

The New Information Industry of the 21st Century — Plenary III

The information industry is undergoing a major transformation, moving away from the current technology boundaries by which it is organized to new frontiers. In the process, we must move from the rule of exclusion to a new one of inclusion or convergence. This, of necessity, will change our industry definition, our management practices and our public policy. In so doing, it will create a world that is more a win-win situation than a win-lose. Substitution of industries will occur, but there will also be significant complements created to existing industries. Ultimately, there will be very few losers. The people who lose will be those who are unable to detach themselves from antiquated thinking, thinking which is incompatible with the new emerging environment.

Information Industry — Structure and Size

Figure 1
The Information Industry

INFORMATION FUNCTION	TEXT	IMAGE	VOICE	VIDEO	DATA
CREATE (CONTENT)	P U	P H	TELE- C O	E N O	C O
DISPLAY (DEVICES)	B L	O T	M M U N I	T E R T A I N M E N T	M P U T I N G
STORE (DATABASES)	I S	O G	C A T I O N S		
PROCESS (APPLICATIONS)	H I	A P			
DISTRIBUTE (TRANSPORT)	N G	H Y			

The matrix in Figure 1 illustrates the major elements of the information industry. The columns are primarily organized by media, or technology, and the rows by the functions we perform with those technologies. In the columns, text represents the publishing industry or printing technology; image includes the photography industry or imaging technology; voice covers the telecommunications industry;

video captures the industry; and the computing industry is represented by data.

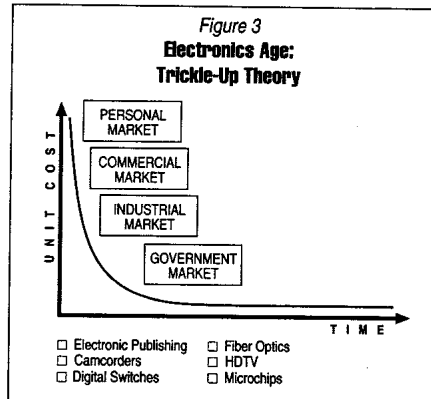
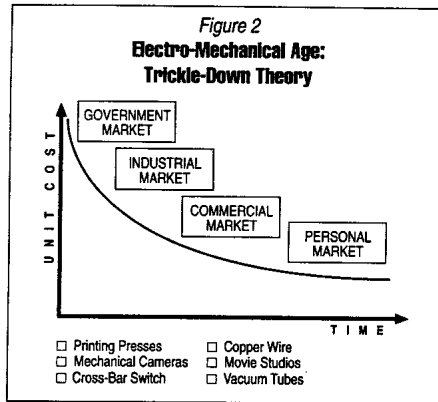
Now if we look at the rows, within the information function, we create and collect information; we also display information through many devices, an example of which is users' terminals; we store information and this is primarily the databases; we process information and this is the applications: this area asks what do I do with the information, how can I add value by manipulating it? Lastly, we distribute the information and this is the transport, or shipping of the information, either one-to-many, many-to-one, or interactively.

As information technology and its applications invade society more and more, it is becoming increasingly more difficult to comprehend the scope and size of this area. My estimate is that the industry already earns more than one trillion dollars in revenues worldwide. Advertising alone, on a global basis, accounts for more than a hundred billion dollars in revenues. I have also been discovering new items of data that I never thought belonged to this industry. In a recent *New York Times* business article, John Scully discussed his excitement about this industry's transformation. He forecast that the industry as it becomes more multimedia — and I think his emphasis is strictly on the display or device side, which is just one element of the total — will exceed \$3 trillion by the year 2000. He may well be right.

As the industry moves from being organized by technology sector to being organized by function, it is going to grow, rather than substitute. And the industry, for its own self-interest, profits and corporate goals, will find that embracing this new pattern of organization will be very advantageous. Here, I forecast that the total industry will easily exceed \$3-4 trillion by the year 2000 or 2005, well within the foreseeable future.

Information Industry — Evolution Through Growth

Fundamentally, it is technology which is shaping the reorganization of the vertically organized information industry. The Electromechanical age has had two fundamental rules: the cost curve spread out over time, comes down very slowly,



and only over a long time period does it have a lower cost estimate (Figure 2). Even then it is still high, so very high economies of scale do not occur. If you think that we achieved great economies of scale in our automobile assembly plants, or within factories building large electricity generators, or through mainframe computers in our industry, you would be astounded with the economies of scale possible with the transformation of this industry.

Here is an example. When you compare mainframe computing from the Electromechanical age to the PC, the PC has a 400 times performance/cost advantage. By the year 2000, experts are suggesting it will go up to 1000 times. Every electromechanical industry I have analyzed has always deployed technology following the trickle-down theory. First, technology is offered to the government sectors; second — and after you recover your R&D costs — it is offered to industry, mostly to manufacturing; next it is offered to commercial or small business service sectors; finally, the last recipient of the technology turns out to be the personal or consumer market.

