Chemical Marketing: The Challenges of the Seventies

A symposium sponsored by the Division of Chemical Marketing and Economics at the 156th Meeting of the American Chemical Society, Atlantic City, N. J., Sept. 9-11, 1968

Robert L. Bateman

Symposium Chairman

ADVANCES IN CHEMISTRY SERIES 83

AMERICAN CHEMICAL SOCIETY

WASHINGTON, D. C. 1968

Library of Congress Catalog Card 68–57115

PRINTED IN THE UNITED STATES OF AMERICA

Advances in Chemistry Series

Robert F. Gould, *Editor*

AMERICAN CHEMICAL SOCIETY PUBLICATIONS

FOREWORD

ADVANCES IN CHEMISTRY SERIES was founded in 1949 by the American Chemical Society as an outlet for symposia and collections of data in special areas of topical interest that could not be accommodated in the Society's journals. It provides a medium for symposia that would otherwise be fragmented, their papers distributed among several journals or not published at all. Papers are refereed critically according to ACS editorial standards and receive the careful attention and processing characteristic of ACS publications. Papers published in ADVANCES IN CHEMISTRY SERIES are original contributions not published elsewhere in whole or major part and include reports of research as well as reviews since symposia may embrace both types of presentation.

PREFACE

The chemical industry in the Seventies can look forward to little, if any, relief from the many challenges of the "Competitive Sixties." There is every indication that in the coming decade, the industry will have to continue to contend with the profit squeeze, high obsolescence of plant facilities, higher labor and increasing raw material costs, proliferation of large modern facilities in overseas countries many of which are located adjacent to abundant low-cost raw materials, and a general reduction of tariff and other trade barriers.

The marketing of the huge world-wide output of the industry will demand the best talents, and the proper organization and facilities within each company to recognize and successfully meet the challenges of the coming decade, The chemical industry—its technology, its products, its organization, its markets—is now multi-national. The solutions to the challenges of the Seventies therefore will be found only by recognition of the change to a world-wide market for chemicals.

The challenges facing the industry are now more similar for each segment—organic and inorganic, plastics, and agricultural chemicals—than nine years ago in 1959, when the book "Chemical Marketing in the Competitive Sixties" was published. With these changes in mind, the symposium "The Challenges of the Seventies" was organized with the same format but expanded to include two additional areas of increasing importance. Again, leading industry executives present their views of the broad challenges. Others, chemists who are authorities on the direct and complimentary phases of the marketing function—selling, technical service, market development, market research, distribution, and advertising—present their solutions to the broad challenges earlier identified. The organization of the marketing function within the present day diversified, multi-product chemical corporations is of increasing significance to the success of the enterprise and this topic has been covered in two additional papers. The chemical industry today employs the computer as a problem-solving tool in a wide variety of technical, accounting and business areas. Marketing's use of the computer in sales analysis, inventory and distribution control, and long-range forecasting of future chemical prices and demands has been added in the two concluding papers.

In presenting this symposium, it is hoped that the authors of these 21 papers, by their individual contributions will assist materially the chemical industry in re-establishing itself as progressive, growth-oriented and profitable to consumers and investors alike.

Special acknowledgment is made of the assistance of John B. Bell of American Cyanamid Co. and Frank E. Dolian of Commercial Solvents Corp. in helping to organize the symposium.

New York, N.Y.
July 1968

ROBERT L. BATEMAN

The Challenge in Marketing for Agricultural Chemicals

J. F. BOURLAND

American Cyanamid Company, Wayne, N. J.

With world food production due to rise dramatically, in what nations will the rise be greatest? What will be the best locations for the plants to produce the agricultural chemicals for these nations? In view of the far-reaching changes taking place in farms and farming techniques, what marketing methods will best reach the large farm of tomorrow without disrupting the network of distributors and dealers, which will be needed for decades to come? What adjustments will be needed to meet the intensified competition as patents on important agricultural chemicals expire? In the fertilizer business, what adjustments will be necessary to bring the farmer the benefits of low costs from the high capacities now building and to assure adequate return to the producer?

Almost ten years ago, Allan Clow undertook to list the major challenges marketers of agricultural chemicals would be facing in the competitive 1960's. Today, as we near the end of the decade, it is interesting to review what they were:

Heading his list was the challenge of coping with increasingly stringent requirements for obtaining government clearances on new products. This certainly deserves to remain near the head of any list of challenges for the decade ahead. The requirements for registration today are far more complex and costly to comply with than could have been imagined ten years ago.

Product obsolescence was next on the list with the need this imposed on each marketing team to be quick in recognizing changes in customer preference and in modifying its marketing strategy. Our industry can be proud of its past achievements in new product development. Nevertheless, major new challenges in product innovation lie ahead as farming technology continues to advance. Further discussion of this topic appears warranted today.

Need for marketers of agricultural chemicals to adapt themselves to changes in the government's program of price supports and acreage restrictions was third on the list of challenges for the Sixties. The past several years have given us a strong reminder that this challenge is still with us. Over a three-year period, government policy has swung wildly from restriction of acreage to stimulation of production and back again to severe restriction. We are likely to have this problem with us until the needs of our own growing population, coupled with the needs of nations abroad for the output of American farms, make all-out production desirable.

Adjustment to the gradual changes taking place in the character of farms and farming methods was fourth on Allan Clow's list. The pace of these changes quickened as the Sixties progressed, and farming is now well along in the transition from a "way of life" to big business. The creation of marketing plans to match this transition will be one of the major challenges of the Seventies.

