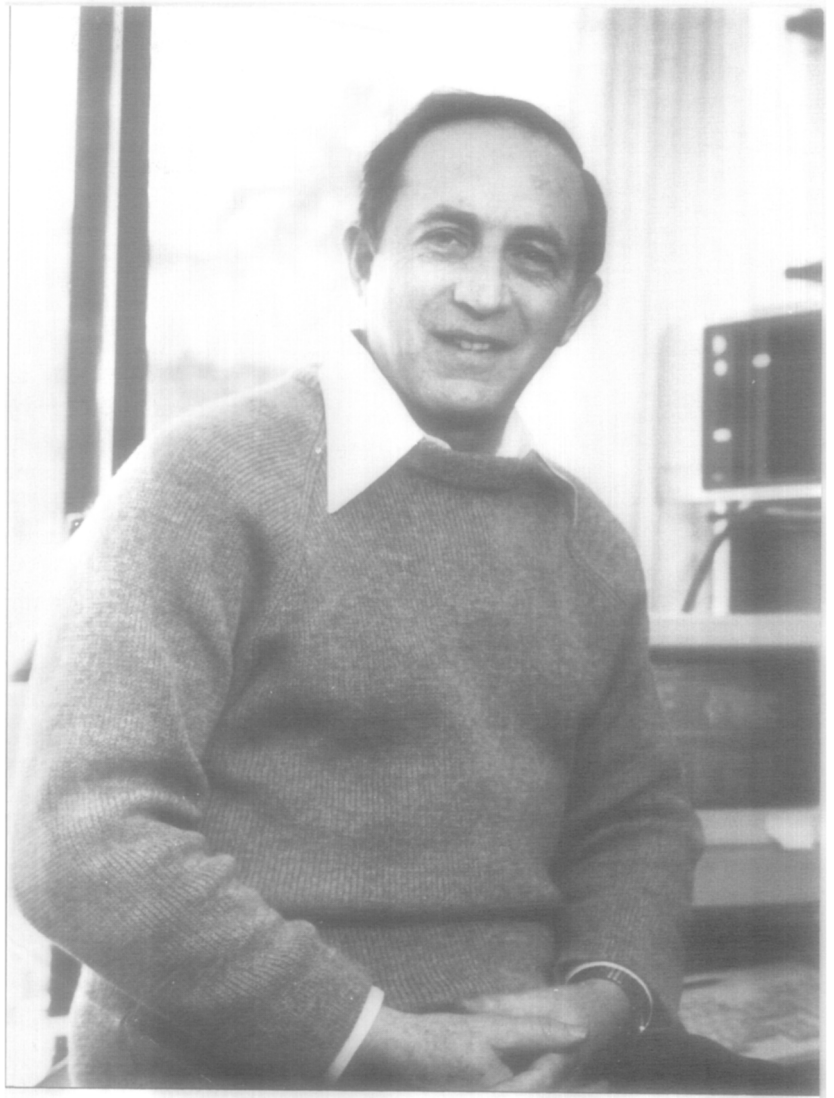


Conversation



with

Paul A. Strassmann

*D*uring the course of his career, Paul A. Strassmann has presided over the purchase and implementation of millions of dollars worth of computer hardware and software. He was an early student of computer technology when he earned his Master's from MIT in the mid 1950s. He joined Xerox in 1969 as director of Administration and Information Systems with worldwide responsibilities for all internal Xerox computer activities. From 1972 to 1976, he served as general manager of its Information Services Division, which included all central computer operations, telecommunications networks, administrative services, software development, and management consulting services. Later, Strassmann became a Xerox director for worldwide computer, telecommunications, and administrative functions. Until 1983 he was vice-president of Strategic Planning for the Information Products Group, and has recently retired as vice-president of Systems Applications for the Systems Group. Before joining Xerox, Strassmann was chief computer executive for General Foods and then for the Kraft Corporation.