Using this logic, I tried to determine what major technological breakthroughs, or even product generation, was introduced directly for the consumer market by a Bell Laboratories, or BT Laboratories, or Northern Telecom or NBR. The only answer I found was in the telephone industry; it was the Princess telephone. There simply was no incentive in the electromechanical age to deploy technology for the personal market. All the public policy issues as well as all the management issues maintained that the consumer market could not afford to pay and hence was not a viable market. They took the easy way out. By adopting this approach, R&D recovery occurred very quickly; it was a no risk strategy. That is how we operated in the Electromechanical age, but this is changing!

Moving from the Electromechanical age to the Electronics age (Figure 3), the fundamental change seen is that the cost comes down very sharply. The lower unit cost becomes incredibly low quite rapidly, so in this case it is advantageous to deploy technology as quickly as possible to as large a base as possible. Hence, what is required is the reverse of the trickle-down theory. Now it is necessary to practice a trickle-up theory. For example, the first place to deploy electronics, especially digital, is in the personal market, not the government market. The second place to deploy it would be small business, or the service sector market, not manufacturing. Manufacturing tends to be highly concentrated, therefore, the number of units produced and sold for the personal market is much greater. And, in the government market, there may be only one customer buying a few units at a time.

Japan has understood this fundamental paradigm shift in the way technologies are created and deployed from the electromechanical to the electronic age. Japan has always practiced the trickle-up theory, deploying the first state-of-the-art technology to the mass market. A good example is memory chips. Although Bell Labs and IBM Laboratories claim to be the inventors of memory chips, they limited initial deployment to the defense industry and mainframe computing, and later to the telephone industry. Japan, on the other hand, deployed memory chips for calculators and watches for the mass market. In retrospect, the Japanese calculated the business better and time has proved them right.

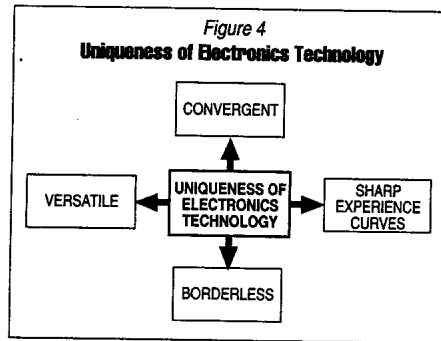
The development of LCD technology occurred in similar fashion. And while we think that going from analog to digital will give us tremendous competitive advantage in HDTV, the advantage is already lost, because the U.S. and Europe have already determined that it will be deployed primarily to large business customers and to government accounts. The real

The New Information Industry

issue of lowering the cost for HDTV technology would be resolved by deploying it to the consumer market first. That is where the advantage will be. Digital will prevail anyway, that is not an issue. It is the "focus and the emphasis of the market" which is going to make the big difference.

Another example is fuzzy logic. Fuzzy logic acts as the expert system on a product: it is the mechanical/electronics combination. This technology has been primarily deployed by consumer electronics companies. Perhaps the largest user of fuzzy logic is a company called Matsushita (Panasonic is the brand name). They have already destroyed the competition in the room-air conditioner business by adding fuzzy logic technology and now they are in the process of revolutionizing the whole appliance industry. An example is the video camcorder which, with fuzzy logic, can be shaken without harm to it because that is what we do as humans. My view is that fuzzy logic must be deployed at the mass market first, although its best use is probably in a F-16 fighter plane.

Information Industry – Structural and Technological Trends



The impact of the electronics age on the information industry has four unique properties (Figure 4). First, it is convergent in nature; second, it has tremendously sharp experience curves and this is a very important; third, it is borderless: it can be any time, any place; and fourth, the technology is highly versatile — it can do things we were never able to do in the electromechanical age. These four properties of the electronics age will have tremendous impact on restructuring the industry and this is the main issue I will now address.

In the information industry, there will be more and more specialization by function. There will also be significant amounts of "cross-industry" consolidation. For example, there will be consolidation between the publishing industry and the

entertainment industry; between cable and the broadcast industry (which is the wireless side of video communications and personal communications). You can also expect to see lot more emphasis on the personal user as the fundamental market over the institutional user. We will also see more and more technology fusion due to what is called mechatronics.

I anticipate that the information industry will specialize according to function and move away from the present specialization by form. At least five distinct, separate businesses will be organized on a global basis, each multimedia in nature. Multimedia will be the buzz word of the '90s and beyond. And in this transformation, we won't just be substituting dollar for dollar, but will be adding a tremendous revenue base, hence, the win-win situation.

