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The manager and the moron

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The computer is a moron. And the stupider the tool, the brighter the master must be, says Peter Drucker. In this *Quarterly* archive article, he explains how "the dumbest tool we have ever had" will compel managers to think through their actions.

As all of us know, during the last 20 years the free world has had the greatest, most sustained economic advance in history. Most of us believe that this has been a time not merely of forward movement, but of vast economic change.

The facts and figures, however, do not support this impression. They show, instead, that our era has actually been a time of unprecedented *non*-change. It has been largely a period of linear forward movement along old trend lines, of adding new stories to an old building according to the old architectural design.

Imagine an economist in 1913, just before World War I, taking the economic trend lines of what were then already the advanced countries, and projecting each of them ahead to 1966. He would have hit it on the nose for Japan, Western Europe, and the United States, in fact for every one of the developed nations with one important exception—the Soviet Union, which is significantly below where it would have come out on our economist's projection. The reason for this, as all of us know, was that the Russians imposed a political straitjacket on agriculture and froze farm technology just at the worst possible moment, when the technological revolution in farming was getting under way. Worse, they froze the agricultural population. By making it possible for anybody who stayed on the farm to be fed, no matter how poorly, they removed the economic pressure that elsewhere in the world has pushed the farmer off the farm, brought about fantastic productivity jumps in agriculture, and provided labor for the expansion of industry.

Suppose, again, that our economist, having made his projections in 1913, fell into a 50 years' sleep. When he woke up, he would have found the industrial geography of the world virtually unchanged. Every country that is today an industrially advanced nation was well past the takeoff point in 1913.

Not a single new one has joined the club, unless you count satellite economies like Canada, Australia, South Africa, and Mexico. Brazil, which has a long and distinguished history as a country of the future, may join the club tomorrow, but it isn't quite there yet.

Compared to this linear movement, the 50 years before 1913 present the greatest imaginable contrast. During those five decades the industrial map of the world had been changing as rapidly as the physical map of the world changed in the fifteenth and the early sixteenth centuries—the Age of Discovery. Right after the Civil War, the United States and Germany emerged as economically advanced countries and rapidly overtook the old champion, Great Britain. A quarter of a century later Russia and Japan emerged, along with the western part of Austria-Hungary—the present Czechoslovakia and Austria, with Northern Italy. In short, the 50 years before 1913 were a period of very rapid shifts in economic power relationships.

Since World War I, however, such changes have been absent. This explains why economists of today are so concerned with economic development. Before 1913, it was taken for granted, but since then we've apparently gone sterile. And we don't know how to start it up.

Perhaps the greatest shock to our Rip Van Winkle economist, however, would be the fact that, with the exception of the plastics industry, the main engines of growth in the past 50 years were already mature or rapidly maturing industries, based on well-known technologies, back in 1913.

The dynamos of growth

Our most rapidly advancing industry in the last 20 years of expansion has been agriculture. The productivity of farming has been increasing twice as fast as the productivity of manufacturing in all the developed countries except Russia. Yet the average farmer of today in the United States is not farming in a much more advanced way than the top farmer of 1913. Hybrid seed is about the only new development of any consequence.

And the next dynamo has been the steel industry. World steel capacity has expanded fivefold since 1913. Yet 99 percent of all steel capacity in existence today is built on a technology that was considered antiquated—and Lord knows *was* antiquated—in 1913.

Our third engine of growth has been the automotive industry. Yet in 1913 Henry Ford was already producing and selling 183,000 Model T's, and a year later the figure had climbed to 261,000—more cars than the Soviet Union has ever produced in a single year. Even the Ford Motor Company of 1913 would be a major producer in today's free-world automotive industry.

Much the same is true of the electrical apparatus industry. Neither Westinghouse, nor GE, nor Siemens was exactly unknown in 1913. They were blue chips. And this is also true of the organic chemical industry.

Plastics is the only industry based on new technology that is economically important today in terms of contribution to gross national product, employment, and so on. As far as the economic statistician is concerned, other industries hardly exist as yet. The airplane began to have an economic impact when the jets came. But the real impact will come with the big freight jets, which will make every airstrip in the world a deep-water port. In a few years, they may make the ocean-going freighter, man's oldest efficient transportation, look roughly the way the railroads began to look around 1950. This will be one of the greatest changes in transportation we've ever had. But it is still ahead of us.

Much ado, little impact

The computers, despite all the excitement they have been generating, are not yet economically important. It's only now that IBM is shipping them out at a rate of a thousand a month that they're even beginning to have an impact. But we haven't begun to use the potential of the computer. So far we are using it only for clerical chores, which are unimportant by definition. To be sure, the computer has created something that had never existed in the history the world—namely, paying jobs for mathematicians. But that is hardly a major economic contribution, no matter what the graduate dean thinks.