He is author of 30 articles on information management. His recent book *Information Payoff: The Transformation of Work in the Electronic Age* (Free Press, 1985) has attracted worldwide attention as a critical assessment of benefits to be obtained from computers. He has made presentations to committees of the U.S. Congress, the British House of Commons, the U.S.S.R. Council of Ministers, and to senior officials of the Australian, Brazilian, Canadian, Chinese, French, and Japanese governments. Strassmann is a frequent speaker at meetings of business and professional organizations. In the last three years he has made 250 presentations on topics dealing with information technology. Strassmann is also on the editorial boards of *Information and Management*, *Information Management Review*, and *Technology and People*. Strassmann served on the board of trustees of the Strategic Planning Institute and is on the advisory boards of the National Science Foundation, Columbia University, Syracuse University, and the Information Institute. He was chairman of a committee on information-worker productivity for the White House Conference on Productivity in 1982.

Strassmann's recent book is the fruit of his many years of experience. In it he argues cogently for a radical reenvisioning of the management enterprise as technology alters the strategic as well as the organizational parameters of the business game. Strassmann's work offers a serious challenge to managers, asking them to reexamine some very basic assumptions about the nature of work and the likely sources of competitive advantage in the electronic age.

The interview that follows was conducted by Shoshana Zuboff. In it, Strassmann and Zuboff discuss a range of issues, including the historical significance of the "computer revolution," the changing division of labor, emerging sources of competitive advantage, and the problems confronted by traditional hierarchical organizations as they attempt to apply information technology in an increasingly competitive marketplace.

ZUBOFF:

In your book, you define *information technology* as marking a distinct historical period essentially parallel to, and as important as, the period defined by industrialism. There are those who would say that information technology is merely a continuation of industrialism. What is your reasoning on this?

STRASSMANN:

There are many ways of defining history. You can slice it into all sorts of chunks. The question in dividing history really is, "Is there for every given aggregation of history some set of rules that are fairly congruent, that hold together, and that are sufficiently universal that they go beyond the particularities of a given society?" When you line up the attributes of industrialism — the rules of success, the rules of power, the rules of economic investment, the profile of the population — they are di-

ametrically opposite to the rules defined by an information-based service economy. In other words, what is a success pattern in the industrial age is a liability in this new age.

ZUBOFF: How is an organization in this new economy different from an industrial-age organization? What are its characteristics?

STRASSMANN: The major attributes of the industrial-era organization are specialization, the detailed division of labor, and economies of scale. In a service-based organization, such a division of labor is counterproductive, because work enlargement gives you greater productivity. There are "diseconomies" of scale in a service organization, in more capital, and in larger agglomerations. And lastly, the most important economic variable, which is measuring performance of organizations as return on investment, does not work in a service environment. There you really have to measure return on people, because people are the capital. It's the accumulated knowledge of your organization that represents your competitive advantage, rather than the accumulated assets of your capital in buildings and in machines.

ZUBOFF: I'll play devil's advocate: Why not say that the accumulated knowledge of your organization can be programmed or structured into systems, such that people, rather than being the primary asset, are the monitors or back-up system to a store of knowledge that is procedural as well as judgmental?

STRASSMANN: This is the concept of a robotic society, where all events are programmed and people can go on vacation. This may happen someday, I don't know. But when you look at cost structures today, and the way technology is moving, the bulk of the cost is still in people. As far into the future as I can see, the cost basis of service organizations will be in people.

ZUBOFF: Why is specialization dysfunctional in this kind of organization, when it has been of essential importance in the industrial organization? One could argue, and many do, that with the proliferation of information, and to a certain extent the proliferation of knowledge, that specialization becomes more than ever a necessity. It is impossible for individuals to have a great range as the depth of available information grows.

STRASSMANN: My reasoning is really based on looking at the demand side rather than the supply side. When you look at the service economy, where do the needs arise? Problems that have to be resolved with service are never in neat or predetermined formats. Service needs are human needs, and human needs are unique. And so the central theme is that you have to look at the demand side of how people who need service require their needs to be satisfied. When you look at medical services, for instance, medical problems don't come neatly packaged by discipline—

radiology, psychiatry, dermatology, and what have you. These problems are organic. They are interdependent. When you look at legal needs, psychological needs, travel, entertainment and, certainly, education, they become more and more intertwined rather than more and more separable as you increase complexity.