Pursuant to these changes, new industry groupings will emerge. We will form an industry called the information content business, another called information display, a third will be information storage, information processing will be fourth, and the last will be information distribution. The publishing and entertainment industries will be consolidated into the information content business.

Events around us already portend this phenomenon. If you look at the Rupert Murdoch group or the former Robert Maxwell group or the U.K.'s Reed Publishing or the *Times-Mirror*, you already see the boundaries between the newspaper industry, the magazine industry, the radio industry, cable TV and the networks being blurred. Publishing and entertainment are the two areas that will primarily dominate the content business.

In the future, just around the turn of the century, the telephone companies will be out of the directory business. That business, both the yellow and the white pages, is a content business and the publishing industry and the entertainment industry will probably absorb content from this and all other areas. The directory business simply no longer belongs in the telephone industry.

Another cross-industry consolidation can be seen between consumer electronics and personal computer manufacturers. It is not just the mainframe computer manufacturers who have lost by emphasizing government and large business markets over the personal consumer market, but PC manufacturers have also. PC manufacturers and consumer electronics companies will consolidate into a single industry called the information display business. This is where I see John Scully's reading of the future for his company and the industry as correct. The alignment will be more and more toward consumer electronics companies who will dominate the area of personal devices. Personal media devices will all be multimedia.

I also forecast that the telephone industry will give up the terminal business on a wide-scale basis. It does not matter

who the manufacturer is, but there undoubtedly will only be one or two left in the world. Most terminal manufacturers will make strategic alliances with consumer electronics companies or PC manufacturers.

In the computing industry, if a company has a mainframe computing mindset, or even a minicomputer mindset, they will not make the transition. There is no contest between the PC business for personal use and the mainframe business for large business use. The PC business will take over, as it has already done with distributed memory and processing.

So in the computing industry, I foresee very strong multi-user alliances between companies like Matsushita, Sony and Thomson, the three large consumer electronics companies. Toshiba, Sharp and companies like Apple and AT&T's Consumer Products Division will also align with each other. Unfortunately, for companies that are very highly vertically integrated, unless they break into smaller business units, the transition will be very painful.

In the processing business, computer companies and data processing centers such as Andersen Consulting or EDS will become major competitors. The mainframe computer manufacturing companies, or whatever is left of them, will consolidate into a single industry called the information processing industry.

The Telcom area will become an information distribution business in which the public telephone networks, the PTTs of the world, cable TV, broadcast and the wireless networks will compete and align with each other. A very significant impact in our industry due to the huge presence of the private network operators. Both the wire-line left as PBX based, as well as the wireless radio-based private network, will all converge aggressively. While it is difficult to predict the winners or the losers at this stage, it is certain that many alliances and convergences will take place.

The second major impact on the industry will be the explosive growth in the personal use market which will surpass the institutional market. In the personal market, people don't care when they call whether the information goes back and forth over copper hard wire or fiber or cable or if it goes over the air. It does not matter to the caller. My belief is that the industry is too hung up on the issue of wireless versus wire-line. Basically, we must stay with the two forms for connectivity.

The dominant medium will be neither data nor voice but video, and second will be voice communication. So video and voice driven technologies are likely to grow faster than any other combination of information media. Personal markets will become multimedia in each of the information businesses and will become universal through global standards and mass customization.

Personal markets are already global and if you don't believe it, think about the globalization of electric transistors. While Bell Labs invented it, it took a Sony to make a portable transistor radio and, as we all know, portable transistor radios are now owned all over the world. There are portable radios today in the jungles of the Amazon or in the remotest parts of India. The same is true of television.

A new model of technology seems to ask, how can we take one technology like mechanics and superimpose electronics on it? Or, how can we take electromechanical technology, or chemical, and superimpose electronics and converge them? How can we add value so that they are no longer substitutes one for the other but are complementary? This is a fundamental paradigm shift. One example of this type of convergence is what I call the smart toilet. A "dumb" toilet costs less than \$200 but "smart" toilets cost about \$2,500. In Japan, seven million units have already been sold, so this is no small fad business. And what does a smart toilet do? The answer is, it does everything. It will wash you, dry you, clean you and it will also take your blood pressure and temperature and send them by NTT telephone lines to your medical center. It can also do a urine or stool analysis and send that information out. The value-added capabilities here are enormous.

Just think of the uses for this in advanced countries where there is a significant aging of the population. The oldest nation in terms of aging is Sweden, second is Japan, third, West Germany, and the U.S. is fifth or sixth. We are all growing older and now we have the emergence of telemedicine.

The concept of telemedicine is very real, as is the concept of tele-education or telebusiness. What began as telemarketing is transforming into all other areas of business. We see not only telemarketing, but telecommuting and teleshareholder management. Teleservice and telebusiness are the new concepts versus the distributed workplace.

