

Otis NAO: Modernization*

In 1986, after months of bidding and negotiation, the Waldorf-Astoria Hotel in New York City awarded the Otis Elevator Company with a \$5 million contract to modernize the hotel's 27 existing units. The contract (Otis's largest modernization job to date) called for the replacement of the old electro-mechanical controllers with Otis Elevonic® microprocessor controllers and the installation of new cabs made from exotic woods with custom-designed brass car controls. The modernization job was to take place in four phases, the first scheduled to begin in November 1986 and the last to be completed by September 1988. During the entire operation, the elevators in the Waldorf-Astoria had to be available for continual use, so Otis would need to schedule work around the hotel's busiest periods and ensure that some cars in each elevator bank were operational at all times.

Securing the Waldorf-Astoria modernization contract was a time-consuming and complex task. Otis escorted Waldorf-Astoria representatives to the prestigious Wrigley Building in Chicago, in order to demonstrate the superior performance of another Elevonic® system in operation. They also took trips to Eastern Car, Inc. in Cincinnati, Ohio (the vendor completing the cab renovations), to tour the assembly operations, and to Farmington, Connecticut, to meet with Otis senior management. Throughout the negotiations, several trips were made to Otis's main production facility in Bloomington, Indiana, to ensure that all phases of the job could be completed on time. According to Jack Taylor, who managed the modernization project for Otis in New York, "We got the job because we were the company that could best combine the hotel's tradition of

* This case was prepared by James M. Lattin, Associate Professor of Marketing and Management Science, Graduate School of Business, Stanford University, and George Von Klan, Branch Manager Far West Region, Otis Elevator Company. Financial figures do not represent the actual financial results or performance of the companies detailed herein. The actual names of competing firms, vendor companies, and individuals have been disguised. Copyright © 1989 by the Board of Trustees of the Leland Stanford University. All rights reserved. Used with permission.

elegance with state-of-the-art technology, and complete the project on time and within the established budget.' In addition to the modernization job, the Waldorf-Astoria also signed a five-year, full-service maintenance contract with Otis.

Despite the success of the Waldorf-Astoria project, modernization had historically been a minor business segment for Otis (especially in North America). Otis was organized to manufacture and install equipment in new construction and to provide service and maintenance for existing equipment, and the company was a market leader in both areas. However, a recent study commissioned by Otis suggested that there might be considerable potential in the modernization market, and these findings gave Otis management cause to rethink the company's approach to modernization.

Otis Elevator: Company Background

Otis Elevator Company took its name from the inventor of the safety elevator, Elisha Graves Otis, who founded the firm in 1853. In subsequent years, the company introduced a number of elevator innovations, including the first electric elevator in 1889, the first gearless traction elevator in 1903, and the first use of signal control in 1924. Over the years, Otis developed its reputation as the industry leader, devoting itself to the design, manufacture, installation, and service of elevators, escalators, and moving sidewalks.

In 1985, Otis was the world's largest elevator company. In the global market, (estimated at \$9.5 billion, 60 percent of which is service and the remainder new equipment), Otis recorded sales of \$1.9 billion. Otis's share of the worldwide revenues from the sales of new elevator equipment was 22 percent. Otis also maintained approximately 17 percent of the 3.3 million elevators and escalators installed worldwide. Eight of the ten tallest buildings in the world used Otis elevators. The company carefully nurtured its reputation for high quality, and priced its products and services at a premium relative to its competition in most markets.

Otis was divided into four separate operating divisions: North American Operations, Latin American Operations, Pacific Area Operations, and Europe Transcontinental Operations. Unless specifically mentioned otherwise, the remainder of this case deals with the elevator market and Otis's activities in North America.