Contending with the cost-price squeeze was last on the list although by no means the least.

Allan Clow's list was a good one. These were indeed the challenges of the Sixties for marketers of agricultural chemicals. As we look ahead to the Seventies, all of these problems are still with us, largely unresolved. Over the years, however, there have been important shifts in relative importance, and several new problems have emerged which we must recognize.

We are becoming accustomed, as we look ahead, to viewing the problems and challenges of agriculture on a global basis. We have been hearing a great deal in recent years about the population explosion, especially in the less-developed nations of Asia, Africa, and Latin America. It is generally agreed that it will be years before this population growth can be checked, and that expansion of the world's food production in the meantime must become dramatic if widespread starvation is to be averted.

The anticipated increase in the total world demand for food is shown in Figure 1. This projection calls for an increase in world food production of 20% between 1970 and 1980, and of 72% above the 1970 level by 2000. Expansion in food output to match these needs will undoubtedly be one of the major tasks not only of our generation but of the next several generations to come.

For us, as marketers of agricultural chemicals, a key question for the Seventies is this: Just where will the additional food needed to feed the world population be produced? Back in the 1930's, the less-developed nations of Asia, Africa and Latin America—considered as a group—were net exporters of grain, but in the 1940's the food surplus of these nations shifted to a deficit, and they have since been net importers, in steadily increasing amounts.

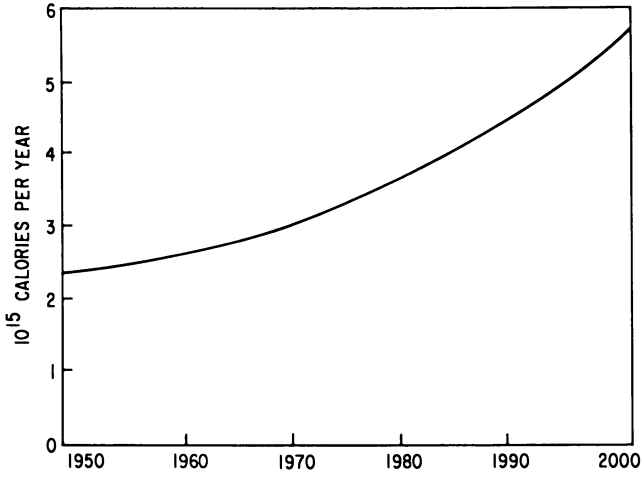


Figure 1. World food demand

Source: (1) "The World Food Problem," the President's Science Advisory Committee, Volume II, May, 1967. (2) Projections beyond 1985 based on United Nations "Medium" projections as shown in "The Future Growth of World Population" (UN Publication Sales, No. 58 XIII 2).

There is, of course, little question that the North American farmer can expand his output greatly. For many years American agriculture has been under wraps. As we demonstrated in 1966-67, the American farmer has the capability of expanding his output substantially on short notice. All that is required is the prospect of reasonable prices for his products.

But is the food to avert starvation in Asia, Africa, and Latin America to be produced on this continent and then moved to ocean ports, transhipped, and distributed—to reach those for whom it is intended only many costly dollars later? The capital investment in transportation and distribution facilities required to solve the world's food problem in this way would be enormous, as would be the direct costs for the food and the transportation.

We have made some estimates—using Pakistan as an example—to illustrate just how expensive this course would be. The results of our calculations appear in Figure 2. As you can see, for $100 Pakistan could import 44 bushels of U.S. wheat.

But instead of importing wheat, Pakistan could import fertilizers and agricultural chemicals. If it used the $100 in this way, it could bring in enough of these materials to make possible the production in

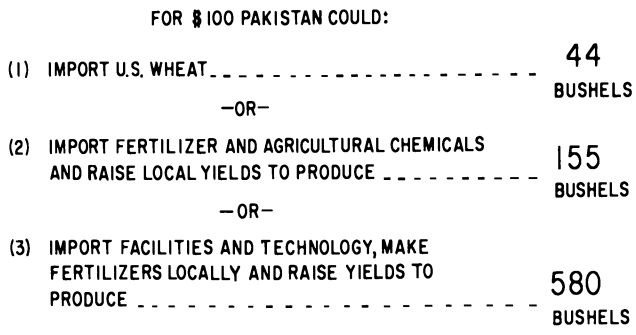


Figure 2. Supplying developing countries with food from the U. S. is costly

Pakistan of more than three times as much wheat as could be imported for the same amount of money—155 bushels.

And Pakistan would have a third option. Instead of importing fertilizers, it could import the equipment and technology to make them. If it used the capital for such facilities and technology, Pakistan could produce enough fertilizers to support the growth of thirteen times as much wheat as the $100 would import—580 bushels.

The shaky position of the dollar in international trade underscores the fact that the United States can no longer be looked to as the principal source of funds for solving the problems of the world. Apart from this, moreover, estimates made by the Department of Agriculture indicate that it would be physically impossible for the United States, even with agricultural production going all out, to make up the food deficit of the less-developed nations beyond the early 1980's. Even if cost were not a factor, we simply would not have the resources to carry the load beyond that point.

Inevitably, much more of the food to feed the people of the less developed nations must be produced within those nations. It is encouraging, therefore, to note that the past year was one of record output for their agriculture as it was for the agriculture of the world as a whole. Most of the developing countries with large populations made substantial gains in production of grain and other foods.