Cross-technology fusion will add significant time and location values. We have not yet seen the full impact of the bar code which will be enormous and is currently revolutionizing industry after industry. Cross-technology fusion will also enhance both economies of scale and economies of scope with huge capabilities.

I am a strong proponent of the idea of being the master of our own destinies. Let me give you an example: the Chinese restaurant versus the French restaurant. At the French restaurant, people eat only occasionally, the prices are very high, the menu is very limited and it takes a long time to get your food. It is an obsolete model which was fine for the electromechanical age. In the future we will have to use, both for manufacturing and services, a concept like the Chinese

restaurant. People eat often at a Chinese restaurant, the prices are reasonable, the menu is very large — a listing of one hundred and twenty items is common. The cycle time in a Chinese restaurant is so short sometimes I worry that, while I'm still talking to the waiter, my dinner will arrive. And, this is a concept for the future that I think information technology will be able to offer.

Information Technology — Market Driven Policies?

Now, what does all this mean from the policy point of view in all three areas — industry policy, management policy, and public policy. My opinion is that all three areas are founded on the principal of exclusion: I give you a franchise which means nobody else can do business. I give you a patent and nobody else can have the invention. This was fine in the older technologies, but now we must move away from exclusion to inclusion. For the information industry it will be necessary for the content providers of information and the conduit providers of information to work together.

At the industry level it will be necessary for the devices and the networks to come together. We can not take intelligence away from the network and put it into the devices, or take all the capabilities from devices and put them into the network. Everything must be distributed in both places and both will have to work together.

Similarly, the world of wireless and wire line must be made complementary. The potential is enormous if only the tinkers of the future will make it work. Here is another example. How many people who subscribe to a cellular line anywhere in the world have given up their paging service or their land based subscriber line in the process? Not very many. The industry and policymakers think they are dichotomous, that one is a substitute for the other, but the market tells you up front that they are highly complementary.

This carries over into all mass media. A family needs one radio, possibly two, but most have six radios on average. In my home there are only two of us, as empty nesters, yet we have fourteen radios not counting those in our two automobiles. The industry will have to learn how to convert and complement wireless and wire line technology.

At the company level I see the following convergences. The functional organizations will have to converge with market organizations, and both the process and the people will have to converge. The oldest debate in the world is whether we get productivity out of the people or out of the processes. My belief is that information technology will allow us to get more productivity by converging the process and the people.

At the company level there is no longer just a domestic market. The franchise may be domestic but the user is global. The definition of what is local and what is inter-local or long distance is blurring so much that we can not say this is exactly where one stops. At this time, I am doing a study on the total telephone traffic in the world by looking at only the top one hundred cities of the world. I estimate that sixty-five percent of the total network traffic — voice, data, video, however you break it up — is concentrated among those one hundred cities, as I plot the origination/ determination matrix. The rest of the world does not matter. Civilizations never were organized around countries, but always around cities, far back in history. My hundred cities define the network of tomorrow; as these cities change different networks will evolve. The boundary between being strictly a regional holding company and strictly a local exchange carrier will quickly change, just as international travelers quickly change air space over countries.

The policy area is an interesting one. We need an overall policy, and must do away with having a separate computing policy, Telcom policy, publishing policy and cable TV policy. There also has been a public policy for the military market, which is different from that for the commercial market, and significant policy differences between public infrastructure and private infrastructure. Policies for all will have to blend. We must have a single IT policy; the technology demands it.

Actually what I see as changes are in reality barriers. Technology will try to break through these barriers and the sooner we prepare ourselves to move toward the future the sooner we will deliver the future. The future is there, and it is coming fast. It is very much a win-win situation, but the mindset of management is slowing it down more than anything else.

Conclusion

In summary, technology shifts from electromechanical to electronic are transforming the information industry. The industry will be reorganized around information functions and move away from information media as it is now organized. There will be at least five separate businesses — information content, display, storage, processing and distribution with cross-industry consolidation.

Some may worry about industry consolidation, about computing companies getting together, telephone companies getting together and so on, but that is where the future lies. The total size of the information industry will grow enormously as it shifts toward the personal market but still includes institutional markets. This is where the real money, the real dollar value is.

Cross industry or cross technology fusions will make information technology as critical in the future as the physical resources such as land, minerals and oil were in the agricultural age, or as human resources were in the industrial age. In this case, Information Technology will become the critical resource, the driver of change, for societies of the future.

Jagdish N. Seth, PhD, Charles H. Kellstadt Professor of Marketing, Emory Business School, Emory University; founder, USC's Center for Telecommunications Management; noted author; recipient, Outstanding Marketing Educator Award, Sales & Marketing Executives International; consultant to major information industry corporations; expert in customer satisfaction and strategic marketing.