The Network Revolution

By David Kilburn

In 1815, early knowledge of Wellington's victory at Waterloo enabled Nathan Rothschild buy with confidence the stocks and businesses others were selling cheaply and in panic. The news of Wellington's victory sped its way by carrier pigeon, then a common way to rush confidential news around Europe.

There are better ways to send information today, but Rothschild's principle remains as relevant. In business, you need accurate data for decisions. If you have better information than your rivals, or get it faster, then you have a chance to win.

Rothschild needed just one crucial piece of information—who had won the battle? Single pieces of information still sway major decisions. However, the new routine is to base many decisions on massaging enormous volumes of information. Computers provide the brute force to handle unthinkable quantities of data. Telephone circuits provide the means to send it all quickly from point to point.

Computers find trends

A computer can correlate sales, stocks, prices, orders by outlet, town, city, region, country, and the weather. It can help find the patterns and trends needed to plan a business. It can do this as fast as the information arrives. Better information helps keep inventories down, reduce costs, and plan new products. By tying manufacturing into the networks, products can match individual consumer needs.

The methods to collect and analyze reams of data to achieve these ends have largely emerged over the last decade. They draw on a variety of technologies, which collectively become "information technology." Nowhere has the change been more dramatic than in the automobile industry.

In 1928, half of the world's motor vehicles were Model T Fords. This was the start of mass production. Ford sold 15 million identical Model Ts over 18 years.

In contrast, the cars rolling off today's production lines are nearly all different. Automakers can now manufacture cars to meet specific orders from individual customers. Tailor-made cars are rolling off the production lines as quickly as standard models once did.

Anywhere in Japan, a typical buyer—let's call him Mr. Suzuki—could walk into his local Toyota dealer on a Monday morning. He might order, for example, a red Celica. He might specify a three-door hatchback equipped with a four-cylinder, 2,000cc twin OHC engine. He might demand custom wheels, leather seats and air conditioning. By consulting a computer terminal, the dealer can say immediately whether this can be done. The new car would arrive within 10 days or so of ordering.

On Tuesday, Mrs. Suzuki might send her husband back to the dealer to add a window defogger. The dealer can immediately tell if this is possible. The Suzukis can make more changes every day until Friday. Despite the changes, they can still look forward to driving their new car on the original delivery date. The same applies to the more than 150,000 cars that Toyota turns out each month in Japan.

Today's car buyer wants a car that meets his own specifications. He wants it quickly. He also wants a lot of choice. To achieve this, makers like Toyota have devised ways to produce each car to order. This means they must produce an ever widening variety from a single assembly line. The hard part is doing this as economically as turning out identical products.

Toyota's computer and communication network is the key to this. The network connects over 5,000 terminals at branches of 311 dealers to Toyota's headquarters, and from there to the plants and 200 parts suppliers. The communications network makes it possible for the dealer to give immediate answers to questions about options and delivery. It makes it possible for Toyota to plan production so that every car meets the specific requirements of an individual customer.

Toyota's dealer network now uses a complex mixture of leased, packet switching, and public telephone lines. By late 1994, a new ISDN network will replace this. The ISDN network will handle sales order, repair and service information. It will also be useful for marketing. The band width of ISDN circuits will enable the network to "broadcast" videos about new cars and for training.

Before Toyota introduced an integrated communications network, it could take at least a day to confirm or change an order. Customers also faced a wait of over two weeks for their new car, after they had finally decided the specification.

Just-in-time delivery

Today, customer orders go on-line to Toyota's headquarters. After checking, an order is broken down into separate orders for all the parts that make up the car. Through the network, computers automatically send these orders over telephone lines to parts suppliers, together with delivery schedules. The parts arrive at plants in the order of assembly. In the Toyota manufacturing system, suppliers deliver parts throughout the day to arrive "just in time" for use.

Toyota says the network allows its production system to work more efficiently, since computers can process orders into packages of manufacturing instructions. "We are trying to improve our ability to meet customer needs even more accurately and with even more precision. We are also trying to do this more quickly," says Andrew Pfeiffenberger, a spokesman in Toyota's public affairs department. "Developing the network is a key part of achieving this."

The percentage of orders that get changed illustrates this. Today, it is 30% to 35%, up from 10% in 1985. Over the same period Toyota dealers have reported steadily increasing turnover, and more satisfied customers.

Nissan is also busy developing its own communications networks to achieve similar goals. The company has several different, interconnected networks that link Nissan's headquarters and manufacturing operations in Japan, the United States and Europe. The networks can handle voice, facsimile, image and data transmissions. One network is mainly for engineers using CAD (computer-aided design) to design new vehicles.

The CAD network gives design centers in the United States and Europe access to Nissan's Japanese technical center in Atsugi. They can exchange design and development data with Japan over high-speed satellite and terrestrial links. By sending complex engineering drawings over the network, Nissan can shorten the time it takes to go from concept to manufacturing. This helps meet changing customer needs more quickly. In turn this leads to more sales. A CAD drawing on paper used to take at least a day by courier to get from Japan to the U.S. With the new network, a drawing the size of four broadsheet newspaper pages takes about 10 minutes to arrive.

