From Analysis to Perception–The New Worldview

by Peter Drucker — 1989

Around 1680 a French physicist, Denis Papin, then working in Germany—as a Protestant he had been forced to leave his native country—invented the steam engine.

'Whether he actually built one we do not know; but he designed one, and he actually put together the first safety valve.

A generation later, in 1712, Thomas Newcomen then put the first working steam engine into an English coal mine.

This made it possible for coal to be mined—until then groundwater had always flooded English mines.

With Newcomen's engine, the **Age of Steam was on**.

Thereafter, for 250 years, **the model of technology was mechanical**.

Fossil fuels rapidly became the main source of energy.

And the ultimate source of motive power was what happens inside a star, that is, the sun.

In 1945, atomic fission and, a few years later, fusion replicated what occurs in the sun.

There is no going beyond this.

In 1945, the era in which the mechanical universe was the model came to an end.

Just a year later, in 1946, the first computer, the ENIAC, came on stream.

And with it **began an age** in which **information** will be the **organizing principle for work**.

Information, however, is the basic principle of **biological** rather than of mechanical **processes**.

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Very few events have as much impact on civilization as a change in the basic principle for organizing work.

Up until A.D.800 or 900, China was far ahead of any Western country in technology, in science, and in culture and civilization generally.

Then the Benedictine monks in northern Europe found new sources of energy.

Until that point the main source of energy, if not the only one, had been a two-legged animal called man.

It was the peasant's wife who pulled the plow.

The horse collar for the first time made it possible to replace the farmer's wife with animal power.

And the Benedictines also converted what in antiquity were toys, waterwheel and windmill, into the first machines.

Within two hundred years technological leadership shifted from China to the Occident.

Seven hundred years later Papin's steam engine created a new technology and with it a new worldview—the mechanical universe.

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In 1946, with the advent of the computer, information became the organizing principle of production.

With this, **a new basic civilization came into being**.

The Social Impacts of Information

A great deal these days (almost too much) is being said and written about the **impact of the information technologies** on the material civilization, on goods, services, and businesses.

The **social impacts** are, however, as important; indeed, they **may be more important**.

One of the impacts is widely noticed: any such change triggers an **explosion of entrepreneurship**.

In fact, the entrepreneurial surge that began in the United States in the late 1970s, and which within ten years had spread to all non-Communist developed countries, is the **fourth such surge since Denis Papin's time** three hundred years ago.

The first one ran from the middle of the seventeenth century through the early years of the eighteenth century; it was triggered by the "**Commercial Revolution**," the tremendous expansion of trade following the development of the first oceangoing freighter that could actually carry heavy payloads over large distances.

The second entrepreneurial surge—beginning in the middle of the eighteenth

century and running to the middle of the nineteenth—was what we commonly call the **Industrial Revolution**.

Then, around 1870, the third entrepreneurial surge was triggered by the new industries the first ones that did not just apply different motive power but actually turned out products that had **never been made before or only in minute quantities**: electricity, telephone, electronics, steel, chemicals and pharmaceuticals, automobiles and airplanes.

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We are now in a fourth surge, triggered by **information and biology**.

Like the earlier entrepreneurial surges, the present one is **not confined** to "high tech"; it embraces equally "middle tech," "low tech," and "no tech."

Like the earlier ones, it is **not confined** to new or small enterprises, but is carried by existing and big ones as well—and often with the **greatest impact and effectiveness**.

And, like the earlier surges, it is **not confined** to **"inventions," that is, to technology**.

Social innovations are equally "entrepreneurial" and equally important.

Some of the social innovations of the Industrial Revolution—the modern army, the civil service, the postal service, the commercial bank—have surely had as much impact as railroad or steamship.

Similarly, the present age of entrepreneurship will be as important for its social innovations—and especially for innovations in **politics, government, education, and economics**—as for any new technology or material product.

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Another important social impact of information is also visible and widely discussed: the impact on the national state and, particularly, on that twentieth-century hypertrophy of the national state, the **totalitarian regime**.

Itself a creature of the modern media, newspapers, movies, and radio, it can exist only if it has total control of information.