North American Operations (NAO)

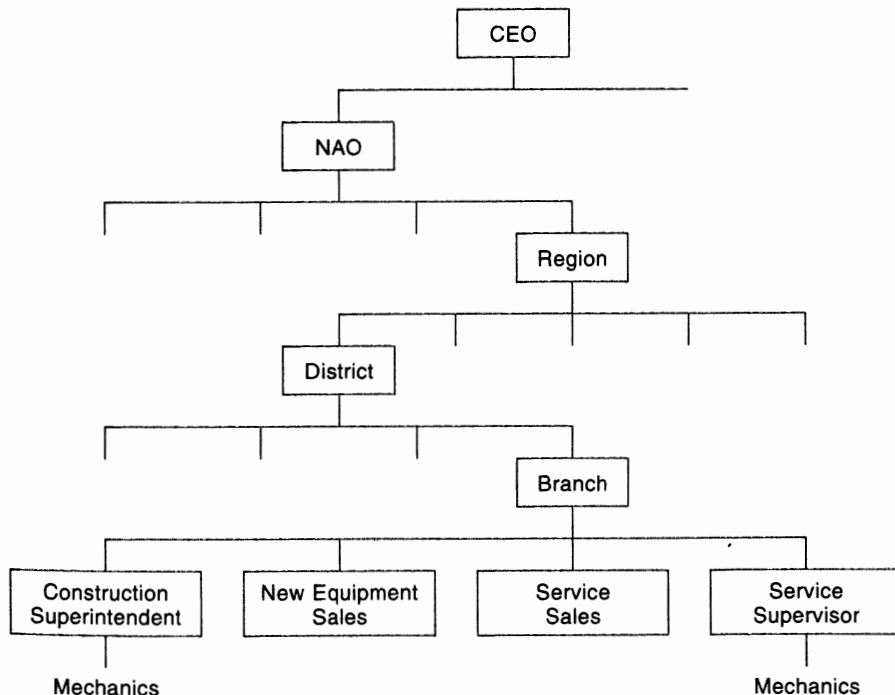
NAO was comprised of the United States and Canada, with sales of new equipment and service totaling over \$743 million in 1985 (approximately 40 percent of worldwide sales). NAO sold its products and services directly to the customer through a network of 180 district and branch offices (hereafter called *field offices*). Field offices performed activities at virtually every stage of the

elevator life cycle: recommending the type and configuration of equipment initially sold to the customer, installing the equipment, maintaining the equipment over the life of the building, and in some cases refurbishing or upgrading the equipment (also called *modernization*). Field offices varied in size from two or three people in a small town to a few hundred people in a major metropolitan area. Field offices were operated as profit centers.

In addition to the field offices, NAO was divided into five regions whose function was to both direct and support the field offices. The organization is diagrammed in Exhibit 1. Regions were also operated as profit centers, and were headed up by a vice president who reported directly to the president—NAO. Regional offices supported the field offices by:

- Assisting with planning and control items like budgeting and payroll.
- Providing technical sales support in the form of engineering expertise.
- Performing “value added” processing activities such as drafting, contracting, estimation, and ordering.
- Overseeing sales activity for the various field offices.

EXHIBIT 1 Otis NAO: organization



The marketing function at NAO was headed up by the vice president of marketing, whose staff consisted of about 30 individuals. The Communications Group made up the largest portion of the marketing department and was responsible for promotional materials, public relations activities, and employee newsletters. There were other smaller marketing departments, each made up of a handful of individuals, dealing with New Equipment Product Management, Service Operations, and Market Planning.

NAO Organization: New Equipment

New Equipment, as its name implies, consisted of selling and installing new elevators and escalators in newly constructed buildings. New equipment was not the most labor-intensive part of Otis's business. Materials generally accounted for about 60 percent of the costs associated with new equipment, with labor accounting for the remaining 40 percent. Different elevator technologies were appropriate for different end uses, including the following.

Hydraulic elevators. Designed for use in low-rise buildings (up to six stories), these elevators rarely exceeded speeds of 150 feet per minute. The hydraulic market was largely dependent upon construction of low-rise office buildings and apartments. In recent years Otis had increased hydraulic market share by introducing a standardized product of lower cost.

Geared elevators. These units, typically installed in mid-rise buildings (up to 20 stories), travelled at speeds up to 400 feet per minute. The geared market was dependent on both office and apartment construction. Recently, Otis had become concerned with the cost-competitiveness of its geared product offerings. NAO was planning to introduce a new geared product by late 1987 or early 1988.