These production gains were owing in part to the rapidly expanding use of new high-yielding strains of rice and wheat which have recently been developed in the Philippines and Mexico. But another factor of perhaps even greater long-range significance is the shift to a policy of providing the farmer—long the forgotten man in the economic planning of many of the emerging countries—with financial incentives. It is this new opportunity to improve his own lot that has motivated the farmer

in these countries to accept the new seeds and cultural practices, and to apply increasing amounts of fertilizer to his fields.

As the acceptance of modern farming techniques spreads throughout the food-deficient nations, vast numbers of new customers for agricultural chemicals and equipment will emerge. This rapid creation of new markets will present unparalleled opportunities for sales expansion. It will also bring to the fore a whole new series of questions to challenge the wisdom and foresight of marketing management. Among these questions are the following:

(1) In what nations will the markets for agricultural chemicals be growing fastest?

(2) Will present product lines be suitable for those markets, or will intensive product modification or development of new products be required?

(3) Who will be the buyers of agricultural chemicals in those markets? Will the decision-makers be governments, cooperatives, or independent distributors and dealers?

(4) Where should the plants to manufacture these products be built? Is it going to be possible to manufacture here in the United States and supply nations abroad with exports, or will it be necessary, because of controls imposed by foreign governments or because of simple economics, to carry out at least some portion of the manufacturing operation in the country of sale?

Answering these questions will be difficult, but finding the best answers will be one of the major tests of agricultural chemical industry management in the decades ahead.

Growth in U.S. Agriculture

Agriculture in the United States would be in for significant growth during the Seventies if only to feed our own growing population. An analysis of U.S. human food consumption in 1960 and an estimate of the projected requirements in 1970 and 1980 appear in Figure 3.

In each food category, the projected increases from 1970 to 1980 are in the neighborhood of 12%, although the increase for sugar is about 19%. And on top of this demand for consumption here at home, the already large commercial export market will continue to expand. Finally, we will continue to respond with gifts of food, as we always have, to the cries for help from those less fortunate than we.

This growth in domestic agriculture will present new opportunities for marketers of agricultural chemicals, but it will bring renewed challenges as well, for the gradual changes in farms and farming methods that Allan Clow foresaw for the Sixties are picking up momentum.

Farms in the United States are steadily becoming fewer but larger. The consolidation of smaller farms into larger ones is reflected in Figure

4 which shows the number and size of U.S. farms for each of the last ten years.

The total acreage devoted to farming in the United States changed very little during this period, falling by less than 5%. As the curves show, however, the number of farms fell by 23%, with average farm size increasing by 24%.

	1960	1970	1980
GRAIN	18.5	21.0	23.6
MEAT	13.0	15.3	17.2
MILK	26.4	27.4	30.7
POTATOES	8.3	9.2	10.3
SUGAR	8.6	9.9	11.8
VEGETABLES	10.8	11.1	12.5
FRUIT	7.6	7.4	8.4
EGGS	3.5	3.7	4.1
TOTAL	96.7	105.0	118.6

Figure 3. U. S. food requirements (million metric tons)

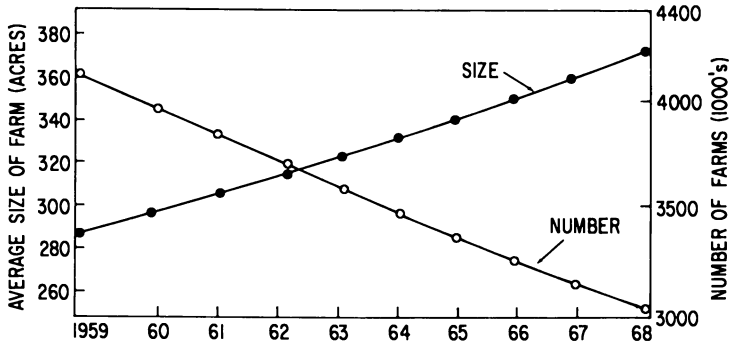


Figure 4. Number and size of farms

This trend toward fewer but larger farms began long before the Sixties, and it is expected to continue through and beyond the Seventies. How far it will go is a good question. Projections of U.S.D.A. data indicate that the present count of about three million farms in this country may well be reduced to the neighborhood of two million by 1980.

Other estimates put the 1980 figure somewhat higher, while others believe the consolidation will proceed even more rapidly.

There may be differences among the experts about how far this trend will carry us, but the trend itself is hardly surprising. Calculations published by *Doane's* last April indicate that even today, the average farm family with gross sales under $10,000 per year would be a good deal better off financially if it rented the farm to someone else and went into non-farm work, or if it sold the farm and invested the proceeds in securities. The same thing is true—although by a smaller margin—for families with gross sales between $10,000 and $20,000. Only after a farmer reaches a gross sales level over $20,000 is he likely to be better off financially in farming than he would be as a landlord or investor. This financial analysis obviously fails to give any weight to the many human factors which will continue to keep families on their farms long after the cold economic facts of life say they should have given up and moved to the city.

Nevertheless, it is this economic pressure which lies behind the steady consolidation of small farms into larger ones. *Farm Journal* predicts that by 1976, average gross income per farm unit will run $25,000 or more—over 50% greater than now—with the figure much higher for farms in the top 1.5 million. Invested capital will go up too. Tractors and equipment of all kinds will be bigger, and there will be more of it. Labor will be more expensive, and to a greater and greater extent automated materials—and animal-handling systems will take over the more routine or disagreeable tasks.

