

Case 3-3

Ford Motor Company: Supply Chain Strategy¹

Teri Takai, the director of supply chain systems, had set aside this time on her calendar to contemplate recommendations to senior executives. The question they'd asked was widely agreed to be extremely important to Ford's future: How should the company use emerging information technologies (e.g., Internet technologies) and ideas from new high-tech industries to change the way it interacted with suppliers? Members of her team had different views on the subject.

Some argued that the new technology made it inevitable that entirely new business models would prevail and that Ford needed to radically redesign its supply chain and other activities or risk being left behind. This group favored "virtual integration," modeling the Ford supply chain on that of companies, such as Dell,² which had aggressively used technology to reduce working capital and exposure to inventory obsolescence. Proponents of this approach argued that although the auto business was very complex both for historical reasons and because of the inherent complexity of the automotive product, there was no reason such business models could not provide a conceptual blueprint for what Ford should attempt.

Another group was more cautious, believing that the differences between the auto business and relatively newer businesses such as computer manufacturing were important and substantive. Some noted, for example, that relative

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²Information on Dell included in this case was obtained by Ford from public sources, including the 1997 Dell annual report, the Dell website (www.dell.com), and Joan Magretta, "The Power of Virtual Integration: An Interview with Dell Computer's Michael Dell," *Harvard Business Review*, March-April 1998 (reprint 98208). This article is included in this book.

to Dell the Ford supplier network had many more layers and many more companies and that Ford's purchasing organization historically had played a more prominent and independent role than had Dell's. These differences and others posed complications when examined closely, and it was difficult to determine the appropriate and feasible scope for redesign of the process.

As she read through the documents provided by her team, she thought about chief executive officer (CEO) Jac Nasser's recent companywide emphasis on shareholder value and customer responsiveness. It was widely acknowledged that Dell had delivered on those dimensions, but would the same methods deliver results for Ford?

Company and Industry Background

Based in Dearborn, Michigan, the Ford Motor Company was the second largest industrial corporation in the world, with revenues of more than \$144 billion and about 370,000 employees. Operations spanned 200 countries. Although Ford obtained significant revenues and profits from its financial services subsidiaries, the company's core business had remained the design and manufacture of automobiles for sale on the consumer market. Since Henry Ford had incorporated in 1903, the company had produced over 260 million vehicles.

The auto industry had grown much more competitive over the last two decades. Since the 1970s, the Big Three U.S. automakers—General Motors (GM), Ford, and Chrysler—had seen their home markets encroached upon by the expansion of foreign-based auto manufacturers such as Toyota and Honda. The industry was also facing increasing overcapacity (estimated at 20 million vehicles) as developing and industrialized nations, recognizing the wealth and job-producing effects of automobile manufacturing,

encouraged development and expansion of their own export-oriented auto industries.

Although manufacturers varied in their degree of market presence in different geographic regions, the battle for advantage in the industry was fast becoming global. Faced with the need to continue to improve quality and reduce cycle times while dramatically lowering the costs of developing and building cars, Ford and the other large automakers were looking for ways to take advantage of their size and global presence. One element of the effort to achieve advantage in size and scale was a movement toward industry consolidation. In the summer of 1998, Chrysler merged with Daimler-Benz to form a more global automaker. In early 1999, Ford announced that it would acquire Sweden's Volvo, and there were rumors of other deals in the works.

Previously, in 1995, Ford had embarked on an ambitious restructuring plan called Ford 2000, which included merging its North American, European, and international automotive operations into a single global organization. Ford 2000 called for dramatic cost reductions to be obtained by reengineering and globalizing corporate organizations and processes. Product development activities were consolidated into five Vehicle Centers (VCs), each responsible for the development of vehicles in a particular consumer market segment (one VC was in Europe). By making processes and products globally common, Ford intended to eliminate organizational and process redundancies and realize huge economies of scale in manufacturing and purchasing. Major reengineering projects were initiated around major company processes such as Order to Delivery (OTD) and Ford Production System (FPS), with goals such as reducing OTD time from more than 60 days to less than 15.