Gearless elevators. These elevators were designed for buildings over 10 stories and travelled at speeds up to 1800 feet per minute. The gearless market was extremely dependent upon office space construction. In recent years competition in this category had been characterized by severe price pressure. Otis was the technological and market leader for gearless elevators, where its products offered superior performance, principally in speed and dispatching capabilities.

Escalators. Otis also manufactured and installed escalators. Escalator sales were dependent upon retail construction, which typically lagged residential construction.

The following table shows the product by applications mix for new elevators prevailing in 1985:

	Fewer than 5 floors	5-20 floors	More than 20 floors
Hydraulic	72%	28%	0%
Geared	22	76	2
Gearless	0	48	52

In 1985, the total size of the new equipment market (unit volume of elevators and escalators) was 19,679 (of which there were 1615 gearless elevators, 4,599 geared elevators, and 12,405 hydraulic elevators). In dollar terms, the new equipment market in 1985 was \$1.364 billion (with \$325 million in gearless, \$468 million in geared, and \$473 in hydraulic). Because of the competition in the industry, gross margins on new equipment were often less than 10 percent.

In 1985, Otis's approximate market share of the industry unit volume was 20 percent in the hydraulic and geared markets and 40 percent in the gearless market (down from its usually higher market share due to foreign competition entering the North American market).

Sales. New equipment was sold by a sales force of new equipment sales representatives who worked out of Otis's field offices, serving all building segments (apartments, offices, shopping centers, hospitals, hotels, airports, etc).

For smaller projects, such as a few hydraulic elevators, the elevator manufacturer was selected by either the general contractor, architect or building owner. As project size increased, such as for the construction of a high-rise office building, all three parties were often involved in making the decision about what company to buy elevators from. Also, as project size increased, factors such as technology, quality, and reputation became more important, and the complexity of the selling task increased. For these larger projects, new equipment representatives relied on OtisPlan[®], a computer program used to simulate elevator performance. OtisPlan[®] helped determine the optimal elevator configuration for a building based on layout, population estimates, and traffic conditions, while still maximizing net rental space.

The sales process consisted of coming up with a bid proposal that would be accepted over the competition, based on price, equipment performance, and installation schedule. If a proposal was accepted, the new equipment representative was responsible for staying in contact with the customer until construction was completed and the elevator installation was turned over to the customer. Most new equipment included New Installation Service (NIS), an initial maintenance contract (typically for one year) included in the new equipment price. Once the equipment installation was finished and covered by NIS, the customer became the responsibility of a service sales representative.

Successful new equipment representatives developed a network of relationships with builders in their area to stay on top of new construction activity. They also relied on *Dodge Reports* for listings of new construction projects.

Market. The market demand for new elevators and escalators was highly dependent upon office and apartment construction. Together these construction segments comprised almost 80 percent of the total dollar value of elevator and escalator sales in typical years.

Sustainable demand for office space through 1991 was projected to average 250 million square feet annually. Actual new capacity additions had exceeded this amount over the past five years (since 1981). The accumulated surplus office space was reflected in high vacancy rates in most cities, with national rates at 16.5 percent in downtown areas and 22.0 percent in suburban areas. It was expected that it would take three or four years before the excess capacity could be absorbed. The high level of market saturation and the uncertainty arising from tax reforms (which might reduce the benefits of accelerated depreciation) were also expected to reduce the amount of new construction activity. According to DRI, office construction and apartment construction were forecast to decline through 1988 (see Exhibit 2). There was also some concern over the possibility of a recession around 1990.

EXHIBIT 2 DRI construction forecast
(million square feet)

<i>Date</i>	<i>Office building</i>	<i>Apartment building</i>
<i>Actual</i>		
1983	285	690
1984	320	760
1985	330	725
<i>Forecast</i>		
1986	260	640
1987	200	550
1988	170	510
1989	180	560

New equipment sales for Otis NAO had more or less followed construction activity from 1983 to 1985. With the forecasted decline in construction, new equipment sales were expected to drop to \$289 million in 1986 and as low or lower in 1987 and 1988. Increasing pressure from competition was expected to keep margins on new equipment sales at low levels.