So the economic impact of the new technologies is still in the future. If we subtracted every single one of them from the civilian economy, we would hardly notice it in the figures—perhaps a percentage point or two.

But this situation of linear movement is rapidly changing in every respect. And the greatest change is one that our Rip Van Winkle economist, looking only at the figures, wouldn't even notice: In the past 20 years we have created a brand-new form of capital, a brand-new resource, namely knowledge.

Up until 1900, any society in the world would have done just as well as it did without men of knowledge. We may have needed lawyers to defend criminals and doctors to write death certificates, but the criminals would have done almost as well without the lawyers, and the patients without the doctors. We needed teachers to teach other ornaments of society, but this too was largely decoration. The world prided itself on men of knowledge, but it didn't need them to keep the society running.

As late as the mid-forties, General Motors carefully concealed the fact that one of its three top men, Albert Bradley, had a PhD. It was even concealed that he had gone to college, because, quite obviously, a respectable man went to work as a water boy at age 14. A PhD was an embarrassing thing to have around.

Nowadays, companies boast about the PhDs on their payrolls. Knowledge has become our capital resource, a terribly expensive one. A man who graduates from a good business school represents some $100,000 of social investment, not counting what his parents spent on him, and not counting the opportunity costs. His grandparents and great-grandparents had to go to work at the age of 12 or 13 with the hoe in the potato patch so that he could forgo those ten years of contribution to society. And that's a tremendous capital investment.

Besides spending all that money, we are also doing something very revolutionary. We are applying knowledge to work. Seven-odd thousand years ago, the first great human revolution took place when our ancestors first applied skill to work. They did not use skill to substitute for brawn. The most skilled work very often requires the greatest physical strength; no ditchdigger works harder than the surgeon performing a major operation. Rather, our ancestors put skills on top of physical labor. And now—a second revolution—we've put knowledge on top of both. Not as a substitute for skill, but as a whole new dimension. Skill alone won't do it anymore.

Now, this has two or three important implications for management.

First, we must learn to make knowledge productive. As yet we don't really know how. The payroll cost of knowledge workers already amounts to more than half the labor costs of practically all business I know. That represents a tremendous capital investment in human beings. But so far neither productivity trends nor profit margins show much sign of responding to it. Pretty clearly, although business is paying for knowledge workers, it isn't getting much back. And if you look at the way we manage knowledge workers, the reason is obvious: we don't know how.

One of the few things we do know is that for any knowledge worker, even for the file clerk, there are two laws. The first one is that knowledge evaporates unless it's used and augmented. Skill goes to sleep, it becomes rusty, but it can be restored and refurbished very quickly. That's not true of knowledge. If knowledge isn't challenged to grow, it disappears fast. It's infinitely more perishable than any other resource we have ever had. The second law is that the only motivation for knowledge is achievement. Anybody who has ever had a great success is motivated from then on. It's a taste one never loses. So we do know a little about how to make knowledge productive.

The obsolescence of experience

Another implication flows from the creation of this new knowledge resource. The new generation of managers, those now aged 35 or under, is the first generation that thinks in terms of putting knowledge to work before one has accumulated a decade or two of experience. Mine was the last generation of managers who measured their value entirely by experience. All of us, of necessity, managed by experience—not a good process, because experience cannot be tested or be taught. Experience must be experienced; except by a very great artist, it cannot be conveyed.

This means that the new generation and my generation are going to be horribly frustrated working together. They rightly expect us, their elders and betters, to practice some of the things that we preach. We don't dream of it. We preach knowledge and system and order, since we never had them. But we go by experience, the one thing we do have. We feel frustrated and lost because, after devoting half our lifetimes to acquiring experience, we still don't really understand what we're trying to do. The young are always in the right, because time is on their side. And that means *we* have to change.

This brings us to the third implication, a very important one. Any business that wants to stay ahead will have to put very young people into very big jobs—and fast. Older men cannot do these jobs—not because they lack the necessary intelligence, but because they have the wrong conditioned reflexes. The young ones stay in school so long they don't have time to acquire the experience we used to consider indispensable in big jobs. And the age structure of our population is such that in the next 20 years, like it or not, we are going to have to promote people we wouldn't have thought old enough, a few years ago, to find their way to the water cooler. Companies must learn to stop replacing the 65-year-old man with the 59-year-old. They must seek out their good 35-year-olds.

For all its importance, however, the appearance of knowledge as a new capital resource is not the most vivid change in our environment, if only because it does not yet have a visible impact on the world's economic figures. Probably the most vivid change is in technology.

Many of the old technologies, of course, still have a lot of life in them. I think it's quite clear that the automobile, for instance, has yet to experience its greatest growth period. In the developed countries, however, it's in a defensive position. I don't think we need a great deal of imagination

to foresee the day when the private car will be banned in the midtown areas or the day when the internal combustion engine will be limited to over-the-road use.

