



# **BEYOND AUTOMATION**

*Managerial Problems  
of an Exploding Technology*

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**JOHN DIEBOLD**

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*For Doris, whose patience has made possible  
the addresses which form the basis  
of the major part of this volume*

Automation is more than a series of new machines and more basic than any particular hardware. It is a way of thinking as much as it is a way of doing. Automation is a new *concept*—the idea of self-regulating systems—and a new set of principles. Only when our political, industrial, and labor leadership understand this shall we gain the full benefits from automation. But this kind of understanding is still so rare in policy-making levels as to be almost an isolated phenomenon.

JOHN DIEBOLD

## FOREWORD

I have been reading John Diebold for almost twenty years, ever since his first book, *Automation—The Automated Factory*, appeared when the author was only in his mid-twenties. And I have enjoyed the privilege of close friendship with John Diebold for well over a decade now.

Since the day his work first appeared in print—while he was still a graduate student at the Harvard Business School—John Diebold has been recognized as the foremost authority on automation, and especially on the computer. His first study was prophetic in its vision of the impact of the new technologies. At that time, the most widely accepted market

forecast gave the computer a total market in this country of fewer than 1,000 machines. Diebold immediately realized that this was nonsense and that, indeed, a major industry was here that would dominate the second half of the twentieth century. He saw that the ability to handle information efficiently is as important as, a hundred years ago, the ability to produce cheap mechanical power, that is, electricity, proved to be. And he recognized the arrival of not only a new technology but also an altogether new way to look at work and at the economy.

On this basic insight, John Diebold has built a world-wide consulting practice, with offices on both sides of the Atlantic. He has built a major innovation on it, a cooperative research project in information technology and computers, in which several hundred of the world's largest companies are working together under Diebold's leadership to anticipate tomorrow's computer technology in order to learn how to use this important new tool, not only for profit but also for the benefit of society and the individual. And on this insight he has also built a world-wide financial business that finds the major new opportunities the advent of information creates and that provides the venture capital they require.

But the most important thing to know about this extraordinary man is not his intellectual brilliance or his entrepreneurial achievement. It is his human quality. From the time he entered the field, Diebold stood out among all thinkers and writers on modern technology, especially on automation and the computer, because of his broad and deep concern with people—his profound commitment to human values and, above all, to compassion. No one writes as bril-

liantly about the computer and about information technology as Diebold does, but there may be people who know almost as much about the subject as he does. No one, however, can compare with him when it comes to concern for, and understanding of, the human and social issues. This human quality, which made him, at a very early age, an adviser to governments and international organizations, comes through strongly and unequivocally in *BEYOND AUTOMATION*. It is precisely because this human quality rests on the solid foundation of a thorough knowledge of technology and of an equally thorough knowledge of management that this book is so very important. Long before anyone else even recognized the potential importance of information technology in human affairs, Diebold saw both the opportunity to use this new capacity for human ends and the danger inherent in its misuse. For the understanding that we have to learn a great deal to be worthy of this new tool and put it to humanly desirable ends, we owe a debt to the work of John Diebold.

There are few books, therefore, from which we in our time can learn more than we can from *BEYOND AUTOMATION*. Few books are more timely or more appropriate to our concerns. And few books written today will stand the test of time as well as this book will. For there are few in which the two needs of our age—the need to understand and master our technology and the need to understand and master the human heart—are so perfectly fused.

PETER F. DRUCKER

*Montclair, New Jersey*  
*October, 1969*

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# *Part 1*

## **THE CHALLENGE**



## *Chapter 1*

### **PERCEIVING THE MAGNITUDE OF THE PROBLEM—THREE VIEWPOINTS**

*The technological revolution confronting society today varies in form, and its consequences—human, business, and managerial—exceed in dimension those which are commonly perceived. The new technology is viewed as creating net changes in manpower. But this is only one aspect of the challenge, and viewed in historical retrospect some years hence, it may appear as a comparatively minor one. Machines that give the mind of man entirely new dimensions will have a far greater impact. Major social and economic innovation to adjust to fundamental technological change has become a prime responsibility of today's industrial and political leaders.*

*This chapter is based on an address given on Alumni Day  
at Columbia University in New York City.*

Beyond the technological and conceptual innovations of automation lie problems and opportunities on a scale seldom encountered in human history. To meet these problems and to achieve the promise requires a perspective not often brought to bear on either public or private enterprise.