NAO Organization: Service

Service consisted of those activities that were performed after the elevator was installed and turned over to the customer. In contrast to new equipment, service was much more labor intensive. Roughly two-thirds of the costs associated with a full-service maintenance contract was labor; the remaining third was materials.

Two important types of service were contractual maintenance and repair. Contractual maintenance referred to contracts that were sold to building owners or property management firms to maintain the elevators in their buildings. In

NAO, contractual maintenance made up approximately 75 percent of service revenues and was the single-largest source of profits. Given that elevators usually lasted the life of the building, which could be 40 years or more, it was not surprising that maintenance was such an important business segment.

When evaluating different elevator companies, maintenance customers were typically concerned with minimizing service interruptions, reducing exposure to liability, and extending the life of their equipment. Otis maintenance was perceived by many to be the best in the industry, and was priced at a premium. Gross margins on service could run as high as 40 percent. The Otis "full service" contracts guaranteed that the elevators covered would be maintained to like-new performance specifications.

Otis tracked its net gains in maintenance contracts from year to year by adding up the number of contracts gained from *conversion* (those customers converted to Otis maintenance following the expiration of the initial NIS period) and *recapture* (those customers convinced to switch to Otis maintenance) and subtract the number of contracts lost to *cancellation*. Since 1983, the annual number of contracts gained from conversion approximately equaled the number of contracts gained from recapture. During the same period, the number of cancellations held steady at about 4,000 per year.

The major portion of Otis's maintenance portfolio consisted of equipment manufactured by Otis (see Exhibit 3). The standard term for a maintenance contract was five years, although contracts could be written for longer or shorter periods.

Repairs not covered by the Otis maintenance contract (which were performed at the customer's expense) were typically billed to the customer based on time and materials, with a markup for profit added on. If no major components of an elevator system were to be replaced and the total was less than

EXHIBIT 3 Installed elevators and escalators in North America
(by maintenance contract)

	1983	1984	1985
Maintained by Otis			
Otis	76,105	76,934	75,075
Other	8,954	9,734	12,537
Maintained by other major			
Otis	21,320	22,365	23,500
Other	142,680	145,533	150,650
Maintained by regional/independent			
Otis	42,101	42,588	45,200
Other	122,899	126,412	127,228
No maintenance contract			
Otis	28,189	27,763	32,404
Other	73,811	77,737	74,996
Total installed base			
Otis	167,715	169,650	176,179
Other	<u>348,344</u>	<u>359,416</u>	<u>365,411</u>
Total	516,059	529,066	541,590

Source: Company records.

\$10,000, then work would usually be billed “open order.” Open order repairs were rarely bid by competitors, and often consisted of routine items. Gross margins on open order repairs were similar to the margins on contractual maintenance. Open order work was usually completed fairly quickly.

Sales. Otis relied on its force of service sales representatives in its field offices to sell maintenance contracts. Service sales was usually an entry-level job in the Otis sales organization and once a service sales representative gained sufficient experience, he or she would often be promoted to new equipment sales. Service sales representatives covered a much larger customer base than new equipment representatives and the dollar value of the individual contracts they sold was smaller.

Market. Compared to new equipment, the contractual maintenance market was quite stable year to year, growing at an annual rate of less than 3 percent (see Exhibit 3). In 1985, the installed base of elevators and escalators in North America exceeded 540,000; in dollar terms, total industry service sales in 1985 totaled \$1783 million.

For Otis NAO, service sales had been growing steadily over the past three years and were expected to continue to grow to \$423 million in 1986.

NAO Organization: Field Operations

Otis had a substantial labor force of trained mechanics who performed construction and service work. Among NAO's 8,800 employees in 1985, 2,200 were new construction mechanics and 3,300 were service mechanics. Elevator mechanics were regarded as skilled tradespeople, and were paid accordingly, with wages over \$30.00 per hour in some parts of the country. Otis was acknowledged to have the best-trained mechanics in the industry. All Otis mechanics were members of the International Union of Elevator Constructors (IUEC).