But with everyone being able to receive information directly from a satellite in the home—and on "dishes" already so small that no secret police can hope to find them—control of information by government is no longer possible.

Indeed, information is now **transnational**; **like money, information has no "fatherland."**

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Since information knows no national boundaries, it will also form new "**transnational" communities of people who, maybe with out ever seeing each other in the flesh, are in communion because they are in communication**.

The world economy, especially the "symbol economy" of money and credit, is already one of the nonnational, transnational communities.

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Other social impacts are just as important but rarely seen or discussed.

One of them is the likely **transformation of the twentieth-century city**.

Today's city was created by the great breakthrough of the nineteenth century: the **ability to move people to work** by means of train and streetcar, bicycle and automobile.

It will be transformed by the great twentieth-century breakthrough: the **ability to move work to people** by moving ideas and information.

In fact, the city—central Tokyo, central New York, central Los Angeles, central London, central Paris, central Bombay—has already **outlived its usefulness**.

We no longer can move people into and out of it, as witness the two-hour trips in packed railroad cars to reach the Tokyo or New York office building, the chaos in London's Piccadilly Circus, or the two-hour traffic jams on the Los Angeles freeways every morning and evening.

We are already beginning to **move the information to where the people are**—outside the cities—in such work as the handling of credit cards, of engineering designs, of insurance policies and insurance claims, or of medical records.

Increasingly, people will work in their homes or, as many more are likely to do, in small "office satellites" outside the crowded central city.

The facsimile machine, the telephone, the two-way video screen, the telex, the teleconference, are taking over from railroad, automobile, and from airplane as well.

The real-estate boom in all the big cities in the 1970s and '80s, and the attendant skyscraper explosion, **are not signs of health**.

They **signal** the **beginning of the end of the central city**.

The decline may be slow; but we no longer need that great achievement, the central city, at least **not in its present form**.

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The city might become an **information center** rather than a **center for work**—the place from which information (news, data, music) radiates.

It might resemble the medieval cathedral where the peasants from the surrounding countryside congregated once or twice a year at the great feast days; in between, it stood empty except for its learned clerics and its cathedral school.

And will **tomorrow's university** be a "knowledge center" that transmits information, rather than a place that students actually attend?

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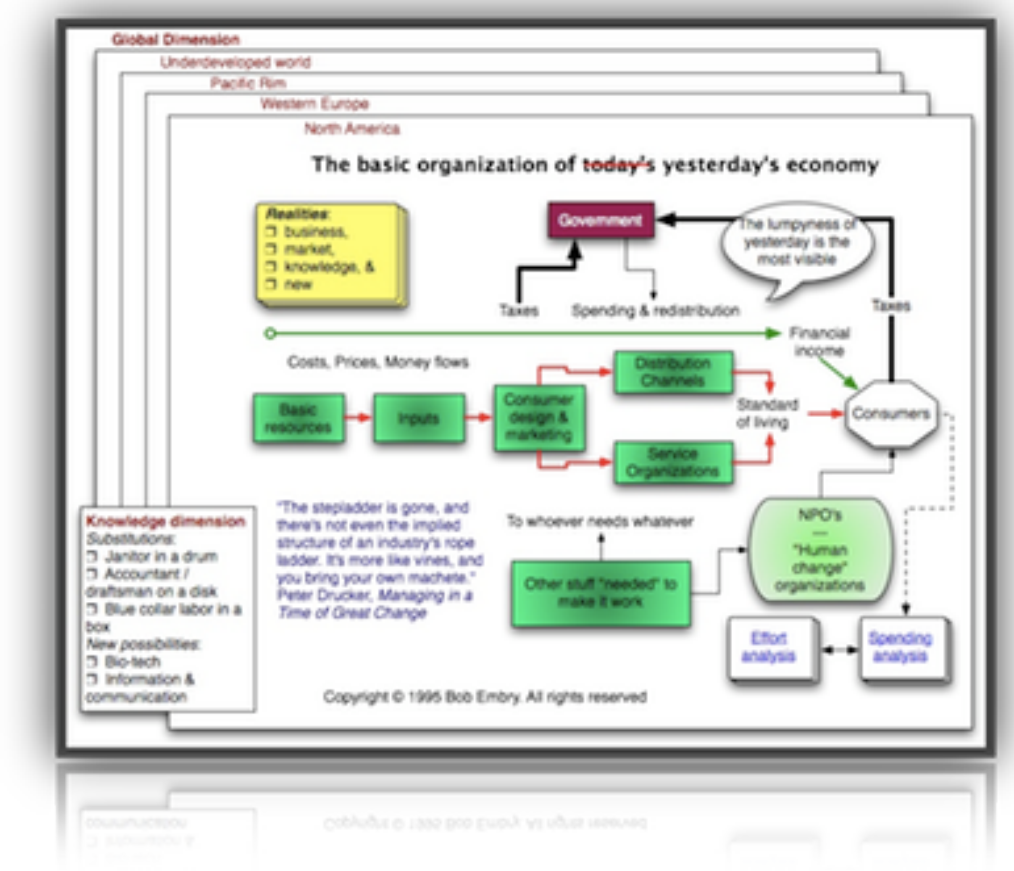
Where work is done determines in large measure also how it is done.