ZUBOFF: The medical example is an interesting one. In medical training, specialization has accelerated, yet many hospital administrators are trying to figure out how they can get specialists to work together to serve patient needs. They see this as an important solution to the cost crisis in the health-care industry. A question that emerges, then, is whether you mean less specialized individual professionals or a new form of work organization that brings people together to create generalist group knowledge?

STRASSMANN: In some respects, you need increased specialization in the hands of the few people who provide the infrastructure and the support, preferably electronically. You cannot afford to have an expert in very rare kidney disease on your team, just in case you might need him or her someday. I am very much driven by economics. You must have the desired organization based on the frequency distribution of the cost of delivering the service, and it will vary according to what you are trying to deliver. I think that when I define generalization, I mean that you have people-oriented service workers who can then integrate specialists. It is a higher level of integration than we know today.

ZUBOFF: So it becomes a new organizational function – to provide a synthesis of what may be specialist knowledge.

STRASSMANN: That's right. And this is why you would almost have to design an organization based on an analysis of your market and the cost basis on which you want to satisfy that market.

ZUBOFF: So we have a service organization driven by a logic quite distinct from the logic to which we are accustomed.

STRASSMANN: That's right, and the logic will be demand-driven rather than supply-driven.

ZUBOFF: There are many large service organizations that are organized along strictly industrial lines. What will make the difference, such that the great bulk of service organizations will grasp these new principles and see the new opportunities and this emerging logic of comparative advantage?

STRASSMANN: I believe that innovation is external, and very few organizations have the structure to really transform themselves internally. There are some instances, but very few. You have organizations like Fidelity in Boston,

which are walking away with the market from the traditional houses, and you suddenly start having consolidation, and Lehman Brothers gets absorbed, and so forth. It's a very destructive process. The innovation by and large comes from external pressure.

ZUBOFF: So it will be a question of those who are a bit further ahead in generating new competitive pressures?

STRASSMANN: That's right. This goes back to my work with the Profit Impact of Market Strategy (PIMS) model. PIMS relates a wide range of strategic and situational variables to profitability and cash flow. I've done very careful work in trying to discriminate between patterns of success and failure. When you observe these patterns, you discover that the adaptable, team-oriented, nonhierarchical organization, by any indices of growth and return on assets, is the most successful performer. The single distinguishing characteristic of unsuccessful organizations is absence of market feedback. If prices are set by monopoly power or by taxation, which is the same thing, then you will create a compulsion for a hierarchical, top-down, clock-universe kind of a design. This goes back to the idea that everybody would prefer to be a monopolist. In other words, the idea of controlling your environment naturally leads you to try to strive for a monopoly. How do you create monopoly? Externally, by eliminating competition and eliminating price. Internally, monopoly is accomplished by concentration of power. And the only way you can do it is if you really try to achieve perfection through stagnation and by ossifying the structure.

ZUBOFF: These compulsions are ageless. Hierarchies often try to establish monopolistic conditions, rigidify the status quo, and resist change. The perception of stability in the external environment creates an opportunity for those age-old compulsions to be expressed internally as well.

STRASSMANN: That is how the power structure gets maintained. And if you cannot do it that way, then you enter into all sorts of coalitions to try to create more stability. You negotiate coalitions with the union, the government, with an antitrust department, or with the Interstate Commerce Commission. These are all collusionary patterns in search of monopoly, and they are repeated over and over again. This is part of the human experience.

ZUBOFF: How do you portray the firm that does have a market-feedback mechanism and tries to be adaptive and to customize delivery of service?

