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THE DIMENSIONS OF TECHNOLOGICAL CHANGE

*B.F. Mathaisel**

My role today is to present how Ford Motor Company is using information technology and, in particular the Internet and electronic business. From this, we can derive some insight into how this technological change will affect us in the future.

I just came from Silicon Valley, where I spent two days updating myself on what is going on. Silicon Valley is one of the places in the world, but certainly not the only place, in which there is a good deal of development, a lot of venture capital money, and a lot of inspiring innovation. I did observe one thing from the few days I spent there. It is very clear that the Internet changes everything. You may have heard that phrase before, but as a chief information officer and somebody who has been around information technology for several decades, I have seen many promised "silver bullets," many "promised lands" that have never materialized. This one has all the elements of being a fundamental shift in the way that society operates and the way business is conducted. In the re-engineering of business practices, this technology is allowing us to do things we were never able to do before.

I also observed, after having met about twenty executives of high-tech companies, that fewer than a third of those were white U.S. citizens. It was fascinating to me. I live in a world of great diversity. I have lived on both coasts of the United States, as well as the interior of the United States. I even lived in Europe. But, I was fascinated how Silicon Valley has become a magnet that has attracted some of the best and brightest from everywhere in the world, regardless of country of origin, genetics, cultures, or history. It is, in fact, the most important magnet in the field of information technology today. Anything with ".com" associated with it, or anything with even just a dot in it, is getting a lot of attention.

Today's newspaper reported Ford's first quarter sales results and those of General Motors. General Motors is considered the largest corporation in the world.¹ Today's news analysis suggested that with Ford's recent acquisition of Volvo, we may, in fact, edge out General Motors as the largest corporation

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¹ See Gregory L. White, *GM, Ford Profits Surpass Estimates For First Quarter*, GLOBE & MAIL, Apr. 16, 1999, at B7.

in the world.² Size is, perhaps, one index of performance, but it is not the only one. The net incomes generated in this industry today are incredibly powerful. Last year, Ford Motor Company produced twenty-two billion dollars of net, after-tax income for plowing back into the company and distribution to our shareholders. While that included a one-time event, the economics of this industry is incredible. It is very powerful. Even though we have about 150 billion dollars of revenue,³ our market capitalization is only about eighty to eighty-five billion dollars, depending on the stock price on a particular day.⁴ I was talking with people in Silicon Valley from companies having revenues of less than a billion dollars a year, whose market capitalization was over 100 billion dollars, and whose companies produced no net income and have no prospect of producing any net income in the near-term future.

One of the best ways to talk about the use of information technology is to think about what is happening, both in the commercial domain and in the consumer domain. It is important to understand both of these elements for, while they are related, the developments that are taking place with technology today are slightly different.

The evolution in the Internet began in the consumer domain. Part of its attraction was the ability to get indexed material from anywhere in this world absolutely free, or at very low incremental costs. And, while much of the focus and the attention is on the consumer side, the real heavy-duty lifting on the Internet today is happening in the commercial world. It is in the business-to-business world where we are working out the problems that will eventually be useful to us when we return to the consumer world. Most of the real work today has been done business-to-business, but for the purpose of eventually getting back to the consumer. What this means is that such issues as security, bandwidth, and intellectual property rights are being worked out in the business-to-business world today.

This is to the benefit of all of us, as we take this capability down the last couple of feet into your homes, or as people at Nokia and in the portable telecom world will tell you, to carry with you anywhere. There are many, in fact, who believe the far greater growth and explosive power of this is going to be felt in hand-held access devices that can, perhaps, be put in your home or in your vehicle. This would be a different product than the personal com-

² See Keith Bradsher, *Ford to Acquire Volvo Operations – \$6.45 Billion Deal to Beef Up Luxury Line*, NEW ORLEANS TIMES – PICAYUNE, Jan. 29, 1999, at C1.

³ See *Operating Highlights*, FORD MOTOR COMPANY 1998 ANNUAL REPORT, at 1. Ford's actual total revenues for fiscal year 1998 were \$142.67 billion.

⁴ See Daniel Gross, *Once the Locomotive That Pulled America's Economy, The General Has Become a New Starter*, INV. NEWS, Aug. 3, 1998, at 7. As of July 14, 1999, Ford Motor Company's market capitalization was \$60.3 billion. See *Yahoo Market Guide – Ford Motor Company* (last modified July 14, 1999) <<http://biz.yahoo.com/p/f/f.html>>.

puter. Much work is being done on it now, but again, the work is largely being done in the commercial world. There are separate streams, the consumer side and the commercial side, but they do come back together again.