It strongly affects **what work is being done**.

That there will be great changes we can be certain—but how and when so far **we cannot even guess**.

Form and Function

The question of the right size for a given task or a given organization will become a central challenge.



Greater performance in a mechanical system is obtained by scaling up.

Greater power means greater output: bigger is better.

But this **does not hold for biological systems**.

There **size follows function**.

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It would surely be counterproductive for the cockroach to be big, and equally counterproductive for the elephant to be small.

As biologists are fond of saying, **The rat knows everything it needs to be successful as a rat**.

Whether the rat is more intelligent than the human being is a stupid question; in what it takes to be successful as a rat, the rat is way ahead of any other animal, including the human being.

In an information-based society, bigness becomes a "function" and a dependent, rather than an independent, variable.

In fact, **the characteristics of information imply that the smallest effective size will be best**.

"Bigger" will be "better" only if the task cannot be done otherwise.

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For **communication to be effective**, there has to be both **information** and **meaning**.

And meaning requires **communion**.

If somebody whose language I do not speak calls me on the telephone, it doesn't help me at all that the connection is crystal clear.

There is no "meaning" unless I understand the language—the **message** the meteorologist **understands** perfectly is gibberish to a chemist.

Communion, however, **does not work well if the group is very large**.

It requires **constant reaffirmation**.

It requires the **ability to interpret**.

It requires **a community**.

"**I know what this message means because I know how our people think in Tokyo, or in London, or in Beijing**."

I *know* is the catalyst that converts "information" into "communications."

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For fifty years, from the early days of the Great Depression to the 1970s, the trend ran toward centralization and bigness.

Prior to 1929, doctors did not put their paying patients into hospitals except for surgery.

Very few babies before the 1920s were born in hospitals; the majority were born at home.

The dynamics of higher education in the United States as late as the 1930s were in the small and medium-size liberal arts colleges.

After World War II, they shifted increasingly to the big university and to the even bigger "research university."

The same thing happened in government.

And after World War II, bigness became an obsession in business.

Every firm had to be a "billion-dollar corporation."

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In the 1970s the tide turned. (See Preface to *Adventures of a Bystander*)

No longer is it the mark of good government to be bigger.