Mechanics working in new construction were the most affected by swings in the level of local construction activity, whereas mechanics working in service were usually employed throughout the year. Mechanics reported to a supervisor who was usually a former mechanic who had moved into management, and was responsible for providing technical and administrative support.

Maintenance mechanics were assigned a “route,” which consisted of various buildings whose elevators the mechanic maintained, and the units within each route were assigned to one mechanic only. A typical route might have 50 or so units. The maintenance mechanic played an important role within Otis aside from performing maintenance, since he was continually in contact with the Otis maintenance customers on the route. Although profitability could be calculated by route, it was difficult to calculate the actual profitability of individual maintenance contracts. Informally, however, the maintenance mechanics and their supervisors were aware of which maintenance contracts were the most or least troublesome.

Once a year the maintenance supervisor visited each contractee to perform a maintenance survey, consisting of an inspection of the elevator and a review of the work completed by the mechanic. The survey also resulted in a letter to the customer identifying any work needed on the elevators but not included in the maintenance contract. Another, more limited review of maintenance was performed directly by NAO headquarters personnel, who inspected randomly selected contracts every two years in each field office. This served to ensure maintenance quality consistent with company and customer expectations.

One of the main issues facing the Otis service organization was the level of "callbacks" within Otis NAO. Callbacks were calls by maintenance customers to Otis due to a problem or interruption in service (such as an elevator shutdown) and were the greatest cause of customer dissatisfaction with Otis maintenance. In order to dispatch mechanics more effectively when callbacks occurred, OtisLine® was introduced in 1983. OtisLine® was a centralized 24-hour toll-free trouble-shooting and dispatching service operated out of NAO headquarters in Farmington. OtisLine® was also used to collect data on different types of callbacks by field office, cause of callback, and type of unit. It was estimated that there were five callbacks per unit per year within NAO, and that on average each callback consumed two to three hours of a mechanic's time.

Competition

Otis faced competition from several major elevator companies, as well as many smaller regional and independent companies.

Mason Elevator was Otis's strongest competitor in North America, with elevator-related profits in 1985 of \$51.9 million. Mason was the market share leader in the hydraulic and geared new equipment, and number two in the gearless market. Mason's strengths were its proven products and its ability to price competitively to gain market share. Mason had been particularly successful at developing products that were easy to install, and in offering pre-engineered elevators that incorporated expensive options as standard. Mason's activity was limited primarily to North America, with only 6 percent of the global new equipment market.

Consolidated's Elevator Division was traditionally NAO's strongest competitor, although over the past decade its position had been deteriorating. Recently, Consolidated had acquired Trotter, one of the largest regional modernization contractors in the United States. Consolidated had the second largest installed base of elevators in North America.

Osaka, a Japanese elevator manufacturer, entered the U.S. market in 1982. They had been a vigorous competitor in the gearless markets in selected metropolitan areas, where they often bid jobs at substantially less than Otis's cost. Osaka seemed to be determined to establish a position in the North American market, despite the presence of well-established competitors and enormous start-up costs. Osaka focused on ride comfort and quietness as its main selling points, and was viewed favorably by building managers and developers regarding quality and technological capability. In 1985, Osaka had 15.7 percent share of the North American gearless market.

Winkler, headquartered in Europe, was the second-largest elevator manufacturer in the world, and was the number one player in many markets in Europe. *Winkler* had 11 percent of the global new equipment market; in recent years, they had become a more vigorous competitor in North America by acquiring smaller regional companies and pricing very competitively.

Nippon Elevator was the largest Japanese elevator manufacturer. Although *Nippon*'s market share in North America was very small, its entry into the U.S. market was seen as a potential threat by Otis NAO. *Nippon* was offering technologically sophisticated products such as their latest variable frequency drive geared elevator and their new spiral-type escalator. *Nippon* had been concentrating its efforts on a limited number of new equipment projects in California. *Nippon* had 6 percent of the global new equipment market.