Along with this, larger and larger acreages will be devoted to a single crop, and operational techniques will become more specialized and precise. The more advanced agricultural equipment and chemical formulations will no longer be multi-purpose, but will be designed for a single crop or type of field or animal care. This in itself poses a challenge for marketers of agricultural chemicals: They will be in a constant race to conceive and bring to market new, specialized products and formulations required for these advanced farming techniques, if they are to stay abreast of the competition.

But the challenge presented by the trend toward larger farms, with the heavier investment in equipment and the employment of sophisticated farming methods, will go far beyond the supplying of more sophisticated chemicals and formulations. Whatever shape the farm of the future may take—family farm or corporate, specialized or multi-crop, contract production or free choice—the small farmer will become less and less influential in the key buying decisions. The decision-maker on purchases will be more and more a professional. His purchases will be made in large lots, and he will insist on buying as directly as possible

to get the best price. He will insist on better terms and on more and better technical service. In short, farming will continue to move rapidly in the direction of becoming big business.

Purchasing Habits of Non-Agricultural Small Business Organizations

Let us look at the changes which we have observed to take place in the purchasing habits of other, non-agricultural small business organizations as they grow larger. The small company starts by buying from local dealers, but as it gets bigger, it finds that it can demand services and prices beyond the ability of dealers to supply. At this stage, distributors take over the account. With further growth, the expanding company finds that it can perform for itself many of the services rendered by the distributor, and that it can pay for them by demanding and getting still lower prices—until finally only the basic manufacturer can handle the account. The concentration of more and more business in the hands of fewer and fewer customers has always resulted in an increase in purchases directly from the basic manufacturer.

The same thing will happen with the larger farms. But the transition in which they shift their purchasing from dealers to distributors and then to the basic manufacturer will obviously be long and slow—and, as indicated, it will occur at first only with the largest units. The farm of medium size is not going to vanish, and for a long time to come the purchases of the medium-sized farm will constitute the backbone of our business. The problem for us as marketers of agricultural chemicals, therefore, will be this: How does the manufacturer gear up to compete effectively for the business of his big farm customers without disrupting the still-much-needed distribution chain of formulators, distributors, dealers, and applicators?

Solving this problem will be a prime challenge for marketers of agricultural chemicals throughout the Seventies.

The Challenge of Patent Expirations

This marketing challenge is just now beginning to become of major importance. The modern age of chemical control of agricultural pests really got under way in the late 1940's. With patents running for 17 years, the industry was fairly well protected into the 1960's. But now a number of important patents—especially in the insecticide field—are expiring, and more of them will expire early in the 1970's. Modern herbicides came along a little later than the insecticides. Many of the most important still have patent protection, but later in the 1970's some of these will be expiring too.

As these patents run out, firms which have been "on the outside looking in" will undertake production—not only U.S. manufacturers, but the Europeans and Japanese as well. One way of countering this new

competition is by developing new products on which new patents can be secured. The development of new products is expensive, however, and the timing of their discovery and introduction is at best uncertain. To a large extent, manufacturers of the older products will have to change their strategies, using the marketing methods suited to commodities rather than specialties.

Herbicides and Product Obsolescence

We have been seeing the rapid introduction of new herbicides, each designed for a specific job rather than for a broad spectrum of applications. These new herbicides are challenging the dominance of the older, multi-purpose products. The challenge now is for the marketing man to aid his organization in the competitive struggle by furthering the discovery of additional special-purpose herbicides. He must work in close contact with his research team, identifying major opportunities for them and seeing that the best candidates are selected from among the possibilities uncovered.

Fertilizers

Those in the fertilizer business probably feel that the last few years have presented them with more than enough challenges to last well into the Seventies!

In this industry, the 1960's have been a period of rapid change, and the changes have not yet ended. Prior to the 1960's the structure of the fertilizer industry had been fairly stable. There were large corporations which manufactured basic fertilizer ingredients. They sold these to local and regional manufacturers who in turn produced medium- to low-analysis mixed fertilizers. These were bagged and distributed to farmers through a dealer system.

More recently, the opportunities offered by the fertilizer industry attracted wide attention. Many outside the industry recognized that growth in demand was assured, that there were unrealized technical potentials in manufacturing processes, and that efficiencies might be achieved in distribution. Major engineering firms turned their talents to development of more economical, large-scale production units. Firms with no prior connection with the industry bought these units and aggressively moved to establish their positions in fertilizers, frequently through acquisition of some of the older companies.

The result of all this has been that a large number of major construction programs were initiated. Even before the first round was completed, grain surpluses suddenly disappeared; and this, coupled with recognition of the magnitude of the problem of coping with world hunger, set off a whole new construction binge. This has gone so far that even if we assume that no new projects will be undertaken—and

there is no basis for any such assumption—manufacturing capacity for basic fertilizer ingredients already coming on stream will be far in excess of demand for material from U.S. sources well into the 1970's.

Figure 5 shows the productive capacity for ammonia in the U.S. based upon plants in operation or announced for construction through April 1968. No doubt new announcements will make this portion of the exhibit out of date by the time this is read. It is for this reason that the plot has not been carried beyond 1970. The outlook, however, is that ammonia plants in the U.S. will be operated, on the average, below 70% of the capacity into the early 1970's.

