the period 1967 to 1977 the value of shipments for this portion of the industry nearly trebled; inflation may be the cause for part of this increase. During the same period the Biologic Products and the Medicinals and Botanicals sections increased even more.

It may also be seen that companies are currently much larger than in years past. This is primarily due to a combination of both growth factors and the number of mergers within the drug industry. It is noteworthy that in the face of dramatic overall growth of the industry as a whole, the number of companies declined.

The last two columns in Table 11-1 indicate important characteristics of the drug manufacturing industry—its reliance on and involvement with other manufacturing industries. The Specialization Ratio referred to in the first of these two columns indicates the percentage of the total output of the company that can be classified as a product of that industry. Thus, 13% of the output of the Pharmaceutical Preparations segment in 1977 consisted of products that actually fit into other industries.

The last column is primarily an indication of the percentage of all *products* that would be classified within that industry. An important part of what the Census would consider as biologic products or medicinals and botanicals were actually produced by companies classified in other industries. These facts are important in recognizing that the pharmaceutical industry is perhaps even larger than statistics would at first indicate.

Table 11-2 provides data for 1972 and 1977 on the magnitude of various therapeutic categories of the pharmaceutical preparations industry.

Pharmaceutical Manufacturers Association

Perhaps the best, although as yet incomplete, view of the prescription drug manufacturing industry can be obtained from statistics compiled by the Pharmaceutical Manufacturers Association (PMA). In this section we will present data dealing with the members of that association taken from two PMA publications, *The Prescription Drug Industry Factbook* (1980) and the *PMA, 1979–1980 Annual Survey Report.* Both these publications are issued regularly, and you are urged to refer to current editions for updated information. Both contain a wealth of data.

The Pharmaceutical Manufacturers Association is a nonprofit scientific, professional, and trade organization. Its active membership is comprised of 144 firms that are principally engaged in the manufacture of prescription pharmaceutical, medical device, and diagnostic products. The manufacturers promote these products primarily to health practitioners licensed by law to prescribe, administer, and dispense them. Financial support of the PMA is

TABLE 11-5. *United States Sales and R & D Pharmaceutical Expenditures by Product Class*

PRODUCT CLASS	SALES (%)	GAIN OR LOSS OF MARKET SHARE, 1972–1978 (%)	R & D EXPENDITURES (%)
Central nervous system	23.6	−9.2	16.8
Anti-infectives	15.0	+17.2	18.9
Gastrointestinal and genitourinary	11.8	+10.3	6.2
Neoplasms and endocrine	9.7	−19.2	16.4
Vitamins and nutrients	9.6	+26.3	2.4
Cardiovasculars	9.4	+11.9	16.6
Respiratory system	7.8	+18.2	4.0
Dermatologicals	2.9	−12.1	3.1
Other	10.2	−19.0	12.4

Source: Pharmaceutical Manufacturers Association: *PMA, 1979–1980 Annual Survey Report*, Washington, DC: Pharmaceutical Manufacturers Association, 1981, p. 13.

TABLE 11-6. *Average Discovery Costs and Testing Expenditures Per Marketed New Chemical Entity**

	DISCOUNT RATES							
	MILLIONS OF 1967 DOLLARS				MILLIONS OF 1976 DOLLARS			
	5%	8%	10%	15%	5%	8%	10%	15%
Post-IND test only	10.1	11.5	13.8	15.7	18.5	21.0	25.2	28.7
Post-IND test plus preclinical animal toxicity	11.2	12.9	14.1	17.5	20.5	23.6	25.8	32.0
Allocated discovery cost 3-year allocation period	13.1	16.6	19.6	29.2	24.0	30.4	35.8	53.8
Total	24.3	29.5	33.7	46.7	44.5	54.0	61.6	85.4

*Inasmuch as pharmaceutical R & D requires a capital investment with a return on investment delayed by several years. Professor Hansen has established a "present value" or "capitalized value" to the point of marketing approval for the sums involved. The capitalized value varies with the interest rate considered most appropriate. A selection of alternative discount rates is shown in this table.

Source: Hansen, R. W.: *Regulation and Pharmaceutical Innovation*, Rochester: University of Rochester, 1976.