Ford's new global approach required that technology be employed to overcome the constraints usually imposed by geography on information flow. Teams on different continents needed to be able to work together as if they were in the same building. Furthermore, in virtually every reengineering project, information technology (IT) had emerged as a critical enabler. The link between

reengineering success and the company's IT groups was made explicit in the Ford 2000 restructuring: IT was placed within the process reengineering organization. In the supply chain area, there was general agreement that IT also could be deployed to dramatically enhance material flows and reduce inventories, substituting information for inventory, as the expression went.

As Ford 2000 unfolded, the Internet revolution unfolded in parallel, creating new possibilities for reengineering processes within and between enterprises. Ford launched a public Internet site in mid-1995; by mid-1997 the number of visits to the site had reached more than 1 million per day. A companywide *Intranet* was launched in mid-1996, and by January 1997 Ford had in place a business-to-business (B2B) capability through which the *Intranet* could be extended in a secure manner beyond company boundaries into an *Extranet* potentially connecting Ford with its suppliers. Ford teamed with Chrysler and General Motors to work on the Automotive Network Exchange (ANX), which aimed to create consistency in technology standards and processes in the supplier network so that suppliers, already pressed to lower costs, would not have to manage different means of interaction with each automaker.

On January 1, 1999, Jac Nasser took over the CEO job from Alex Trotman. Nasser had been Trotman's second in command throughout the Ford 2000 rollout and had a long-standing reputation as a tough-minded cost cutter and a capable leader. Even before taking the helm, he had begun to focus Ford senior management on shareholder value. In the period 1995-1999 Ford had seen companies with fewer physical assets and much lower revenues and profits achieve market capitalization well in excess of Ford's. Corporate staff members began to study models such as Cisco and Dell to try to understand whether Ford could produce shareholder value in the ways these newer companies had.

As the end of 1998 approached, Ford had amassed profits of \$6.9 billion, employees enjoyed record profit sharing, and return on sales (3.9 percent in 1997) was trending solidly upward.

The company was the world leader in trucks. It had taken over the U.S. industry lead in profit per vehicle (\$1,770) from Chrysler, and it was the most improved automaker on the 1997 J. D. Power Initial Quality Study (in fourth place overall, behind Honda, Toyota, and Nissan).

Ford's Existing Supply Chain and Customer Responsiveness Initiatives

Ford had a number of initiatives under way that were aimed at positioning the company favorably for success in integrating with the extended enterprise that also included suppliers and customers. In addition, there were historical factors that would have to be taken into account in any virtual integration strategy.

Ford's Existing Supply Base

The existing supply base was in many respects a product of history. As the company had grown over the years, so had the supply base, to the point where in the late 1980s there were several thousand suppliers of production material in a complex network of business relationships. Suppliers were picked primarily on the basis of cost, and little regard was given to overall supply chain costs, including the complexity of dealing with such a large network of suppliers.

Beginning in the early 1990s, Ford had begun to try actively to decrease the number of suppliers the company dealt with directly. Rather than fostering strong price competition among suppliers for individual components, there was a shift toward longer-term relationships with a subset of very capable suppliers who would provide entire vehicle subsystems. These "tier 1" suppliers would manage relationships with a larger base of suppliers of components of subsystems—tier 2 and below suppliers. Ford made its expertise available to assist suppliers in improving their operations through a range of techniques, including just-in-time (JIT) inventory, total quality management (TQM), and statistical process control (SPC). In exchange for the closer relation-

ships and long-term commitments, Ford expected yearly price reductions from suppliers. While first tier suppliers had fairly well developed IT capabilities (many interacted with Ford via electronic data interchange links), they were not able to invest in new technologies at the rate Ford itself could. Also, IT maturity (understanding and modernity of technology) decreased rapidly in lower tiers of the supply chain. As more cautious members of Takai's staff had often observed, this supply base was different in its nature and complexity from Dell's supply base.

Another major difference between Dell and Ford was organizational. At Dell, purchasing activities reported into the product development organization. At Ford, purchasing was organizationally independent of product development and had been—historically and up to the present—a powerful force within the company. Because of the sheer volume of materials and services Ford purchased, a very slim reduction in purchasing cost could result in very significant savings. Consequently, purchasing was involved closely in nearly every product decision. Engineers were counseled to avoid discussing prices in interactions with suppliers, as price negotiation was the sole province of purchasing agents. How this might work in a more virtually integrated system was unclear.