Here are the kinds of questions that organizations need to ask themselves as they think about the impact of these technologies on the demand side from consumers. Who is making the purchase decision? What is the information stream coming to them? On what basis are they making the purchase? Is it price? Service? Appearance? Increasingly, vehicles are becoming like fashion products. Today, the heavy emphasis is on sport utility vehicles. I, for one, have observed many a person climb up a running board into a fairly large-sized truck and tell me afterward they would not be caught in a minivan because minivans are *passé*, at least according to them. Sport utility vehicles are hot today, and we are very thankful for that because much of our net income derives from vehicles such as the Navigator and the Expedition. But, a significant increase in gasoline prices or a significant environmental regulation by the government may produce a shift to a different type of vehicle, and this world is likely to shift very quickly. Being fleet of foot is absolutely essential to us on the commercial demand side.

Ford recently purchased Volvo Car.⁵ We also own a major interest in Mazda; and, of course, within the Ford branding, there are the Ford products, Lincoln and Mercury, and each are different. They serve different segments of the market. There is no such thing as a single, homogeneous market. It is important for us to understand how we approach each of the sub-elements of those markets and those segments. There is perhaps no better way to do it than through the Internet.

About thirty percent of the life cycle cost of a full-size vehicle is in the vehicle acquisition itself, or in the original equipment manufacture, the overall manufacturing, and delivery of the vehicle. Seventy percent of the life cycle cost is after the initial sale. The margins on the after-initial-sale are far larger than the margins even on a proportionate basis of the initial sale, and I know that is hard for some people to believe.

When I joined Ford Motor Company a couple of years ago, my wife's business partner called me up and said, "I know you can get me a \$20,000 discount on a Jaguar. I just know it. I know the dealers have that much of a margin." That is not true. Dealer margins, depending on the vehicle, are not that high. Dealers make their net income on service, some of it during warranty, some of it after warranty, and on repair parts. A great deal of industry that has been developed around the automotive business for financing and insurance. Those are reflected on the after-sale part.

⁵ See Bradsher, *supra* note 2.

The Internet allows us to capture a market segment's interests during the initial purchase, but more importantly, it allows us to build a relationship with a consumer for an extended period of time. If we can be captivating to the consumer at the initial sale level by providing information and by making it convenient for them to index to dealers, then perhaps we can convince them they ought to buy their financing from us or from a subsidiary. Perhaps we can get them to buy insurance from us or from a subsidiary. Perhaps they ought to schedule their service appointments with us, since we can make it convenient for them. We might be able to gain insight into the useful life of the vehicle. And, as their first financing is coming to term, we can send them a message allowing them to be taken out of their lease a little bit early. We could advertise a brand-new vehicle that Ford is announcing, ask them to come and test-drive it, and if they buy this vehicle, their lease will be terminated. Building a relationship and establishing a set of dialogues are very, very important.

In the United States, forty-eight states have laws which prohibit original equipment manufacturers, such as Ford, from dealing directly with consumers. In fact, as recently as the last few weeks, two states, Georgia and Texas, passed even more restrictive regulations which prohibit or somehow restrict the kind of relationship we at Ford or Chrysler or General Motors can have with consumers.⁶ Guess who put those laws in place? It was the dealers, and for very good reasons. These laws have been in place for decades in many instances. We value our dealer franchises. Our dealers are members of the community. They know the consumers very well. They know or should know when people are having anniversaries, when children are graduating from high school, and when their customers will need a vehicle. They are very important to us as part of our information chain.

So, we have included them in our Internet strategy. We automatically allow people to go on-line and learn about vehicles. It is even possible to price the vehicle. People can get immediately indexed to a dealer and set up an appointment. There is a lot of subtlety there. There is a richness of law and a richness of history. What about the relationship with the consumer? What about privacy of information? Even that side is rich in topics and in opportunity.

The business-to-business domain is where the real action is today. We at the Ford Motor Company, in order to be able to produce a total net income of twenty-two billion dollars and sales of 150 billion dollars, buy eighty-eight

⁶ See Peter Mantius, *Barnes Signs Bills to Aid Dealerships and Farmers*, ATLANTA J. & CONST., May 4, 1999, at D2.

billion dollars worth of stuff.⁷ Much of it goes directly into the vehicles. It is a tremendous value chain, a huge industry in and of itself, but one that is not very efficient. It has become more efficient than it was courtesy of the Japanese reusing our own supply chain methods, which they studied after World War II and applied better than we have, but still the supply chain is very inefficient.