TABLE 11-9. *Ethical Pharmaceuticals Manufacturers' Direct Human Use Dosage Form Sales in the United States by Class of Customer, 1969–1979 (Odd Years, Percentage Share of Sales)*

CLASS OF CUSTOMER	1969	1971	1973	1975	1977	1979
Wholesalers	47.6%	46.4%	44.9%	46.9%	49.1%	53.0%
Retailers	29.9	30.0	29.6	27.6	25.5	22.5
Private hospitals	12.2	13.2	14.7	14.7	15.1	14.9
State and local government hospitals	4.0	4.8	4.9	4.6	4.5	4.0
Federal hospitals	2.9	2.8	2.9	2.6	2.7	2.3
Other federal government	1.0	.9	1.2	1.1	1.3	1.4
Practitioners	1.8	1.5	1.4	1.2	1.1	1.2
Manufacturers, repackagers, and other direct sales	0.6	0.4	0.4	1.3	0.7	0.7
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Pharmaceutical Manufacturers Association: *PMA, 1979–1980 Annual Survey Report*, Washington, DC: Pharmaceutical Manufacturers Association, 1981, p. 6.

In addition to roles organizational character, defined as being a product of "its method of work, its natural allies, its stake in the course of events, the predispositions of its personnel, and the labels which have become attached to it,"[4] also helps lend stability and predictability to industry relationships. The specific channel member (e.g., wholesaler or retailer) possesses a definite self, distinctive character, and ways of acting and perceiving different from other such organizations. It behaves in accordance with specific roles or sets of prescriptions defining what its behavior should be. The other firms in the distribution channel are able to anticipate its behavior and, similarly, it can foresee the behavior of dependent channel members.[5]

It is patently impossible for each organization in the drug industry to have ready knowledge of the organizational character of all others, although some companies, such as Lilly, McKesson, and Walgreens, have developed such a recognized character. Moreover, in many cases, the character of one organization is known to another one or to a few representatives. Thus, the Syntex detail man *is* the Syntex organization in the experience of the pharmacies in his territory.

The concept of organizational roles also presents problems. This is particularly true because smooth industry functioning is most likely to occur when all parties have a mutual perception of the roles of all organizations in the system. This obviously does not occur quickly, but rather is the result of long-term and increasingly successful performance in a particular role. Other members of the industry, through experience, tend to prescribe

A similar reduction is achieved in order processing, invoicing, and all associated costs, with the genuine advantage of fewer opportunities for error. Computerization of this process overcomes the difficulties of human order takers and depersonalizes inventory control for maximum economic benefit.

Wholesaling, then, *concentrates* merchandise appropriately by assembling an assortment from diverse manufacturers, and *disperses* the right amount to the indicated point of sale in the quantity required (Fig. 12-1). This concentration-dispersion function is often characterized by the terms "sorting" or "breaking bulk." Local availability in response to demand is an important factor in the value added by sorting.

Market proximity in an economic sense refers to local availability and the utilities of place, timeliness, and possession. Next-day delivery from wholesalers is possible virtually everywhere in the United States, and same-day delivery can be achieved in many urban markets. For reasons of cost efficiency, however, there is a trend toward fewer deliveries per week from wholesalers to the pharmacies they serve.

Siecker has provided an interesting example that recognizes this trend and relates it to turnover improvement. He noted that two-thirds of the funds in a typical pharmacy are tied to the purchase and resale of inventory, and he then emphasized the problems of ordering too frequently "because scarce dollars are supporting lazy stock." His example continued with the following:

> If a pharmacy were designed to operate on a two-week order cycle . . . the theoretical inventory turnover would exceed 17 for the year. Obviously, it would be tough to make that figure. But what if 10 turns was a realistic figure for this model? Compare that with the norm of about four turns per year, and suddenly thousands of dollars could be extracted from lazy inventory, easing the cash flow crunch, allowing more flexibility on promotional purchasing and improving return on investment.[8]

Concentration of Purchasing Power

An extension of this reasoning leads to the primary supplier concept. More pharmacists now recognize the benefits that can be obtained by ordering less often from a single wholesaler—a concentration of the purchasing pattern. Similarly, wholesalers are seeking out the best-managed pharmacies in a given market in order to concentrate and improve their customer base.

Some attrition is unavoidable during periods of growth. Improperly managed, underfinanced businesses at both the wholesale and retail levels leave the market to the strongest competi-