Or consider steel. I think one can quite easily foretell technological changes that will cut the cost of steel by about 40 percent. But whether that's enough to re-create momentum for the steel industry is debatable. I think that steel would probably need a greater cost advantage to make it again the universal material it used to be. Since steel, like all multipurpose materials, isn't ideal for any one use, it has to compete on price. And, as you know, the steel industry has lost 20 percent of the markets it had before World War II. It's concrete here, plastic there, and so on. Whether steel will lose the automotive-body business to one of the new composition materials in the next ten years is a moot question. Only a fool would bet on it at this point, but by the same token only a fool would bet against it. If it does happen, it's very doubtful whether even a 40 percent reduction in cost might be enough to keep steel from joining the long parade of yesterday's engines of economic growth.

In agriculture, the great need is for an advance in productivity—but again, not in the developed countries. By now, the agricultural population in the developed countries has shrunk to such a small percentage of the total that even tripling its productivity would make little difference in the overall economic picture.

And so on. I'm not saying that the industries based on old technologies can't advance, but I am saying they're unlikely to provide the impetus we need for continuing expansion. From now on, I think, the expansion will have to be powered by new industries based on new technologies, something we have not seen to any extent since before World War I.

Enter the knowledge utility

One of the most potentially earthshaking forces in our economy is the technology of information. I don't mean simply the computer. The computer is to information what the electric power station is to electricity. The power station makes many other things possible, but it's not where the money is. The money is in the gimmicks and gizmos, the appliances, the motors and facilities made possible and necessary by electricity, that didn't exist before.

Information, like electricity, is energy. Just as electrical energy is energy for mechanical tasks, information is energy for mental tasks. The computer is the central power station, but there are also the electronic transmission facilities—the satellites and related devices. We have devices to translate the energy, to convert the information. We have the display capacity of the television tube, the capability to translate arithmetic into geometry, to convert from binary numbers into curves. We can go from computer core to memory display, and from either one into hard copy.

All the pieces of the information system are here. Technically there is no reason why Sears, Roebuck could not offer tomorrow, for the price of a television set, a plug-in appliance that would put us in direct contact with all the information needed for schoolwork from kindergarten through college.

Already the time-sharing principle has begun to take hold. I don't think it takes too much imagination to see that a typical large company is about as likely to have its own computer 20 years hence as it is to have its own steam-generating plant today. It is reasonably predictable that computers will become a common carrier, a public utility, and that only organizations with quite extraordinary needs will have their own. Steel mills today have their own generators because they need such an enormous amount of power. Twenty years hence, an institution that's the equivalent of a steel mill in terms of mental work—MIT, for example—might well have its own computer. But I think most other universities, for most purposes, will simply plug into time-sharing systems.

It would be silly to try to predict in detail the effects of any development as big as this. All one can foresee for certain is a great change in the situation. One cannot predict what it will lead to, and where and when and how. A change as tremendous as this doesn't just satisfy existing wants, or replace things we are now doing. It creates new wants and makes new things possible.

A new age of information

The impact of information, however, should be greater than that of electricity, for a very simple reason. Before electricity, we had power; we had energy. It was very expensive and rather scarce, but we had it. Before now, however, we have not had information. Information has been unbelievably expensive, almost totally unreliable, and always so late that it was of little, if any, value. Most of us who had to work with information in the past, therefore, knew we had to invent our own. One developed, if one had any sense, a reasonably good instinct for what invention was plausible and likely to fly, and what wasn't. But real information just wasn't to be had. Now, for the first time, it's beginning to be available—and the overall impact on society is bound to be very great.

Without attempting to predict the precise nature and timing of this impact, I think we can safely make a few assumptions.

Assumption No. 1: Within the next ten years, information will become very much cheaper. An hour of computer time today costs several hundred dollars at a minimum; I have seen figures that put the cost at about a dollar an hour in 1973 or so. Maybe it won't come down that steeply, but come down it will.

Assumption No. 2: The present imbalance between the capacity to compute and store information and the capacity to use it will be remedied. We will spend more and more money on producing the things that make a computer usable—the software, the programs, the terminals, and so on. The customers aren't going to be content just to have the computer sitting there.

Assumption No. 3: The kindergarten stage is over. We're past the time when everybody was terribly impressed by the computer's ability to do two plus two in fractions of a nanosecond. We're also past the stage of trying to find work for the computer by putting all the unimportant things on it—using it as a very expensive clerk. Actually, nobody has yet saved a penny that way, as far as I can tell. Clerical work—unless it's a tremendous job, such as addressing 7 million copies of *Life* magazine every week—is not really done very cheaply on the computer. But then, kindergartens are never cheap.