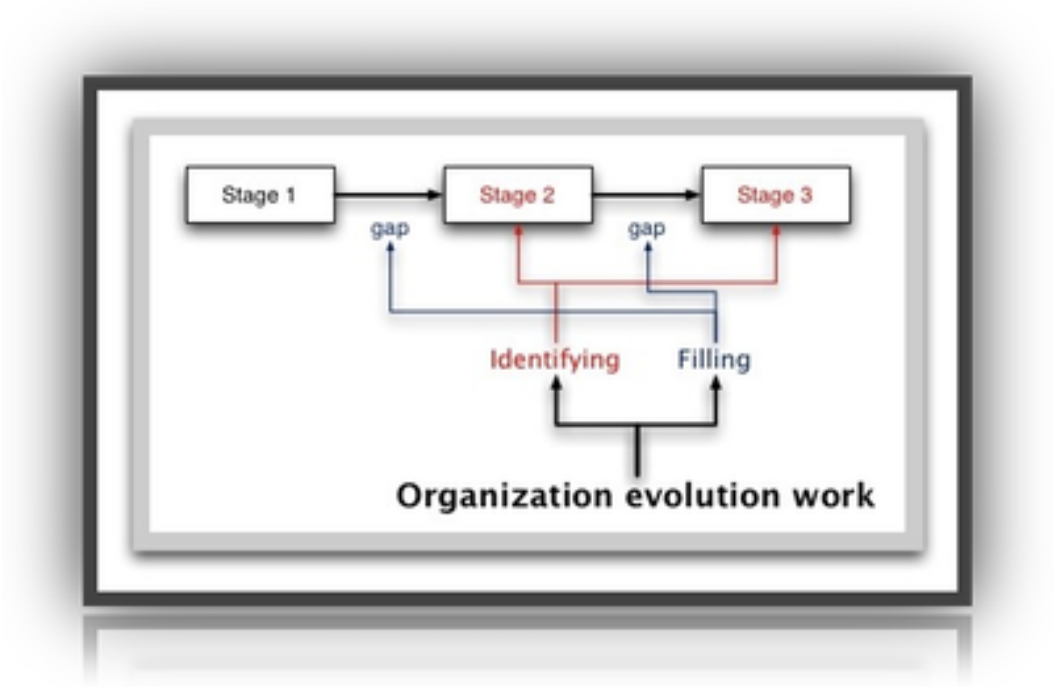
In health care we now assert that whatever can be done outside the hospital better be done elsewhere.

Before the 1970s, even mildly sick mental patients in the United States were considered to be best off in a mental hospital.

Since then, mental patients who are no threat to others have been pushed out of the hospital (not always with good results).

We have moved away from the worship of size that characterized the first three quarters of the century and especially the immediate post-World War II period.

We are rapidly restructuring and "divesting" big business.



We are, especially in the United States, pushing governmental tasks away from the center and toward local government in the country.

We are "privatizing" and farming out governmental tasks, especially in the local community, to small outside contractors.

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Increasingly, therefore, the question of the **right size for a task will become a central one**.

Is this task best done by a bee, a hummingbird, a mouse, a deer, or an elephant?

All of them are needed, but **each for a different task** and **in a different ecology**.

The right size will increasingly be **whatever handles most effectively the information needed for task and function**.

Where the traditional organization was held together by command and control, the "skeleton" of the information-based organization **will be** the **optimal information system**.

> *Form and Function Connections: see chapters On Being the Right Size and On Being the Wrong Size in Management: Tasks, Responsibilities, Practices*

From Analysis to Perception

Technology is not nature, but **humanity**.

It is not about tools; it is about **how people work**.

It is equally about **how they live** and **how they think**.

There is a saying of Alfred Russel Wallace, the codiscoverer—with Charles Darwin—of the theory of evolution: "Man is the only animal capable of directed and purposeful evolution; he makes tools."

But precisely because technology is **an extension of human beings**, **basic technological change** always both **expresses our worldview** and, **in turn, changes it**.

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The computer is in one way the ultimate expression of the analytical, the conceptual worldview of a mechanical universe that arose in Denis Papin's time, the late seventeenth century.

It rests, in the last analysis, on the discovery of Papin's contemporary and friend, the philosopher-mathematician Gottfried Leibniz, that all numbers can be expressed "digitally," that is, by 1 and 0.

It became possible because of the extension of this analysis beyond numbers to logic in Bertrand Russell and Alfred N. Whitehead's *Principia Mathematica* (published from 1910 through 1913), which showed that any concept can be expressed by 1 and 0 if made unambiguous and into "data."

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But while it is the triumph of the analytical and conceptual model that goes back to Papin's own master, René Descartes, the computer also forces us to **transcend that model**.

"Information" itself is indeed analytical and conceptual.

But **information is the organizing principle of every biological process**.

Life, modern biology teaches, is embodied in a "genetic code," that is, in

programmed information.