Ford Production System

The Ford 2000 initiative produced five major, corporationwide reengineering projects. One was Ford Production System. Modeled roughly on the Toyota Production System, FPS involved a multi-year project that drew on internal and external expertise worldwide. FPS was an integrated system aimed at making Ford manufacturing operations leaner, more responsive, and more efficient. It focused on key attributes of the production process, aspiring to level production and move to a more pull-based system, with synchronized production, continuous flow, and stability throughout the process. One important part of FPS was Synchronous Material Flow (SMF), which Ford defined as "a process or system that produces a continuous flow of material and products driven by a fixed, se-

quenced, and leveled vehicle schedule, utilizing flexibility and lean manufacturing concepts." One key to SMF was In-Line Vehicle Sequencing (ILVS), a system that used vehicle in-process storage devices (such as banks and ASRSs³) and computer software to assure that vehicles were assembled in order sequence. By assuring assembly in order sequence, Ford could tell suppliers exactly when and where certain components would be needed days in advance, and buffer stocks thus could be reduced dramatically. If such sequenced assembly could be kept level and if it was well-forecasted, the benefits would be felt throughout the supply chain. The vision was of trucks constantly in motion throughout their lives, in continuous circuits between suppliers and Ford, stopping only to refuel or change drivers, feeding a process that worked like a finely tuned and smoothly running precision instrument.

Order to Delivery

Another key process Ford reengineering initiative was Order to Delivery. The purpose of the OTD project was to reduce to 15 days the time from a customer's order to delivery of the finished product—a significant reduction from the present performance of 45 to 65 days. Ford took a holistic approach to the reengineering. Pilot studies in 1997 and 1998 identified bottlenecks throughout Ford's supply chain, including its marketing, material planning, vehicle production, and transportation processes. Ford's approach to implementing an improved OTD process relied on several elements: (1) ongoing forecasting of customer demand from dealers—before OTD Ford had never

officially involved dealers in forecasting demand, (2) a minimum of 15 days of vehicles in each assembly plant's order bank to increase manufacturing stability—gaps in the order bank are filled with "suggested" dealer orders based on historical buying patterns, (3) regional "mixing centers" that optimize schedules and deliveries of finished vehicles via rail transportation, and (4) a robust order amendment process to allow vehicles to be amended for minor color and trim variations without the need to submit new orders. The OTD vision was to create a lean, flexible, and predictable process that harmonized the efforts of all of Ford's components to enable it to provide consumers with the right products in the right place at the right time. Ford believed that success in achieving this vision would provide better quality, higher customer satisfaction, improved customer selection, better plant productivity, stability for its supply base, and lower dealer and company costs.

Ford Retail Network

On July 1, 1998, Ford launched the first of its Ford Retail Network (FRN) ventures in Tulsa, Oklahoma, under the newly formed Ford Investment Enterprises Company (FIECo). Ford Investment Enterprises was formed to take advantage of the changing face of retail vehicle distribution systems in North America. FIECo had two primary goals: (1) to be a test bed for best practices in retail distribution and drive those practices throughout the dealer network and (2) to create an alternative distribution channel to compete with new, publicly owned retail chains such as AutoNation. Ownership in the FRN varied from market to market; in some Ford would be the majority owner, and in others Ford would be the minority owner. In Rochester, New York, Ford was partnering with Republic, another large, publicly owned corporation. One of the principles of the FRN was to buy all the Ford dealers in a local market so that the dealers were in competition with the "real" competition (i.e., GM, Toyota, Honda) rather than with each other. The overriding goal was to give consumers the highest level of treatment and create an experience they would want to come back to again and again. Showrooms would have a consistent

³A bank is a storage area into which partially assembled vehicles can be directed for the purpose of removing them in a different order from the order in which they entered (i.e., resequencing). An ASRS (automated storage and retrieval system) is essentially a multilevel bank (vehicles are literally stored on top of each other). Whereas an ordinary bank provides some resequencing flexibility, an ASRS provides the ability to access any vehicle in the bank at any time. As might be imagined, to hold a large number of vehicles and allow them to be accessed randomly, an ASRS must be very large (roughly the size of a several-story building).