Through the network, engineers worldwide also will gain access to a Cray supercomputer at the Nissan Technical Center. This will let them perform much more CAD design work locally and run simulations, models and analyses on the supercomputer.

Nissan uses its U.S. network to provide Infiniti dealers with an interactive link to manufacturers' sales, parts, service and consumer-affairs applications. More advanced features will eventually include sales-prospect analysis, on-line warranty processing and the service history of each vehicle.

Last year, Nissan linked many of its overseas subsidiaries to form regional networks. It introduced digital satellite links between branches in North America and Europe. It also set up a network linking Nissan Motor Inc. in the U.S. and its Mexican manufacturing plant. Nissan Europe N.V., in Amsterdam, Nissan Motor (U.K.) Ltd. and Nissan Motor Iberica S.A. form a European network. These regional networks will evolve into a global digital network.

Both Toyota and Nissan have developed their networks largely in-house. They both make extensive use of dedicated telephone lines as well as using public networks and satellites. Both networks ensure that those who make and market cars in each country can tap know-how worldwide with just a few strokes on a keyboard. The surge in communications technology has its problems. Most executives have still to grasp the communication power networks provide.

"At the moment the level of communications technology available in the company is not widely understood," says Ikuo Hasuike of Nissan's Information Systems Center. "We need to spend more time educating executives about our network capabilities, and how to use them." "Our final aim is to connect all networks so that the company's entire computing and communication resources are accessible from any terminal within the company," adds Hasuike.

Use in retailing

Old fashioned, inefficient, and a barrier to progress are common descriptions of Japan's retail system. Yet some of the most advanced information networks are in the retail industry. The pioneer is Seven-Eleven Japan Co., Japan's largest chain of convenience stores.

Convenience stores have limited floor space and no storage room. The average size of a Seven-Eleven store, for instance, is only 100 square meters. In such tiny shops there are two basic keys to profitability. The first is to keep the shelves filled with items that sell quickly. The second is to match the variety of merchandise as accurately as possible to the needs of each neighborhood. Seven-Eleven stores typically carry 3,000 to 3,500 different items. Their inventory turns over every 10 days. With limited shelf space, stocks of each item are small. Rapid turnover and small stock levels make fine-tuning of inventory control necessary. Seven-Eleven achieved this by developing a POS (point-of-sale) system.

At the checkout, the sales clerk uses a laser-scanning gun to read a bar code on the item. The clerk punches a couple of buttons on the register, accepts the customer's money and hands over the change. The laser scanner feeds detailed information about the sale into the store's computer. Buttons on the cash register identify the customer demographically as a young man, girl student, etc. The store's computer can analyze data about sales of a specific product and general groups. It matches sales with customer demographics, the time and day of purchases, and even daily weather conditions.

Each store has a monitor which displays the information in charts. These can plot sales of products against the hour of the day, day of the week and so on. Spotting trends and patterns is easy. The shopkeeper can easily weed out poorly selling lines. He can quickly test-market new products. He can also vary his stocks by time of day. This latter is important for fresh food sales. Night-time customers don't want the left-overs from lunch time. Orders go from the terminal directly to suppliers, cutting out paperwork. With three deliveries a day, an order can be at the store within eight hours.

Seven-Eleven collects all the data from individual shops and analyzes it more thoroughly. It provides manufacturers with details of the sales of their products. The data also allows Seven-Eleven to advise its franchise holders what to sell and when. Sophisticated inventory control leads to high sales. Seven-Eleven is Japan's largest retailer of magazines, *oden* (a pot-au-feu with vegetables, tofu, kelp and an assortment of fish-based pastes) and rice balls. High sales also mean buying power.

Seven-Eleven owns only about 5% of the stores in Japan that bear the name. In each store, it owns the sales terminals and the network design. Franchisees own the rest. Essentially, Seven-Eleven is a very sophisticated information network. It owes its success more to information management than traditional retailing skills.

The computer network makes new services possible. At Seven-Eleven and other convenience stores, customers can pay gas and electricity bills. They can also order cinema and theater tickets, reserve train tickets, arrange courier services and

use fax machines. These provide more reasons to visit the stores, which helps sales of more traditional merchandise.

Seven-Eleven built its network using ordinary telephone lines. The enormous volumes of data it handles and the need for even more information are making it obsolete. So it is installing a 4,400 circuit ISDN network at a cost of around ¥24 billion. This will speed ever more data from franchisees to the company. It will also help regulate store computer systems, air-conditioning and refrigerator temperatures.