STRASSMANN: That organization is basically Darwinian; it is competing to survive. It is not a very glorious kind of organization; in fact it can be pretty brutal. In these organizations people are very close to the customer. Past accomplishments don't count for anything; it's whatever you've

done for me recently. It's a fairly pressurized kind of environment, and quite opportunistic. The only thing that curbs this opportunism is the fact that members accumulate so much knowledge. For people to operate in this kind of environment, you have to invest so much in them that you cannot be opportunistic anymore. I'm not glorifying the market-driven organization. In its extreme form, which is the small tradesman, it's pretty brutal.

ZUBOFF: It exerts high demands on organization members.

STASSMANN: Very high demand to change, and a fairly high destruction rate from lack of success.

ZUBOFF: What role does technology play in this scenario of the surviving, adaptive, customer-oriented organization? In your book, it's very hard to separate the two phenomena, namely, the service orientation of these organizations and the information technology that provides both their infrastructure and market interface. They seem inextricably linked.

STRASSMANN: Yes, they are inextricable. What the technology does is to shift the cost curve. It makes it possible for labor that otherwise would be overpriced to continue to receive high income, because technology can also increase output. In changing the cost curve, certain new activities become viable. This is connected to one of the central themes in my book—the preeminence of strategy over organization and technology. If there is a central theme that I want to be identified with after many years, it is that technology and organization are enablers, but the strategic goal seeking, positioning, or discovery of new islands where you can suddenly survive are the things that make a difference. When people just buy bulk technology promiscuously, nothing is achieved. It is after you have multiple factors clearly clustered around a strategic recognition of the marketplace that organization design, human resources, and technology all come together; that's when you are viable. It calls for a much more delicate balancing act than we've ever attempted before.

ZUBOFF: So the key element is the strategic vision that emerges from an analysis of competitive opportunities.

STRASSMANN: Yes, but it's a very organic process. In fact, you may look at information technology and ask, "What new strategies can I entertain now that I have the technology?" You can play a game where you suddenly say, "Aha, that's a technology, and now I'm going to go and settle a new universe." Without the strategic insights, that technology is just dead metal.

ZUBOFF: So the new possibilities that are created by the technology can be strategically rich, if one is bright enough to perceive them.

STRASSMANN: Yes, because in the new era, you have to find people who need services, you have to identify those people, and you have to harness organizations to deliver those services.

ZUBOFF: Can you elaborate more on the enabling role technology plays in this process?

STRASSMANN: The key enabler as I see it is artificial intelligence. That is the *sine qua non* of the next 100 years. And the reason is that it makes it possible to create generalists. It is *the* vehicle for overcoming the limit of the single, sequential brain.

ZUBOFF: So this new class of generalists that you spoke of earlier are people who have as resources not only organizational members who might be specialists but artificial intelligence programs that can provide *in absentia* specialist knowledge.

STRASSMANN: More than that, the artificial intelligence is not only a replacement for experts, but the expert encapsulates and capitalizes knowledge through these kinds of embodiments.

ZUBOFF: So that becomes a way of continually deepening, upgrading, and extending your influence as a specialist?

STRASSMANN: And one of the things you do then is if you're a generalist on a network, you buy specialization, and your own augmentation, by continually shopping in a wide universe for knowledge that you then add into your machine. That machine then becomes an extension of you. You begin to have a symbiotic relationship, and your machine is then a symbiosis with the rest of your expertise. Suddenly what happens is information becomes a priced commodity, a traded commodity, and that is the big breakthrough. Until now, information was always a monopolistic possession. So if there is anything that really divides the service age from

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the industrial age, it is that the industrial age “productized” trade, although it left a monopolistic type of structure, which was largely based on knowledge. In the upper echelon, the *enabling* underlying the materialism that drives the new age is that suddenly, information ceases to be the possession of the power structure, which has existed for the past 6,000 years. Information has never been viewed as something that you traded, something that you gave away to everybody. There was no way of bringing information to the market.

ZUBOFF: Except by buying specialists.

STRASSMANN: Yes, which is quite feudal. The big innovation of the industrial age was not steel or products. That existed even in Greek and Roman times. The big innovation of the industrial era was creating a marketplace that was nonmonopolistic. And so the big innovation of the service age is bringing services that are heavily information-based into the marketplace and marketing them.