I had a study done by a group from the MBA program at the University of Michigan. As one of their graduation requirements, they were required to do a study. I had them look at the opportunities in inventory turn around in the supply chain. You are moving eighty-eight billion dollars worth of stuff across many tiers. At Tier one, let us say we buy seats from Lear. At Tier 2, Lear buys cloth or springs that may go into a seat from some other supplier. Finally, at Tier 3, somebody is providing the metal that goes into the springs or the fabric that goes into the cloth. There is, for eighty-eight billion dollars worth of inventory that we buy, at least three times that amount in the value chain during the course of the year. Just think of the reduction of both obsolescence and the tremendous inefficiencies if you could cut the inventory-carrying costs in half.

Just as there are questions that need to be asked on the consumer side, there are equivalent questions that need to be asked on the supply side. I want to describe to you some of the kinds of things that we are doing on the supply side. An article appeared in the *Detroit Free Press* a while ago that described the Automotive Network Exchange.⁸ The automotive network exchange in the United States has been established by the Automotive Industry Action Group which is an industry association put in place to produce an Internet protocol network for the entire automotive industry. When in place and fully functioning, more value will move across this network than any other industry network in the world without a close second.⁹

An Internet protocol network allows us to do something we could never do before. This is why I said, in many decades of experience, I have never seen anything quite like the Internet as an opportunity for us to do business differently. The Internet is inexpensive. It is ubiquitous. The standards have largely converged, although, not fully. It is something that not only do we have, but almost any of our suppliers and consumers can have readily.

⁷ See *Operating Highlights*, *supra* note 3; Jeffrey Ball, *Ford Posts Strong Profit on North American Sales*, WALL ST. J., July 15, 1999, at A3.

⁸ See Mike Brennan, *Solving the Supplier Puzzle: Automakers Spend Billions on Fast, High-Security Computer Networks to Make the Pieces Fit*, DETROIT FREE PRESS, Oct. 6, 1997, at 8F.

⁹ See *id.*

For once in our industry, we have a universal capability. We track the hits on the Ford Motor Company Web site. We get several million hits a week from everywhere in the world, places you would not even guess people have computers or bandwidth. That information can come from anywhere and be sourced anywhere; people do not necessarily know where it is coming from, nor does it matter. There is a good deal of opportunity and interest developing around the automotive network exchange.

Another example is order-to-delivery. Could you guess how long it takes, on average, from the time a custom order for a vehicle is placed to when it gets delivered? You probably have had that experience. The answer in the United States is forty-five to sixty days. I am talking about custom configuration, not something that was already manufactured that a dealer happened to find somewhere else.

Ford, General Motors, and Chrysler differ on this. Our approach has been to figure out how to get that cycle time down. This week, we were named a finalist for an award from the Smithsonian Institution for using the Internet in order-to-delivery.¹⁰ For certain vehicles, customers can order the vehicle exactly as they want it, as long as Ford can build it, assuming that they did not order something that would not work. And, they can have it in a matter of just a few weeks. Now, the theoretical turn-around time is a week because it takes us a few hours to manufacture a vehicle, and probably a week to ship it anywhere in North America. What makes the difference between forty-five days and a week? It is information flow. It is the suppliers knowing that a customer wants seventeen-inch aluminum cast wheels and a particular kind of audio system. The key is getting that sequence so that when it comes to our factory, everything flows seamlessly through the production line.

Just think of the power of having consumers realize that they can configure what they want. We discovered that, when consumers get something other than what they really want, there is a great deal of resentment. Every time they get in that vehicle, they think, "I didn't want that engine, but I had to take it because it was the only one on the lot, and I would have had to wait two months to get what I wanted." Color is incredibly important to consumers. We have heard from our customers years after the purchase that they loved the car, but they hated the color every time they got in and out of it.

Just think of the power of order-to-delivery short cycle times. A customer can get on the Internet, configure the vehicle, and depending on the color fidelity of their computer system, they can actually see the colors, two-tone or whatever. We can tell them right on the spot whether we can build that particular configuration. The customer can track the delivery and receive the

¹⁰ See Computerworld Smithsonian Award Finalists, Press Release, June 7, 1999 (visited July 15, 1999) <<http://www.computerworld.com/home/print.nsf/all/990607ACOE>>.

vehicle in a matter of weeks. Just think of the power on the consumer side and the important linkages that have to take place between all the suppliers who synchronize the flow. Some of the other uses, such as purchasing on-line and electronic auctions, are already the rage.

We have begun to take commodity parts, like rivets and metal fasteners, put our requirements out on the Internet for bid, and then hold an auction for the contract. The supplier wins bids electronically; sometimes the cycle time is an hour. How different that is from the old request-for-proposal system where you had to put up with the long cycle times and the approvals. You cannot quite do that for part or supply, but certainly it is a start.