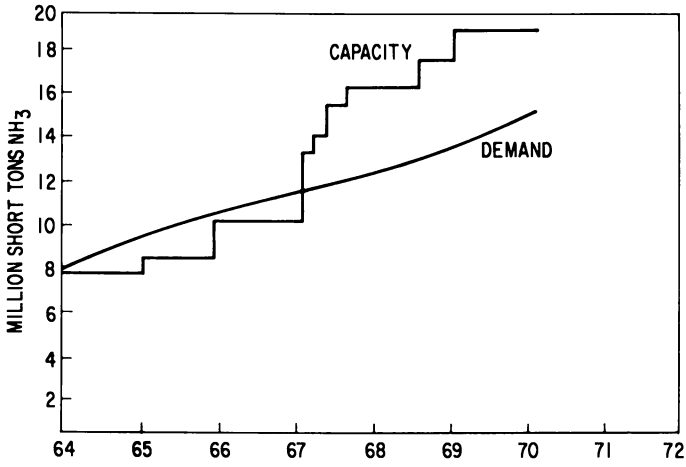


Figure 5. U. S. ammonia capacity and demand

The U. S. Ammonia industry will enter the 1970's with a huge overcapacity.

Ammonia demand is expected to continue expanding at an average rate of 10% per year, and could overtake capacity by about 1972 if there were to be moratorium on new plant construction. That there will actually be such a moratorium seems doubtful as of now. It seems more likely that new plants will continue to be built and that total capacity by 1972 will be higher than shown in Figure 5 even though two to three million tons of old capacity in the form of small plants is shut down in the interim. In addition to domestic capacity, U.S. producers will have to contend with increasing imports from the new large plants now being built in the Caribbean.

Figure 6 presents the same story for wet-process phosphoric acid. Here the burden of over-capacity is already even more oppressive and is likely to be of longer duration.

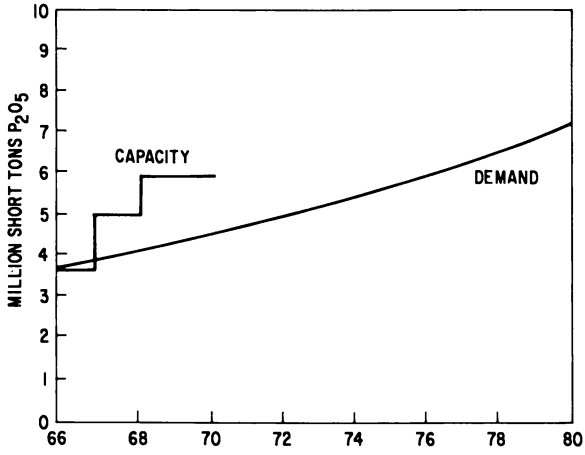


Figure 6. U. S. wet process phosphoric acid supply and demand

Wet process phosphoric acid overcapacity will extend well into the Seventies, even if no new plants are built

In the case of potash, both production and consumption must be examined on a free-world rather than a strictly domestic basis. In Figure 7 we have undertaken—with a good deal of hesitancy—to project potash capacity and demand for the entire free world to 1975.

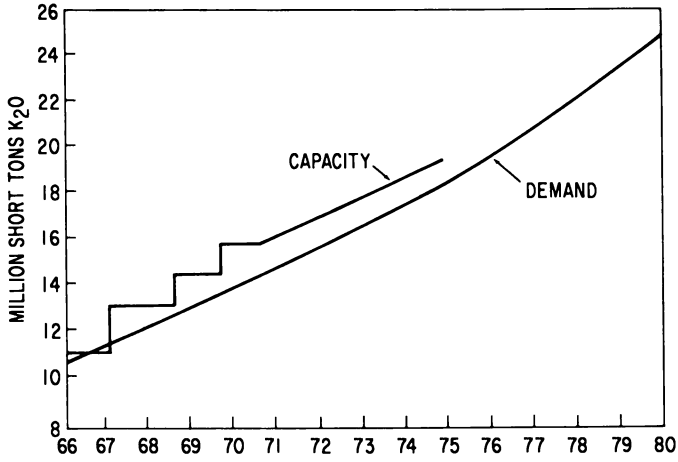


Figure 7. Free world potash supply and demand

World potash overcapacity will persist during most or all of the Seventies

The capacity projection is based upon announced expansions and new projects in Canada, Africa, and the Near East. It includes a considerable amount of expansion which can be made at a minimum of additional investment by producers who already have shafts. Some of the present producers in Canada will probably expand in an effort to lower their costs, and some of the large purchasers of potash will seek captive supplies, regardless of the overall industry supply and demand situation. Western European production will probably level off and even decline slightly.

Basic fertilizer ingredients are, of course, commodities, not specialties, and they must be marketed as commodities. A number of manufacturers of basic ingredients have set up networks of farm service centers for supply of fertilizers and other agricultural chemicals directly to the farmer. These centers offer soil analysis and custom-blended products tailored to individual soil and cultural requirements. The emphasis is on supplying the farmer, not with a commodity, but with a service—although the underlying motivation is obviously to move products.

These farm service center operations represent attempts on the part of manufacturers of basic commodities to move their products by selling "system." Where all this will lead remains to be seen. However, the future success of firms in the fertilizer business will depend on how well the marketing executive meets the challenge of finding the most effective combination of basic manufacturing facilities and sophisticated distribution machinery to enable him to pass on to the farmer the benefits of large-scale fertilizer production—and at the same time deliver a reasonable return on the very substantial capital investment required.