ZUBOFF: Suppose we compare two organizations, each with relatively visionary leadership, a desire to be adaptive, to address customer needs, and to renew itself in innovative ways. If only one of them had a profound understanding of information technology, what would it be able to do that the other organization would not be able to do?

STRASSMANN: A typical American manufacturing company today buys maybe 30% of its revenue, in terms of materials, on the market. The materials are in the marketplace, and they shop around for that. The company may add 20% labor to the cost of the finished product. The remaining 40% or more is really overhead. This is manifested in the fact that the typical American organization has to add 300 to 400% overhead burden to its cost base. So what you have is a terrible incongruity where everybody is doing a tremendous amount of cost analysis on a smaller and smaller base, and then adding a tax in an almost feudal way.

ZUBOFF: You are referring to the growing number of us who are subsumed under the heading, General and Administrative (G&A) Costs.

STRASSMANN: Yes. The difference between the new organization and the old organization is G&A. The G&A of a service-oriented organization is less than 50%. And the reason is that when you need information, you buy it, and it becomes part of the direct cost, which means you can make trade-offs. Information has value. That means that you can allocate resources, you can make a trade-off between capital and labor. The organization that maintains a high G&A will not be able to do it. It's that simple.

26 ZUBOFF: This would imply less people per organization and more organizations?



STRASSMANN:

Yes, and the evidence is there; it's incontrovertible. I have developed a measure of management productivity, which is the ratio of management value-added divided by management cost. It's return on management (ROM), an analogue of ROI. Using the PIMS data, I have looked at about 60 ROM firms. The firms that have the highest ROM are those that have cut back on vertical integration. They buy more and more of their overhead from outside. One of the big problems with low-performance organizations is that they're trying to own too much of their overhead. That approach creates hierarchy, because each group of experts enters into the game of getting their cut of the budget. The more people they hire, the more they are entitled to – the system is wired for high G&A. So my view is a fairly unromantic one based on the economic forces. The technology allows you to have experts available electronically, and to pay them by the minute on a transaction basis.

ZUBOFF:

What is your vision of the kinds of jobs people will be performing in this electronic milieu?

STRASSMANN:

You almost need an economic scenario, and the economic scenario takes two issues into consideration. First, what is your expected growth rate in GNP per capita? Clearly, a 2% per year compound model is very achievable. Two percent per capita means that within 50 years we will have incomes of \$40,000 per capita. By that time you're talking about 350 million people in the U.S. population, and 160 to 170 million in the work force. What are people going to do with \$40,000 per capita? If we consider the economy in 50 years, it is clear that the agricultural sector is going to be even smaller than it is today. It turns out that manufacturing can very easily be done with less than 10% of the population. What you are left with is 65% to 70% of the work force in service. In that kind of environment, education becomes the dominant industry, and it is the only way you can stoke that kind of rate of growth based on services, because services become very educationally intensive.

ZUBOFF:

Explain how you understand that linkage.

STRASSMANN:

In order to build productivity, you have to lower overhead costs and give people an ability to compound capital. You don't compound capital on assets anymore. You compound capital on people because that's all there is. And how do you compound capital on people? Through

education and the software that they buy. And what is software? It is the result of people educating themselves. Once you open up jobs in order to get productivity, to bring down G&A, you have to put maybe as much as 10% of the overhead right into training and education. Ten percent of 70% of the work force is 7% per year of a \$10 trillion economy. That is a very, very large training budget.

ZUBOFF: This training is essentially the maintenance and upgrading of the functional equivalent of the capital base?

STRASSMANN: That's right. So the major new innovation that I see is that you will start setting up depreciation allowances on people assets and replacing "losses" in assets by means of education. Your accounting system will have to change. You may not be able to capitalize general education, but from then on everybody is in school in one way or another, usually in the work place on a terminal, one hour a day.

ZUBOFF: Work itself becomes more educationally rich.