To begin with, we have yet to perceive the magnitude and the true nature of the momentous change automation is effecting in our lives, in our businesses, and in our society.

The potential and the problem of automation are far greater and quite different than yet perceived. The problem is grave and requires far more private as well as public action than has yet been proposed. Social innovation is needed to match the technological innovations.

The speed of this technological change is so great that we must today do far more than even yet proposed to ascertain:

1. The true nature of the future that is cast for us by today's innovations.
2. The magnitude and character of the problems posed for mankind by automation.
3. The alternatives open to us to cope adequately with the changes automation is making in our world.

Automation is perceived primarily as a manpower problem—involving changes in labor requirements, changes in skill as jobs change, and problems of retraining and worker mobility. Managers and workers who have experienced automation in practice know that it is more than this—that it is more often than not introduced to make possible wholly new ways of performing a task, whether that task be controlling a business, a government agency, or passenger air traffic.

Automation is all of these things. But my point is that it is much more.

Machines have always been important to us primarily in their role as *agents for social change*. We use the very term "industrial revolution" not because of the revolutionary machines of James Watt and Richard Arkwright, but because they created a whole new environment for mankind—a whole new way of life. What they gave to history was much more than the steam engine and the cotton gin, the railway and the power loom. Their machines gave society a whole new tempo, a whole new outlook.

Today's crop of machines is a far more powerful agent for social change than was that of the first industrial revolution. Today's machines result from a new found ability to build systems which process and communicate information, translate from one language to another, respond to the human voice, and devise their own route to goals that are presented to them; machine systems which improve their performance as a result of encountering the environment (machines, in other words, which learn in the normal sense in which that term is used); in short, machine systems which deal with the very core of human society—with information and its communication and use. These are developments which augur far more for mankind than net changes in manpower, more or less employment, or new ways of doing old tasks.

These are developments which mean that mankind will undertake new tasks, not merely perform old tasks in a new way. This is a technology which vastly extends the range of human capability and which will fundamentally alter human society.

The very nature of today's technology, its effect on the

building blocks of human society, will force us to reconsider our whole approach to work, to society, and to life itself.

The technology of automation casts before it shadows of far greater social change than were brought about by the industrial revolution set in train by Watt and Arkwright.

Let us look, for example, at automation as perceived from three viewpoints: that of the individual, the manager, and public policy.

I. *The individual* perceives automation as a job threat or, if he be a mathematician, engineer, or otherwise situated to benefit, he perceives it as a challenge and an opportunity.

Yet automation is going to force the individual—and all of mankind—to reconsider his very conception of himself. As Professor Herbert A. Simon of Carnegie Institute of Technology states: "The definition of man's uniqueness has always formed the kernel of his cosmological and ethical systems. With Copernicus and Galileo, he ceased to be the species located at the center of the universe, attended by sun and stars. With Darwin, he ceased to be the species created and specially endowed by God with soul and reason. With Freud, he ceased to be the species whose behavior was—potentially—governable by rational mind. As we begin to produce mechanisms that think and learn, he has ceased to be the species uniquely capable of complex, intelligent manipulation of his environment."

I am confident man will find a new way of describing his place in the universe. Machine systems certainly show no signs of many of the fundamental human qualities such as imagination, volition, purposefulness, compassion, or love. Yet my point is that man's ability to build machines which



learn, and which already possess so much of the quality we today call “intelligence,” means that we have the most fundamental of changes in store for the individual and for our conception of our role as human beings.

In addition to the obvious increase in our leisure time—or, as my friend Professor Peter Drucker so aptly calls it, discretionary time—our role as individual humans is being inexorably changed by automation.

2. *The manager*, public administrator, and private businessman today perceive automation as a labor-saving device and as a means for exercising tighter control on their enterprises and making them more responsive to rapid change. The great theme in today’s business literature is that automation represents an opportunity to do a better job of managing. This is all well and good as far as it goes. But in itself it tells only a small part of the story. For the significance of automation to the manager is not so much the new methods it gives him for managing—the new kit of professional tools, so to speak—but the fact that the enterprise he manages will change totally owing to the changes automation is effecting in our society.

The real potential, and the enormous problem automation poses to the manager, is that the environment in which the enterprise exists is changing, rapidly and completely. As the goals, aspirations, needs, and wants of the individual shift, and shift again and again through the human social change induced by automation, the economic realities that sustain the enterprise will change.

In other words, the great meaning of automation to the manager is to be found in the social change induced by automation. This holds a far more profound meaning to the