Ford's supplier network put up a portal. Those of you who have followed America Online (AOL) or Yahoo! understand what a portal is. It is a doorway that allows you to have passage into, perhaps, a hallway with many other doorways. In the portal that we have established with suppliers, we now have the basis for an exchange of information. I do not have to worry about telephones or faxes anymore. In fact, we can keep a database on frequently asked questions and responses, and we can make announcements about emerging new products. We can put people immediately in touch with engineers who have answers to their questions. We can help our suppliers with such things as Year 2000 remediation by telling them how Ford Motor Company is dealing with it, what we have discovered, what we are replacing it with, and so on. This represents a vast treasure trove of information. Think about the legal implications of that flow of data; the liability, perhaps, that may accrue from some of it. I look at it from the optimist's side and see the great business opportunities, but I am sure there is a dark side to it as well.

As for product development, some manufacturers, such as Ford, are now doing collaborative development. You have probably read about Boeing and the 777 and how they created a paperless airplane electronically in collaboration with suppliers all over the world. They were actually configuring components and assembling it electronically. We are doing the same thing in the automotive industry. We are using three-dimensional slide modeling capabilities in CAD-CAM¹¹ and computer-aided engineering that are equivalent to what suppliers are using, and they can literally reach out and exchange things with us. They can try to change a shock absorber and see instantly whether it hits up with some constraints on another supplier's system. Our system is called C3P. The "C3" is for computer-aided-design, computer-aided-manufacturing, and computer-aided-engineering. The "P" is for "product information management." Again, this is all shared across Internet protocol.

¹¹ Computer-aided-design and computer-aided-manufacturing.

Another use is competitive intelligence. There is a vast amount of information out there. It is amazing what people will tell about themselves on Web pages. You can see pictures of them and their pets. There is a shady side to it as well. It is equally amazing what corporations will reveal about themselves and what tips they may give to each other. We have people who go to auto shows, as much as you would. When I was at the Detroit Auto Show in October, I noticed a bunch of Asians with cameras swarming over our new concept vehicles. I would gather that, within hours, those pictures were probably digitized, put on-line, and sent to their engineers in Japan or the Far East accompanied by a good deal of description. There were a lot of people surrounding this new concept vehicle, so it must be really hot. We ought to be thinking about the same sort of thing.

The ubiquitous Internet allows us all kinds of information, not just text, but voice, image, video, and the like. If you are interested in research, there is more that you can do on this topic; there are magazines and journals that specialize on various aspects of the Internet. There are some that are, in fact, just dedicated to the auto industry. *Harvard Business Review* has included some write-ups,¹² and there have been some recent articles in *Business Week* and *PC Week*, among others. You can do your own search through a search engine such as Yahoo! or Snap.com. Once you dive in, be prepared to swim around for a long time. There is a vast treasure trove of topics and information out there. I think you will find it absolutely fascinating.

Let me characterize how the industry is changing by binding together a couple of icons. Remember how development moves from the consumer world into the business-to-business world with the intention of returning? That is happening this year. The industry is going through these fundamental steps. It starts by just improving the existing processes. It could be manufacturing, it could be product development. The next step is industry restructuring. Some organizations have already been formed which are electronic distributorships. Microsoft has one called CarPoint.¹³ There is also Autobytel.com.¹⁴ These are brand-new industries that are being changed and restructured. Other new industries are being newly created, which is the third step. For example, we started a concierge service for a certain level of affluent individuals. You can have all of your transportation needs fully served on

¹² See, e.g., Robert D. Austin & Mark Cotteleer, *Ford Motor Company: Maximizing the Business Value of Web Technologies*, HARV. BUS. REV., July 10, 1997.

¹³ CarPoint is an Internet car-purchasing service offering new and used vehicles, financing, and insurance on-line. See CarPoint (visited July 15, 1999) <<http://www.carpoint.msn.com>>.

¹⁴ Autobytel.com offers new and used vehicles for lease or sale via the Internet. See Autobytel.com (visited July 15, 1999) <<http://www.autobytel.com>>.

the Internet, whether it be air, or rental vehicles, or a purchase of your own vehicle or taxis or limos or anything associated with transportation, all done electronically.

The way I like to look at it is, one hundred years ago, I probably would have been planting some kind of seeds in some farmland. While that is an honorable profession, I just think of the opportunities that I have had to change fundamentally the way the world operates, at least the world in which I have operated at Disney, Ford, and elsewhere. I am really amazed, enthused, and highly motivated by what these new set of technologies and opportunities will allow us to do for those of us who want to participate. It is really an exciting set of opportunities for those of us who have the energy, the time, and the talent and who want to be dedicated to it. It is going to be an outstanding ride.