STRASSMANN: Yes. Once you start making investments in human resources, it's a very long-term investment. The cost of turnover is simply too great. A 20% turnover is typical for administrative people, and a 30% turnover is typical in a sales force. This is like taking most of your assets, one-third of your assets, and throwing them out the window each year. It's just an unaffordable way to sustain profits. So the work day really consists of managing the human capital, by continually enriching people and making it very profitable to invest capital in them, so that they can generate more value added.

ZUBOFF: Your vision of the emerging organization is an optimistic one. You seem to brush aside questions of power. In the organizations that you imagine, power is benign. It's almost as if there is a new human nature of autonomous and creative individuals connected by computer networks. Many studies have shown that computer technology in service organizations can be used to monitor, pace, and deskill employees. Isn't there a shadow side that you have ignored?

STRASSMANN: I avoid the power issue by taking a very strong stand that the market arbitrates power.

ZUBOFF: Right. But what you've done in a sense is written off the large, established organization, with its conventional "industrial" logic and an approach to computer technology consistent with that logic. It's not in your scenario.

STRASSMANN: It is in the scenario, and it may become dominant by seizing power by political means. I yield on that. It may be victorious if it applies

totalitarian means to seize and hold power. But my scenario is that the big G&A organizations that have six layers or more will invariably have no other choice but to go to oblivion.

ZUBOFF: The implication, then, is that they simply use the technology as a powerful vehicle for more efficiently managing the hierarchy. The technology reproduces the authoritarian character of the organization.

STRASSMANN: Yes, and my evidence so far suggests that this accelerates poor economic performance. When you look at the increase in the amount of information technology that these organizations invest in, it turns out that as they increase technology, the rate at which they degrade economic performance is accelerated.

ZUBOFF: How do you explain that?

STRASSMANN: You bring in information technology as a cost increment on top of already exorbitant overhead costs. It's a drain. It doesn't add value.

ZUBOFF: Managers in such hierarchical organizations often believe that the technology will enhance their capacities – to know more, to be able to confirm more, to be able to evaluate more precisely, to have a more efficient operation.

STRASSMANN: That's the presumption. It's in the roots of computers. The first people who got hold of a computer were the finance people. They said, "Well, finally, I'm going to be able to analyze the variances – manufacturing variance by shift, by machine." I have in my career as a computer executive guided the expenditures of hundreds of millions of dollars on computer technology. I ran huge data centers. What usually happens is that these things look very good on paper. They look very good during the feasibility study. The error rates and the costs to keep the system up-

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dated are enormous. External conditions change, requiring more and more people to catch the exceptions. The systems are designed monolithically. Pricing changes may take six to eight months to execute because your competition can move very nimbly.

The Social Security Administration is now two years behind in updating its database. If you write to Baltimore and ask them to give you a statement on your W-2, they will most likely tell you that the last information they can give you is from 1982.

Externalities militate against the compulsion to control things. The monopolies want to control both the external and the internal order. If you have enough externality intruding, the systems imposed on the internal organization to maintain stability increasingly cause malfunctions. So then you try to fix it, and the fix becomes more and more difficult. The people become more and more obsolete because, as the systems grow, you have to program smaller and smaller procedures. It may take 10 to 14 coordinators to follow up on a transaction that has been misapplied. And so, although you may be mechanizing transaction costs, your overhead goes up.

ZUBOFF: One of the statements that you make in your book is that the sign of a truly revolutionary technology is that it is often misapplied for non-technical purposes. What are the most frequent ways that organizations misuse information technology?

STRASSMANN: My list of the top five begins with using a computer to solve a surface problem. You report an administrative problem and you bring in a computer to mechanize the existing process. A typical example would be bringing in a computer so that you can send more solicitation letters to alumni. That, I must say, is a typical university computing-center approach.

ZUBOFF: So, this means using the computer to do more of the same.