Regional contractors were smaller firms that limited their activity to a certain geographical area. Within the given area, they were often quite established. Regional firms were successful in hydraulic and geared new equipment, where they were able to offer a relatively simple product at a lower price than the major manufacturers. Regional firms also competed with the major national firms by offering maintenance contracts for name brand equipment. They typically offered less comprehensive maintenance than the major manufacturers at two-thirds the price.

Because major manufacturers such as Otis focused their efforts primarily on larger projects involving their own brand of equipment, regional contractors were often quite successful in addressing specialized market segments neglected by the major manufacturers. These firms often had capable engineering staffs which included modernization specialists. Some regional firms had developed preengineered modernization packages, which helped reduce the amount of time elevators had to be taken out of service when performing modernization work.

Regional firms had their own field force of mechanics (usually IUEC). Overall, regional contractors were able to offer competitive performance for projects that did not require state of the art technology or large financial resources.

In addition to the regional contractors, there were smaller, independent contractors, consisting typically of the owner, a designer and a few mechanics (maybe IUEC—non-union mechanics were paid substantially less than union mechanics and were less skilled). Independents usually had no engineering staff, and were not involved in the new equipment market. Their prices for maintenance contracts were 25 percent to 35 percent lower than the regional contractors.

Declines in Otis NAO service margins in recent years were attributed in part to increased costs (such as product liability, workers' compensation insurance, FICA, SUI, FUI, etc) and greater competition. Exhibit 4 provides additional information concerning new equipment and contractual maintenance market shares for Otis NAO and its competitors.

EXHIBIT 4 New equipment sales and contractual maintenance
(by company): North America

<i>New equipment sales (units)</i>				
	1983	1984	1985	1986*
Otis	4,442	4,868	4,714	3,833
Mason	6,264	6,326	6,786	5,878
Consolidated	2,374	1,985	1,948	1,523
American	1,659	1,428	1,623	1,431
Standard	731	327	338	284
Winkler	733	969	503	465
Osaka	43	261	460	496
Nippon Elevator	0	0	19	55
Other	3,661	3,023	3,288	2,753
Total	19,907	19,187	19,679	16,718
<i>Contractual maintenance (units)</i>				
	1983	1984	1985	1986*
Otis	85,050	86,668	87,612	89,134
Mason	34,900	37,000	39,300	41,500
Consolidated	37,500	38,500	39,900	40,800
American	29,000	29,200	29,750	30,500
Standard	8,200	8,150	8,200	8,300
Winkler	23,400	24,750	25,400	26,000
Osaka	0	0	450	850
Nippon Elevator	0	0	0	0
Other Major	31,000	30,298	31,150	31,050
Regional/Independent	165,000	169,000	172,428	175,333

* Forecast.

Source: Company records.

Elevator consultants. In the past decade or so, elevator consulting firms had become a significant factor in the elevator industry. These were relatively small firms whose principals often had over 20 years experience in the elevator industry, usually with major manufacturers. They specialized in assisting building owners with elevator decisions (e.g., by recommending the carrying capacity, speed, location, and brand of elevators for a new building). There was sometimes an adversarial relationship between consultants and industry sales representatives.

Modernization

Modernization, simply defined, was the renovation of elevator systems to improve appearance or performance. The appearance of an elevator system could be enhanced by replacing or refurbishing cab interiors, lighting, hallway entrances, and fixtures (e.g., hall buttons and position indicators). The performance of an elevator system could be improved through the use of technological advances to decrease waiting times, reduce elevator crowding, and improve the comfort of the ride.

One of the most common performance modernization items involved upgrading the elevator controller (a device that controlled the acceleration, deceleration, and direction of the elevator; where there was more than one elevator, a “group” controller was needed to coordinate the dispatching of the elevators to calls at different floors). Replacing or overlaying an electromechanical controller with a microprocessor controller could result in a 25 percent to 50 percent improvement in elevator service. Performance modernization projects often also included upgrading or replacing door mechanisms, power supplies, hoist ropes, car frames, and rails.