look on the outside, with customized interiors for the different Ford brands: Ford, Mercury, Lincoln, and Jaguar. The number of showrooms would be consolidated to focus resources on creating a superior selling experience, while the number of service outlets would increase to be closer to customer population centers. Ford expected personnel and advertising cost savings as well as inventory efficiencies due to economies of scale and greater use of the Internet. Ford also believed that the FRN would provide an opportunity to increase business not just in new and used vehicles but also in parts and service, body shop operations, and Ford Credit.

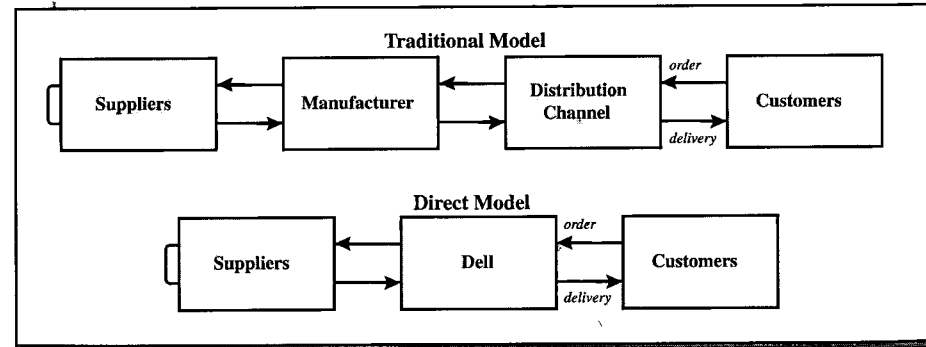
Dell's Integrated Supply Chain

See "The Power of Virtual Integration: An Interview with Dell Computer's Michael Dell," *Harvard Business Review*, March-April 1998, pp. 72-84, which is included in this book.

The Decision

Takai perused the neatly prepared documents that had been provided by her staff. There was a broad-based comparison between Dell and Ford on many important dimensions (see Exhibit 1).

EXHIBIT 1
Dell and Ford Compared



Comparative Metrics (latest fiscal year)

