll only miss my first meeting."

I stand up. He walks to the door.

Hand on the knob, he turns and says with a grin, "Now that I've helped you kick some ass around here, you won't have any trouble getting Bucky's order shipped for me today, will you?"

"We'll ship it, Bill," I say.

"Good," he says with a wink as he opens the door.

A minute later, I watch from the window as he gets into his Mercedes and drives toward the gate.

Three months. That's all I can think about.

I don't remember turning away from the window. I don't know how much time has passed. All of a sudden, I'm aware that I'm sitting at my desk and I'm staring into space. I decide I'd better go see for myself what's happening out in the plant. From the shelf by the door, I get my hard hat and safety glasses and head out. I pass my secretary.