STRASSMANN: Do more of the same in a more mechanistic way. You are unable to keep in touch with the alumni, so you get yourself into the mail-order business. It's an absolutely classic example. Before you start computerizing the existing alumni office, which may have caused the decline in alumni donations, you better understand what the issues are. Why have the alumni reduced their amount of giving?

Another example of misuse is that you mechanize what is easy to mechanize. In other words, since payroll is easy to mechanize, you install payroll systems. Since word processing is something that people understand, you go after eliminating secretarial heads. I was brought in a couple of years ago to look at the office automation budget of a very large oil company. This was a \$40 billion-plus company, and they were spending the entire office automation budget to put 300 headquarters secretaries behind word processors. I said, "Well, before we discuss whether you should put in word processing, maybe we ought

to look at how well the company is doing by using value-added analysis and productivity ratios, like the ROM." It turned out that this company barely made returns in excess of cost of capital, which means their ROM, in fact, was less than one. I lined up on a graph the ROMs for all the oil companies, and I said, "Well, there must be a reason why your ROM is just under one. Some of the best oil companies have ROMs in the range of 3 to 4, which is very high."

ZUBOFF:

What would the average be?

STRASSMANN:

American industry ROM is just a shade over 1.2. By the way, 35% of American corporations have an ROM of less than one; 35% of American corporations pay their management more than what management delivers as value added. At any rate, these people looked at this chart (appropriately steered away from discussing secretaries) and they said, "Well, such-and-such company clearly is up there because they have this fantastic exploration department." They didn't see how they were walking into the trap I set. I said, "Tell me more about exploration," and a very lively conversation ensued. It turns out that when you look at an oil company, the only decision of real consequence is where you drill. You know, a thousand feet of pipe costs just about the same for everybody. Secretaries cost pretty much the same. And overhead structures are pretty much the same. The leverage was clearly in exploration. When you discuss exploration you find that this is all involved in the bids that you place—which plot of land you buy, and how much you pay for it.

I said, "Well, tell me more about how you make those decisions." Typically they are made by a bunch of guys meeting in a hotel and finessing a lease. This is done on a much larger scale with the Arabs and a much smaller scale if somebody has drilling rights in Texas to sell. But it's essentially a very poor system in which there is very little intelligence and very little collective knowledge. I pointed out that applying information technology to this problem could be worth millions, whereas you won't even break even if you use automation simply to replace secretaries.

The most frequent error in information-technology investments is going for the gains that are technical rather than strategic. It turns out that the alienation they created, including management dissension and emotional upheaval, by taking those 300 secretaries and reducing them down by about 280, was not worth it. By no stretch of financial analysis could they justify it, even if it were fantastically successful.

ZUBOFF:

And the three other major forms of misuse?

STRASSMANN:

The third big one, which is almost always a killer, is to budget very accurately for the technology part, and never budget for the human investment.

ZUBOFF: Yes. The human investment rarely even shows up as a line item.

STRASSMANN: And this is typical, when you look at business proposals. They are just totally lopsided. The amount of effort on a business proposal is inversely related to the amount of risk. Hardware risks are almost nonexistent today. And they're always containable. The costs of those kinds of investments and how they are conceived are usually such that they are almost a permanent drain.

ZUBOFF: And to the extent that an organization expends all its resources on the hardware without investing in the training and education, it never creates the sort of work force that could be anything other than an appendage to the machine system.

STRASSMANN: That's right. I call that "conceiving systems in sin." The system is technologically conceived. There are almost theological connotations of the fatal damage that is done to such a system. Conceiving a system in sin will either create the counterforces that will escalate the cost of the system beyond any benefit that you can garner from it, or will give rise to forces that will ultimately destroy the system.

The fourth mortal sin that you can commit is to fail to build a self-adjusting process into the system. You are almost building a clock to perfection. You overdefine the system; there is no give. It has a very long development lead-time, and the computer code is very hard to reconfigure. People have no stake in such systems. In fact, what will happen is that people will develop ways of surviving in spite of the system.

ZUBOFF: And number five?