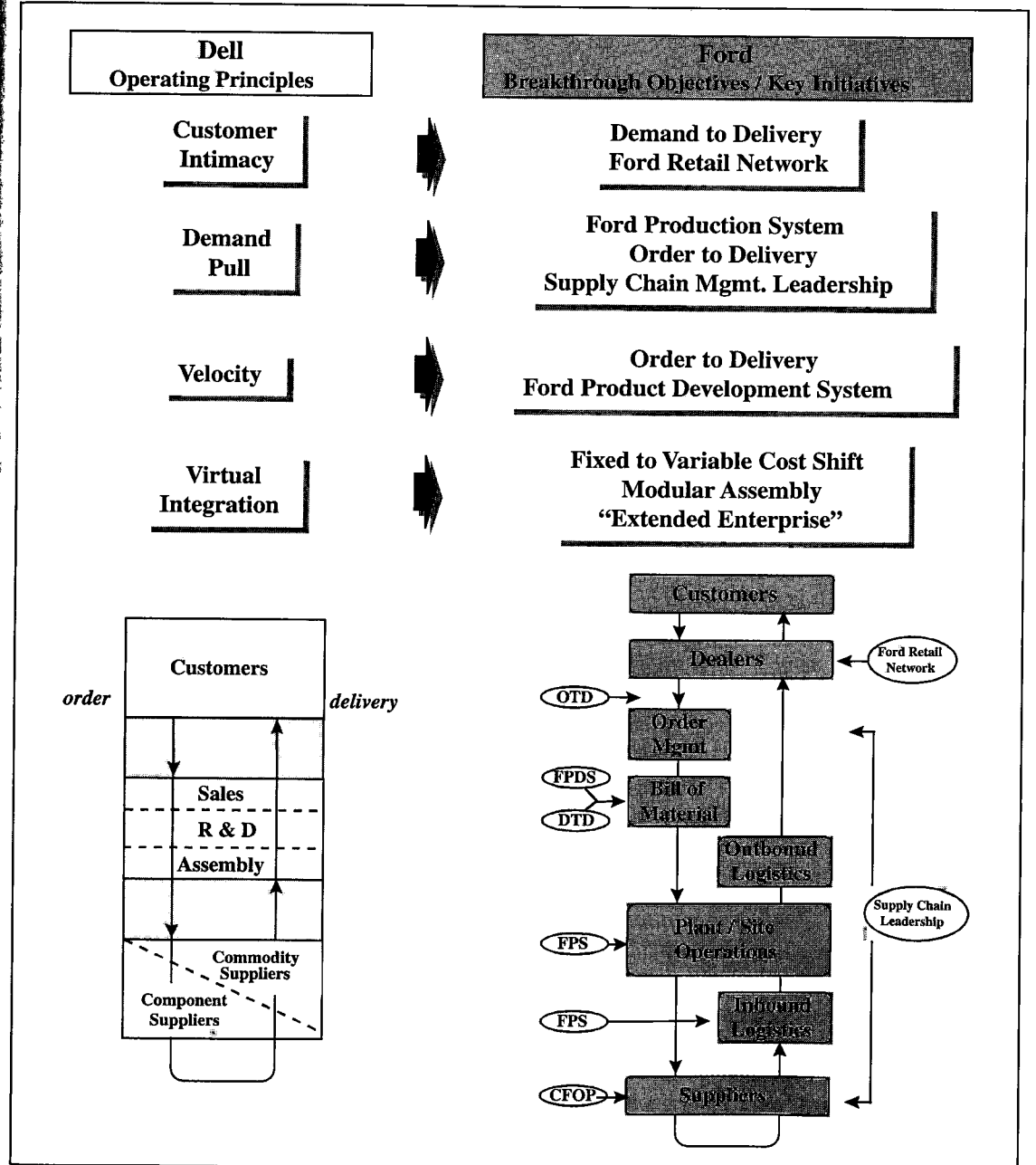
	Dell	Automotive	Ford Financial Services
Employees	16,100		363,892
Assets (\$millions)	4,300	85,100	194,000
Revenue (\$millions)	12,300	122,900	30,700
Net income (\$millions)	944	4,700	2,200
Return on sales	7.7%	3.8%	7.2%
Cash (\$millions)	320	14,500	2,200
Manufacturing facilities	3 (Texas, Ireland, Malaysia)	180 (in North and South America, Europe, Asia, Australia)	
Market capitalization (\$millions)	58,469		66,886
Price-earnings ratio	60		10*
5-year average revenue growth	55% per year		6% per year
5-year average stock price growth	133% per year		33.4% per year

*Excludes earning from associates spin-off.
Source: Dell 1998 financial report, Ford 1997 annual report, *Wall Street Journal Interactive*.

EXHIBIT 1 Dell and Ford Compared (continued)

Enterprise Model Comparison

A high-level comparison of the Dell and Ford Motor enterprise models is shown below. Besides the lack of a dealer distribution channel, other key differences are Dell's ownership of assembly plants only—all component/subassembly manufacturing is done by its supply base—and the more integrated nature of Dell's sales, R&D, and manufacturing operations. All the operating principles that underlie Dell's success have counterparts in Ford's breakthrough objectives and key business plan initiatives.



Dell Operating Principles	Ford Breakthrough Objectives / Key Initiatives
Customer Intimacy	Demand to Delivery Ford Retail Network
Demand Pull	Ford Production System Order to Delivery Supply Chain Mgmt. Leadership
Velocity	Order to Delivery Ford Product Development System
Virtual Integration	Fixed to Variable Cost Shift Modular Assembly "Extended Enterprise"