Conclusion

To recapitulate, these are some of the emerging challenges which marketers of agricultural chemicals will be called upon to meet in the Seventies:

(1) With world food production due to rise dramatically, in what nations will the rise be greatest? What will be the best locations for the plants to produce the agricultural chemicals for these nations? What marketing machinery will best fit the conditions to be found in these markets?

(2) How shall manufacturing and marketing be made flexible enough to adjust to the swings in U.S. agricultural production resulting from the vagaries of government control?

(3) In view of the far-reaching changes taking place in farms and farming techniques, what are the marketing methods which will best reach the large farm of tomorrow without disrupting the network of distributors and dealers, which will continue to be needed for decades to come?

(4) How can marketing most effectively contribute to the development of the sophisticated new products and new formulations which will be called for by these advanced farming techniques?

(5) What adjustments in marketing strategy will be required as a result of the intensified competition that will follow expiration of the patent protection on important agriculture chemicals?

(6) In the area of fertilizers, what combination of large-scale production and advanced marketing techniques will bring to the farmer the benefits of the lowest possible costs and at the same time provide an attractive return on their investment to the stockholders?

These are major challenges. Meeting them will call for hard work and high ingenuity. The growth in prospect for world food production, however, assures that the rewards will be great for those who are most successful in meeting the challenges of the 1970's.

RECEIVED June 6, 1968

2

The Challenge in Marketing for Inorganic and Heavy Chemicals

W. F. NEWTON

PPG Industries, Inc., Pittsburgh, Pa. 15222

The major challenge facing the heavy chemical industry now and in the Seventies is satisfactory profits. Some of the factors contributing to the decline of profits in heavy chemicals over the past few years include over capacity, price erosion, the dislocation of exports in some areas, and the rise in distribution costs. As a result of the decline in profits, the financial community has become more selective in its attitude toward equities of heavy chemical producers. Among the challenges in the marketing area are the needs to improve skills in market intelligence, forecasting, development, planning, and pricing strategy. Strengths and weaknesses in relation to competitors must be assessed. Also needed is a dedication on the part of marketing management to the use of mature judgment in directing and controlling operations in such a way that the effects of basic strategies and decisions are measured in relation to profit and return on investment.

The major challenge facing the heavy chemical industry now and in the Seventies can be summarized in two very simple words—satisfactory profits.

One is almost apologetic about approaching such an important subject in such an unsophisticated manner, but it is most important to get at the heart of the matter without delay. Profits are very important to all of us, for without the profit motive, free enterprise is dead.

Obviously, when we talk about satisfactory profits, we are not thinking of a single figure as being satisfactory for all. This is a relative term and what is satisfactory for one company may not be for another, or what may be satisfactory for one company at one time in one product line may not be satisfactory under different conditions. This implies the necessity

for each company to think seriously about specific targets and to judge its efforts in the light of those targets.

For some time, we have used the definition of successful marketing as the creation and satisfaction of a demand at a satisfactory profit. Measured against that definition, many of the heavy inorganic chemicals are not being successfully marketed.

Since we obviously do not have specific information on product lines of individual companies, some more general documentation may be needed to support the observation about an apparent lack of marketing success.

But, first, let's define the major product lines we are considering and characterize the businesses involved. Some of the major products that come to mind most naturally in the category of heavy major chemicals are sulfuric and other mineral acids, caustic soda, soda ash, chlorine, salt cake, phosphates, potash, ammonia, and silicates. These are basic building blocks for the whole chemical and processing industries, and the growth curves for the consumption of these products reflect the economic health of our country. Most of the products considered in this field have had a long period of high tonnage commercial use. Product quality is usually high, although minor differences in quality can often be of extreme importance to some customers. Capital investments per unit of sales are quite high, and "out-of-pocket" production costs are usually quite low; thus, profits must be high in relation to sales to yield a satisfactory return on investment. End-use distribution is usually quite broad. Freight costs represent an important part of the delivered cost to the customer. A high percentage of the volume of the products is consumed by users requiring frequent bulk deliveries in tank cars, barges, hopper cars, box cars, and trucks. Packaged products represent a minor part of the market. We are apt to think of the processes for these products as being mature, yet during the 1960's, we have seen some very significant technological changes involving several of the products. To cite a few—(1) the commercialization of oxychlorination allowing HCl to be used in place of chlorine in many processes, (2) the establishment of natural trona as a major source of soda ash, which together with the substitution of caustic soda for many soda ash uses may number the days of economic operation of some Solvay process plants, (3) the successful adaptation of solution mining to potash, yielding a product of high purity with a low labor input, and (4) developments in ammonia production leading to 1,000 ton-per-day units which make uneconomical the operation of some of the old smaller units. These are far reaching changes for supposedly mature processes.

Next, let's look at some of the points made with respect to the heavy inorganic chemical industry at a similar meeting held in September,

1959. F. A. Gilbert, Vice President of Food Machinery & Chemicals Corporation, then cited the challenges of the Sixties as:

Overcapacity
Cost-price squeeze
Impact of changes in exports and imports
Increasing costs and problems of distribution
Need for better or different human skills

It will be helpful to review and update some of these factors because they are just as pertinent today as they were in 1959.