Modernization projects varied in size from minor appearance improvements (costing a few thousand dollars per car) to very large performance projects involving replacement of one or more components in all the elevators of a large building (costing \$100,000 to \$200,000 per car). A large performance modernization project required at least eight months for design, bidding, and negotiation and another eight months to complete construction. Major projects also required considerable technical and marketing expertise. The variety and degree of customization of larger modernization projects made them more difficult to understand and manage than either new equipment sales or service sales.

Modernization appealed to building owners and managers because it allowed them to improve tenant satisfaction, retain and attract tenants, and increase lease revenues. Modernization sometimes also appealed to building owners and managers simply because they could no longer obtain parts for their old elevators.

In choosing a company to perform modernization work, owners and managers typically looked at a number of different characteristics:

- The contractor’s reputation and skill in similar modernization jobs.
- Price.
- Bid responsiveness, with respect to scope, reaction time and follow up.
- Availability and price of subsequent maintenance contract (customers often purchased a maintenance contract from the firm that modernized their equipment).
- Familiarity with equipment through current service contract.
- Personal relationship with contractor.
- Referrals from other owners.
- Conformity with owner’s schedule (there was usually a rush to complete modernization projects once they were started in order to minimize the disruption of elevator service to building tenants).

The Modernization Market

In the mid 1980s, the market for modernization began to attract the attention of Otis NAO. In 1984, management commissioned Industrial Marketing Consultants, Inc. (IMC) to do a study on the potential of the modernization market and

the possible opportunities for Otis. IMC examined the characteristics and size of the modernization market in cities (including New York and Boston) where the installed base of elevators was older on average. In 1984, New York City had the largest installed base of elevators (nearly 52,500 units) of any city in North America. There were 22,500 elevators in place in 15,000 apartment/condo buildings, 11,000 elevators in 1,500 commercial office buildings, and 1,500 elevators in 500 hotels. In 1984, Boston's installed base was less than 7,000 units.

Market characteristics. In their survey, IMC found that customer attitudes toward modernization varied substantially, as shown in Exhibit 5. IMC

EXHIBIT 5 Customer Attitudes toward Modernization

<i>Description</i>	<i>Agent</i>	<i>Service</i>	<i>Modernization attitudes</i>
Residential			
Condos	Owners	O&G	Fix as breaks
Apartment building	Owners/Management	POG	Cosmetic; keep leased
Commercial			
Office/single	Direct maintenance	Full	Best; minimize time in elevator
Office/multi	Owner/Developer	Full	Cosmetic first; service to keep tenant
Hotel	Direct maintenance	Full	Stay competitive; highly cosmetic

Notes:

O&G stands for "oil and grease," the least expensive service offering.

POG stands for "parts, oil, and grease," about half the cost of full service maintenance.

Source: Industrial Marketing Consultants, 1984.

also found a wide range of modernization activity. In NYC, jobs ranged from as little as \$5,000 or less (refurbishing cab interior) to as much as \$200,000–\$350,000 (complete cab, controller, door operator, and machine rehab). A list of modernization projects, and their approximate price ranges, is shown in Exhibit 6. IMC estimated that the likelihood of securing a maintenance contract following a modernization job varied with the size of the job. Following a small job (6 stop), the likelihood that Otis would come away with a maintenance contract was estimated to be 50 percent. However, the success rate increased to 85 percent for the larger performance modernization jobs.

EXHIBIT 6 Typical modernization projects in New York City in 1984

<i>Project (number of stops)</i>	<i>Value (thousands)</i>
Cab interior (6)	under \$5
Controller and door operator (6)	\$ 5–\$15
Controller, door operator, and machine rehab (6)	\$ 15–\$40
Overlay and door operator (25)	\$ 40–\$60
Group controller and door operator (25)	\$ 60–\$100
Controller, door operator, and machine rehab (25)	\$100–\$150
Controller, door operator, and machine rehab (50)	\$200–\$350

Source: Industrial Marketing Consultants, 1984.