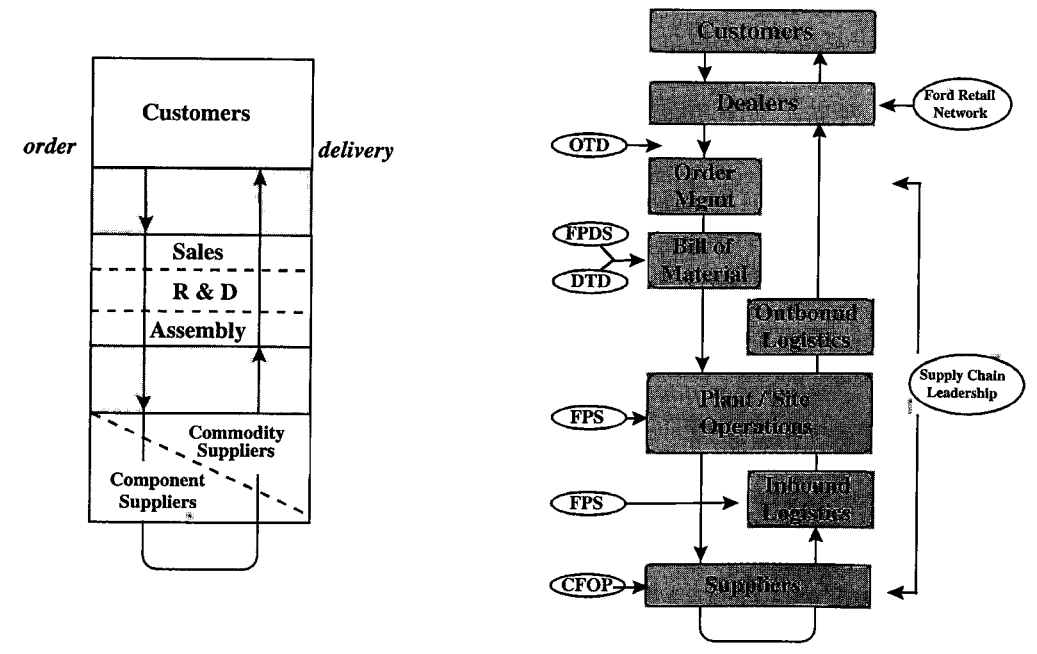


EXHIBIT 1 Dell and Ford Compared (concluded)

Dell Processes	Ford
Suppliers own inventory until it is used in production	
Suppliers maintain nearby ship points; delivery time 15 minutes to 1 hour	✓
External logistics supplier used to manage inbound supply chain	✓
Customers frequently steered to PCs with high availability to balance supply and demand	✓
Demand forecasting is critical—changes are shared immediately within Dell and with supply base	
Demand pull throughout value chain—"information for inventory" substitution	
Focused on strategic partnerships: suppliers down from 200 to 47	✓
Complexity is low: 50 components, 8–10 key, 100 permutations	

EXHIBIT 2 Moving from Push to Pull

	Process	Push	Pull
Design	Design strategy	Please everyone	Mainstream customer wants
	Vehicle combinations	More is better	Minimal
Marketing	Pricing strategy	Budget-driven	Market-driven
	Vehicle purchase incentives	Higher	Lower
Manufacturing and supply	Capacity planning	Multiple material/capacity constraints, driven by program budget	Market-driven (no constraints, FPV/CPV* + 10% for vehicle, + 15% for components)
	Schedule and build stability	Maximize production; make whatever you can build	Schedule from customer-driven order bank, build to schedule
Dealer network	Dealer ordering	Orders based on allocations and capacity constraints	Orders based on customer demand
	Order to delivery times	Longer (60+ days)	Shorter (15 days or less)
	Inventory	High with low turnover	Low with rapid turnover
	Dealership model	Independent dealerships, negotiations with company	Company-controlled dealerships (Ford Retail Network)

*FPV, or financial planning volume, is the volume of components expected to be required by the supply base when assembling the business case for a particular vehicle model. CPV, or capacity planning volume, is the volume of components that will be expected that is communicated to suppliers. Typically these numbers are the same, but the recommendation of Takai's staff is that these numbers should include some contingency (+10 percent, +15 percent) to allow suppliers to tool up for the possibility of "hot options," to avoid shortages.

Virtual integration would require changes in fundamental operations; some of the changes, framed as a shift from "push" to "pull" processes, were identified in another document (Exhibit 2). Whatever she decided, she would

have to do it soon. Meetings were already scheduled with the vice president of quality and process leadership, and from there the recommendations would move upward, eventually reaching Nasser.