Overcapacity

The problem can best be illustrated by reference to a typical demand *vs.* production curve shown in Figure 1, taken from a paper by F. A. Gilbert (3). Even though the products we are concerned with show generally rising demand, many factors make it difficult to avoid periods of overcapacity. There are many competing producers of these products, and all are generally anxious to maintain or increase their market penetration. Usually twelve to twenty-four months may be required to

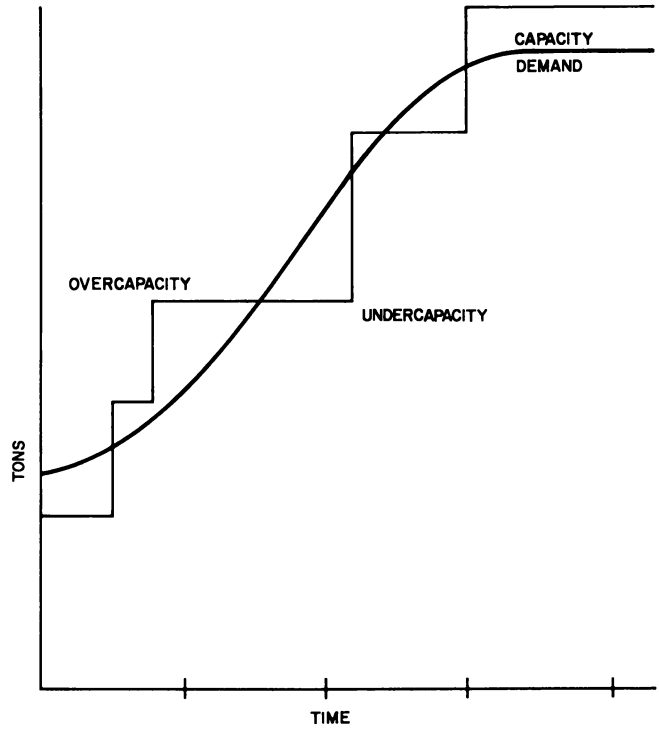


Figure 1. Demand vs. *production capacity*

build new producing units, and the economic size of these units is increasing substantially. Newcomers to the field often build substantially higher volume than can be sold in the early years of production. With all of our sophistication in forecasting, short-term projections can be in substantial error even though our long-term trends may be quite accurate. These combined factors lead to frequent periods of overcapacity which tend to put pressure on prices.

Cost–Price

Added to the problem of pressure on prices caused by various competitive factors, including overcapacity, is the fact of rising costs. Figure 2 shows by index, the relationship of chemical prices, chemical equipment, and weekly earnings of chemical production workers.

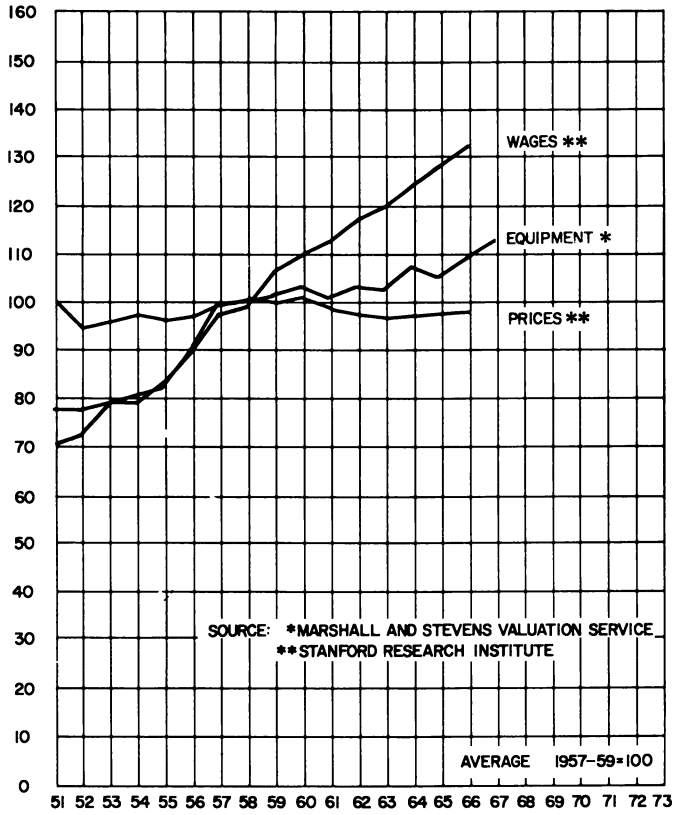


Figure 2. Relationship of chemical prices, equipment, and chemical workers' weekly earnings

That these factors have caused a serious squeeze can be seen from Figure 3, which shows the decline in profits as a percent of sales for basic chemicals compared with the figures for all manufacturers. Because of the high capital investment in basic chemicals noted earlier, chemical profits in relation to sales are necessarily higher than for "all manufacturers" if a satisfactory return on investment is to be realized.