STRASSMANN: I think that many problems with faulty systems designs and faulty investments can be attributed to the fact that people don't have options;

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there is no bypass. The system does not allow the people to evolve. People cannot, as they acquire skills, change the way they operate. They have to go through the same stupid menu that defines the system at the entry level. In other words, the system doesn't learn. In fact, the system doesn't know who you are. The system doesn't recognize you as a person. It doesn't recognize your error rates. It's totally indifferent to the person living with it. The person is almost taken as a necessary evil. And so what happens is that as systems evolve, you hire more and more programmers to automate even very trivial things that human beings ought to be able to do. You escalate the complexity of the system, the ritualistic part of the system, to higher and higher degrees of refinement. The sole compulsion behind that system being ritualized is to dispense with even a smidgen of discretion that a person could exercise. Then you build an enormous retinue of courtiers called programmers, assistant administrators, systems analysts, customer administrators, expeditors, exception analysts. There is a whole hierarchy of these people, because there's always an opportunity to take a task requiring judgment and dispense with it.

ZUBOFF: This leads directly to another question I had: In your book, you seem to treat human judgment as a necessary antidote for other features of this new kind of organization. You've talked about human beings as the assets of an organization, and their knowledge as the source of competitive advantage. So human judgment has a central role to play.

STRASSMANN: That's right.

ZUBOFF: At the same time, you talk about software as what is most important about this technology. Hardware is only the dead metal. It seems to me that those two ideas are potentially on a collision course. There is an invitation for more and more powerful software. Artificial intelligence applications will become more adaptive, and more organizations will find ways to use them. It seems to me that it's quite easy for those systems to be conceived of as supplanting human judgment, even though the rhetoric is almost universally one of "supporting" and "augmenting" human decisions, expanding the opportunity for humans to do more things, and so on. You have just described the mentality that says, we're going to automate every trivial aspect of this operation, and so create needless complexity. It seems to me that the same mentality can occur in software applications, where there is an attempt to reduce the amount of judgment needed.

STRASSMANN: The hierarchy will use every truly revolutionary technology illegitimately. In other words, any technology you give it will be misused. But the fact is that if you go into a service function, like education, health, or social services, most of the value comes from the intuitive, the spontaneous. If you look at these aspects of artificial intelligence that deal with things like inflection of the voice, or even shapes, those are very

intractable kinds of problems. So the computers, at least for the foreseeable future, will be supplementing, not substituting. A machine will simplify the process of the search. Determining relevance is still something that the machine cannot do and will not be able to do for a long time.

ZUBOFF: It seems that you've just written off the mainstream, bureaucratic, hierarchical organizations.

STRASSMANN: Well, these organizations will do whatever they want to do anyway, and there's no point wasting one's time or energy or teaching them when they insist on taking directions that are suicidal.

ZUBOFF: You would argue then that instead of giving attention to the problem of changing the traditional organizations, it is more important to define an alternative vision for those organizations that have the ability to perceive the opportunities and benefits.

STRASSMANN: You are so right! Because many of these people who are succeeding don't know exactly why. They sort of experiment their way into it.

ZUBOFF: So defining the new form is ultimately more useful than figuring out how you're going to deal with the old forms.

STRASSMANN: The only thing worthwhile doing with the old organizations is to demonstrate and illustrate the record of failure that they don't even want to examine.

ZUBOFF: And in doing that, create a new cultural object, a new vision, that others who are struggling can attach themselves to and use as a map.

STRASSMANN: When you look at the history of industrial development, for a long time there were profound doubts as to the rightness of the new order. Many of the successful capitalists, as soon as they had any capital, sold out and became landed gentry, because that was the socially accepted form. The worst thing that could happen, of course, is for an innovative organization to liquidate as soon as it has some money. It's very important in the history of ideas to somehow enshrine success as something legitimate. One of the crises – of course – in this whole information age, is that when you look at who has written about it and how it has been conveyed, there is very little out there that will legitimize new models. In the history of ideas, there comes a time when you have to develop an intellectual underpinning, and that's very hard work. Therefore, that's where it pays to spend some time.