Now we can begin to use the computer for the things it should be used for—information, control of manufacturing processes, control of inventory, shipments, and deliveries. I'm not saying we shouldn't be using the computer for payrolls, but that's beside the point. If payrolls were all it could do, we wouldn't be interested in it.

Managing the moron

We are beginning to realize that the computer makes no decisions; it only carries out orders. It's a total moron, and therein lies its strength. It forces us to think, to set the criteria. The stupider the tool, the brighter the master has to be—and this is the dumbest tool we have ever had. All it can do is say either zero or one, but it can do that awfully fast. It doesn't get tired and it doesn't charge overtime. It extends our capacity more than any tool we have had for a long time, because of all the really unskilled jobs it can do. By taking over these jobs, it allows us—in fact, it compels us—to think through what we are doing.

But though it can't make decisions, the computer will—if we use it intelligently—increase the availability of information. And that will radically change the organization structure of business—of all institutions, in fact. Up to now we have been organizing, not according to the logic of the work to be done, but according to the absence of information. Whole organization levels have existed simply to provide standby transmission facilities for the breakdowns in information flow that one could always take for granted. Now these redundancies are no longer needed. We mustn't allow organizational structure to be made more complicated by the computer. If the computer doesn't enable us to simplify our organizations, it's being abused.

Along with vastly increasing the availability of information, the computer will reduce the sheer volume of data that managers have had to cope with. At present the computer is the greatest possible obstacle to management information, because everybody has been using it to produce

tons of paper. Now, psychology tells us that the one sure way to shut off all perception is to flood the senses with stimuli. That's why the manager with reams of computer output on his desk is hopelessly uninformed. That's why it's so important to exploit the computer's ability to give us *only* the information we want—nothing else. The question we must ask is not, "How many figures can I get?" but "What figures do I need? In what form? When and how?" We must refuse to look at anything else. We no longer have to take figures that mean nothing to us and read them the way a gypsy reads tea leaves.

Instead, we must decide on our information needs and how the computer can fill those needs. To do that, we must understand our operating processes, and the principles behind the processes. We must apply knowledge and analysis to them, and convert them to a clerk's routine. Even a work of genius, thought through and systematized, becomes a routine. Once it has been created, a shipping clerk can do it—or a computer can do it. So, once we have achieved real understanding of what we are doing, we can define our needs and program the computer to fill them.

Beyond the numbers barrier

We must realize, however, that we cannot put on the computer what we cannot quantify. And we cannot quantify what we cannot define. Many of the important things, the subjective things, are in this category. To *know* something, to really understand something important, one must look at it from 16 different angles. People are perceptually slow, and there is no shortcut to understanding; it takes a great deal of time. Managers today cannot take the time to understand, because they don't have it. They are too busy working on things they can quantify—things they *could* put on a computer.

This is why the manager should use the computer to control the routines of business, so that he himself can spend ten minutes a day controlling instead of five hours. Then he can use the rest of his time to think about the important things he cannot really know—people and environment. These are things he cannot define; he has to take the time to go and look. The failure to go out and look is what accounts for most of our managerial mistakes today.

Our greatest managerial failure rate comes in the step from middle to top management. Most middle managers are doing essentially the same things they did on their entrance jobs: controlling operations and fighting fires. In contrast, the top manager's primary function is to think. The criteria for success at the top level bear little resemblance to the criteria for promotion from middle management.

The new top manager, typically, has been promoted on the basis of his ability to adapt successfully. But suddenly he's so far away from the firing line that he doesn't know what to adapt to—so he fails. He may be an able man, but nothing in his work experience has prepared

him to think. He hasn't the foggiest notion how one goes about making entrepreneurial or policy decisions. That's why the failure rate at the senior-management level is so high. In my experience, two out of three men promoted to top management don't make it; they stay middle management. They aren't necessarily fired. Instead, they get put on the Executive Committee with a bigger office, a bigger title, a bigger salary—and a higher nuisance value because they have had no exposure to thinking. This is a situation we are going to eliminate.

On the other hand, we are going to open up a new problem of development at the middle-management level. It isn't difficult for us to get people into middle management today. But it is going to be, because we shall need thinking people in the middle, not just at the top. The point at which we teach people to think will have to be moved further and further down the line. We can already see this problem in the big commercial banks.

We will have to manage knowledge correctly in order to preserve it. And this gets us into myriad questions of teaching and learning, of developing knowledge and techniques of thinking—not only in the developed nations, but in countries that are yet unaware of the distinction between management-by-experience and management-by-thinking, countries that are unaware of management itself. But that is another subject. ▢

Peter F. Drucker was one of the most well-respected management thinkers of the 20th century and the author of more than 30 books, most notably *The Effective Executive* (Harper & Row, 1967).