Indeed, the sole definition of that mysterious reality "life" that does not invoke the supernatural is that it is **matter organized by information**.

And biological process is not analytical.

In a mechanical phenomenon the whole is equal to the sum of its parts and therefore capable of being understood by analysis.

Biological phenomena are, however, wholes.

They are different from the sum of their parts.

Information is indeed conceptual.

But meaning is not; it is perception.

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In the worldview of the mathematicians and philosophers, which Denis Papin and his contemporaries formulated, perception was "intuition" and either spurious or mystical, elusive, mysterious.

Science did not deny its existence (though a good many scientists did).

It denied its validity.

"Intuition," the analysts asserted, can neither be taught nor trained.

Perception, the mechanical worldview asserts, is not "serious" but is relegated to the "finer things of life," the things we can do without.

We teach "art appreciation" in our schools as indulgence in pleasure.

We do not teach art as the **rigorous, demanding discipline it is for the artist**.

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In the biological universe, however, perception is at the center.

And it can—indeed it must—be trained and developed.

We do not hear "C" "A" "T"; we hear "cat."

"C" "A" "T" are "bits," to use the modern idiom; they are analysis.

Indeed, the computer cannot do anything that requires meaning unless it goes beyond bits.

That is what "expert systems" are about; they attempt to put into the logic of the computer, into an analytical process, the perception of experience that comes from understanding the **whole** of a **task** or **subject matter**.

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In fact, we had begun to shift toward perception well before the computer.

Almost a century ago, in the 1890s, configuration (Gestalt) psychology first realized that we hear "cat" and not "C" "A" "T."

It first realized that we perceive.

Since then almost all psychology—whether developmental, behavioral, or clinical—has shifted from analysis to perception.

Even post-Freudian "psychoanalysis" is becoming "psychoperception" and attempts to understand the person rather than his or her mechanisms, the "drives."

In governmental and business planning, we increasingly talk of **"scenarios" in which a perception is the starting point**.

And, of course, **any "ecology" is perception rather than analysis**.

In an ecology, the "whole" has to be seen and understood, and the "parts" exist only in contemplation of the whole. (social ecologist)

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When some fifty years ago the first American college—Bennington in Vermont—began to teach the doing of art—painting, sculpture, ceramics, playing an instrument—as integral parts of a liberal arts education, it was a brazen, heretical innovation that defied all respectable academic conventions.

Today, every American college does this.

Forty years ago the public universally rejected nonobjective modern painting.

Now the museums and galleries showing the works of modern painters are crowded and their works **fetch record prices**.

What is "modern" about modern painting is that it attempts to present **what the painter sees** **rather than** what the viewer sees.

It is **meaning** rather than description.

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Three hundred years ago, Descartes said, "I *think* therefore I am."

We will now have to say also, "I ***see*** therefore I am."

Since Descartes, the accent has been on the conceptual.

Increasingly, we will **balance** the **conceptual** and the **perceptual**.

Indeed, the new realities are *configurations* and as such call for perception as much as for analysis:

- the dynamic disequilibrium of the new pluralisms, for instance;
- the multitiered transnational economy and the transnational ecology;
- the new archetype of the "educated person" that is so badly needed.

And *The New Realities* (the book) attempts as much to **make us see** as it attempts to make us think.

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It took more than a hundred years after Descartes and his contemporary, Galileo, had laid the foundations for the science of the mechanical universe, until Immanuel Kant produced the meta-physics that codified the new worldview.

His *Kritik der reinen Vernunft* (*Critique of Pure Reason*, 1781) then dominated Western philosophy for more than a century.

It defined the meaningful questions even for Kant's adversaries, such as Friedrich Nietzsche.

Indeed, Kant still defined "knowledge" even for Ludwig Wittgenstein in the first half of the twentieth century.

But contemporary philosophers no longer focus on Kant's concerns.

They deal with configurations—with signs and symbols, with patterns, with myth, with language.

They deal with perception.

Thus the shift from the mechanical to the biological universe will eventually require a new philosophical synthesis.

Kant might have called it *Einsicht*, or a *Critique of Pure Perception*.

What to calendarize? TLN key links