Easy to install

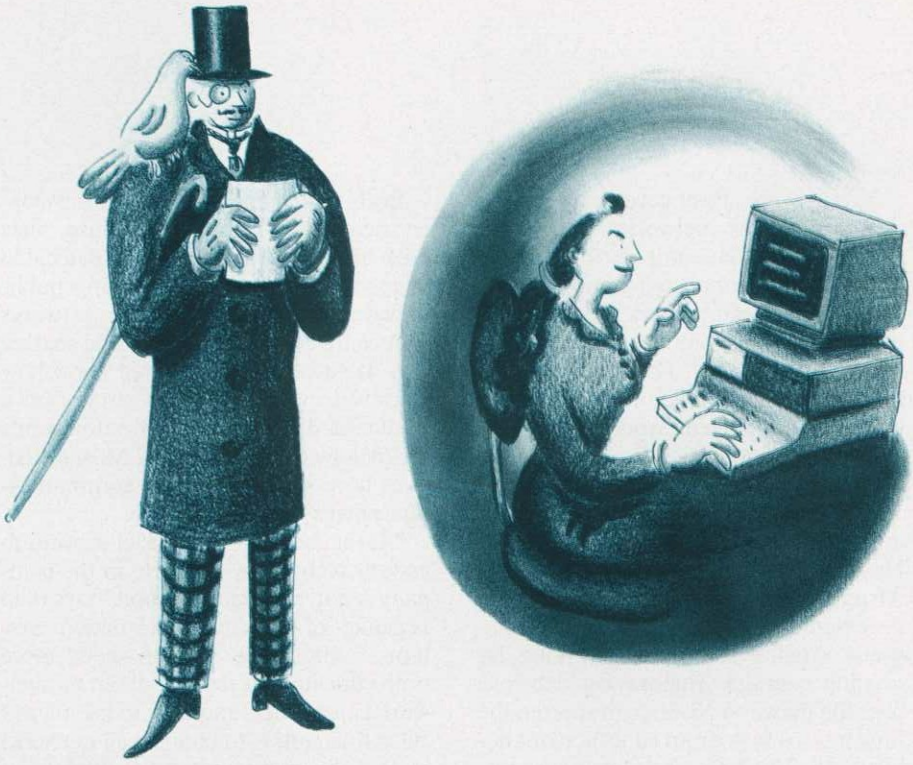
Toyota, Nissan and Seven-Eleven can all exercise a high degree of control over their outlets. It's easy to install the computers and systems they need wherever they need them. But for the manufacturers who stock the shelves of supermarkets, this is not possible.

Take Kao, Japan's leading maker of detergents and toiletries. Over 300,000 outlets stock Kao brands. These include large supermarket chains, department stores, convenience stores, discounters and traditional tiny neighborhood shops. Kao is as information-hungry as Seven-Eleven and the car makers. Collecting the data it needs over so many varied outlets is a formidable task.

It subscribes to POS data service companies, and also buys POS data from various retailers. These include general merchandisers, convenience stores and drug stores. It has even installed its own POS machines and software at a representative sample of stores. Most of the POS data it collects are about its own brands, but some cover competitors.

Kao collects orders and inventory data directly from 110,000 of its retail outlets nationwide. Kao staff visit the outlets and record inventory data and orders in notebook PC terminals. This information goes to Kao's host computers over public telephone lines. High-volume outlets can expect a daily visit. Others get visits as often as their sales volume warrants.

While some manufacturers can only track their products as far as their wholesalers, Kao's system tracks right down to individual stores. Data becomes available throughout the day. It goes to research and development, production, sales and marketing departments over a personal computer network.



The flow of information helps plan new products and marketing campaigns, and reduce inventory levels. By relating sales data to production, Kao is also able to manufacture products in pace with their consumption. This cuts inventory costs in two ways. There is less money tied up in product stockpiles and less space needed to store finished products.

A key part of Kao's manufacturing system is just-in-time production. This means that Kao makes its products only as orders come in. This cuts out the need to maintain an inventory of products awaiting distribution.

This has implications for quality control. When products were stockpiled for days before shipping, there was ample time to take samples and perform laboratory tests. To maintain the standards but shorten the time, Kao has developed automatic quality controls for many of its products. These involve computerized sampling and testing during production. Thus when a product batch is ready, its quality has already been checked. There are still some manual tests for some products. To allow for this, Kao maintains a one-day quality control inventory of appropriate products. This allows for final checks before shipment.

"There are still areas of quality control where human sensitivity is better than computerized analysis," says Kenzo Kunikawa, quality control manager at Kao's Wakayama plant. "Overall product appearance and fragrance are two examples. Analysis of these is about their impression on human beings. Sensors can make some checks of color and smell. However, these are not yet as sensitive as the human eye and nose."

Toyota, Nissan, Seven-Eleven and Kao have shown how information networks can change every aspect of a company's operation. Networks have changed manufacturing, sales and marketing. The changes have also brought better service to individual consumers as well as to retailers and manufacturers. The next stage of the network revolution is likely to be in marketing. In many mature markets, the various manufacturers are at similar levels of technology, design and consumer understanding. It is hard to find innovations that competitors cannot match quickly. Networks and information management are becoming key tools in the battle for market share.

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