While studying the market in New York City, IMC found that the majority of modernization projects were relatively small in size (less than \$40,000) and mostly in residential buildings. Projects over \$40,000 were mainly commercial in nature. Exhibit 7 shows the price distribution of all 2,665 modernization projects undertaken in New York City in 1984. Over 80 percent of modernization revenues came from commercial buildings (average project size \$100,000) and 20 percent from residential buildings (average project size \$11,000). IMC estimated that New York City alone accounted for 20 percent to 25 percent of the modernization market in North America.

EXHIBIT 7 Distribution of modernization projects in New York City in 1984

<i>Project Value (thousands)</i>	<i>Number of Projects</i>	<i>Approx Total Value (millions)</i>
Under \$5	600	\$ 2
\$ 5-\$15	900	\$ 7
\$ 15-\$40	300	\$ 7
\$ 40-\$60	400	\$ 20
\$ 60-\$100	150	\$ 14
\$100-\$150	225	\$ 32
\$150-\$200	50	\$ 9
\$200-\$350	40	\$ 9
	2,665	\$100

Source: Industrial Marketing Consultants, 1984.

Competition. IMC found that regional contractors had traditionally been most successful in their pursuit of modernization. In NYC, for example, four regional contractors accounted for 46 percent of the modernization market in 1984 (each doing more modernization business than any major elevator company). In Boston, three regional contractors accounted for half of the 1984 modernization market.

Competitive margins on modernization varied dramatically, depending upon the size of the project. Very large performance modernization projects (those in excess of \$150,000) were competitively priced like new equipment, with gross margins below 10 percent. Small appearance modernization jobs (less than \$15,000) were priced more like full maintenance contracts, such that gross margins ranged from 25 percent to 40 percent. Projects in between were priced with gross margins ranging between 10 percent and 25 percent.

IMC found that elevator consultants played a very important role in the modernization decision. Elevator consultants were virtually always retained by owners for large modernization projects, since the consultants' expertise was often useful in understanding how to combine the older technology in a client's existing elevator system with various new technologies in order to increase the performance of the elevator system in a reliable, timely, and cost effective manner. In NYC, over 80 percent of the total contract value of modernization in 1984 involved elevator consultants.

Decisions on Modernization

In 1986, the important question for Otis NAO management was not *whether or not* to pursue modernization, but *how*. Several key questions needed to be answered.

- *What are the advantages for Otis of a full-scale modernization effort?* The first step for NAO management involved defining the company's strategic objectives with respect to modernization. Such a strategic direction was necessary before Otis could go about designing a modernization program and putting it into place.
- *How should Otis organize to pursue modernization?* Traditionally, Otis had organized to support its new equipment and service businesses. Should modernization be treated as a separate area or somehow be included into the existing organization? A closely related question involved the responsibility for selling modernization. Service sales representatives had the opportunity to identify new prospects for modernization through direct customer contact or by speaking with the route maintenance mechanic. However, because of the wide range of modernization possibilities, Otis service sales representatives were sometimes unfamiliar with modernization options available to the customer. They also tended to be less experienced than new equipment representatives in handling larger projects.
- *What market segments should be targeted and what modernization products should Otis develop?* For most of its modernization work, NAO either adapted its own new equipment components to modernization applications or purchased components from suppliers. National and local elevator equipment suppliers provided components such as cabs, door mechanisms, fixtures, relay logic controllers, and solid state controllers. Otis had been moderately successful replacing the relay logic controllers on older Otis equipment with its Elevonic® microprocessor controller. NAO was planning to introduce other, less costly products in 1986 designed to offer upgrades in elevator appearance and safety, such as the OtisVoice® (a programmable, electronically synthesized voice message) and the Lambda® door detector (an infrared sensor designed to reverse the elevator door without physical contact with the passenger). Both OtisVoice® and Lambda® had been developed as new equipment products. However, management was concerned that the adaptation of new equipment products might miss some of the opportunities that a dedicated modernization product development effort might catch. Furthermore, the mix of products under development would depend upon what segments of the modernization market were targeted.