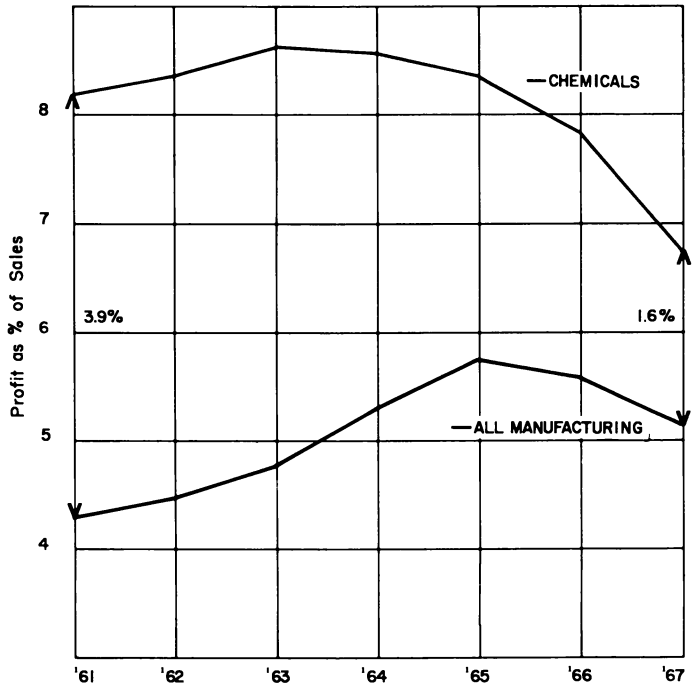


Figure 3. The narrowing profitability gap between basic chemicals vs. *all manufacturing (profits as percent of sales)*

Source: U. S. Dept. of Commerce

A squeeze of this nature pushes up the "break-even" rate of operation, and sets into motion a vicious cycle. Any individual operator can usually show that his profits will be higher if he can operate near capacity even if he obtains the added volume by reducing his prices. Somewhat paradoxically, it is sometimes the most inefficient operator who feels the greatest pressure to gain this additional volume, because his "break-even" rate of operation is so high as compared with the more efficient producer.

Although the strategy of an individual company of reducing prices to selected buyers may result in a short-term gain to that company, almost inevitably the effect of that strategy is a widespread deterioration of pre-

vailing prices to all significant volume buyers. Once prices are lowered, it is difficult to reverse the trend and reestablish satisfactory prices.

Export–Import

Many of the areas of the world which have served as outlets for our products have installed or plan to install capacity for the manufacture of many of these chemicals. Often the major impetus for the building of such facilities is a political and nationalistic one rather than an objective economic justification. Quite often there will be a demand for only part of the output and additional pressure will be put on world markets. Although only a small percentage of this country's heavy chemical sales are dependent on export, even a small reduction of markets in time of overcapacity can have a disproportionate effect.

Distribution

Total distribution costs have continued to rise as a result of freight increases and the addition of many bulk distribution points. For several of the heavy chemicals under consideration, freight rates on a weighted basis by type of carrier have increased approximately 11% from 1960 through 1967.

Current Financial Concern

A review of current trade and financial publications augmented by discussions with investment professionals reveal disturbing verification of concern about profits in certain segments of the industry.

For many years, stocks of most of the chemical producers enjoyed the almost unquestioned confidence of investors and investment advisors. This has been reflected in the ready market for the stocks and the price/earnings ratios which the market has established. Many financial analysts recently have modified their views of the industry and have become much more selective in their recommendations. They are particularly interested in the extent to which a company's earnings depend on commodity type chemicals which are subject to price and earnings deterioration. They want to know more about a company's plans for upgrading from basic products to specialty and proprietary products. Many analysts are far more interested in companies that use chemicals for further processing than in those who produce the basic products. The extent to which this present disenchantment exists is a measure of the lack of confidence the investing community has in the ability of parts of the industry to solve the marketing challenge in a satisfactory way.

Annual reports of many companies speak of moves to build away from a high dependence on basic commodities in an effort to improve the

return to stockholders. Price erosion in basic lines has been the explanation of poorer than hoped for results.

Some quotations from recent articles and statements will further ilustrate the problem.

C. P. Neidig, Partner, White, Weld & Company has the following to say:

While chemical stocks sold at a significant premium over the Dow Jones Industrial Average, that situation is not true today. It doesn't take long to find that the explanation is poor profit performance, and too often poor profit performance can be traced to price erosion in basic commodities. Hence the need for careful selectivity for capital investment.

In an address before the Commercial Chemical Development Association in March 1967, Mr. Neidig said in part:

. . . Some 15 years ago I moved into the financial side and am no longer personally responsible for finding a market for a chemical—but I am very responsible for trying to determine who is discovering the way to make the most profit in finding markets for chemicals—I hope you notice I have inserted the word Profit. To me—and I really don't think I am prejudiced or tainted by 15 years in Wall Street—the chief aim of everyone in this room should be to maximize the profits of his company. This I think is the principal problem facing the chemical industry and therefore especially everyone involved in development. I don't believe I need to remind most of you that investors have not been particularly impressed with the profit growth of the chemical industry in the last five years compared with a good number of other industries.

We can all say that the problem is really that the chemical industry looked so good that everyone else jumped in and made it more competitive—pushed prices down, cut profit margins and this is why chemical profit growth wasn't as good as it should have been.

Certainly the traditional chemical company today would be making a lot more money—and its common stock would be selling much higher—if the petroleum companies, milk companies, trading companies, gas transmission companies, aluminum companies, etc. had not entered the chemical industry. But the point is, they have; They are in the chemical industry and some have done a lot better at making money than have the so-called traditional chemical company. As development men you must adjust to the present conditions and maximize profits under the much more competitive atmosphere.

The following editorial appeared in a recent issue of *Chemical Week* (*1*):

CHAOTIC PRICING HURTS ALL

The startup this month of a 1.5-million-tons/year Canadian potash mine emphasizes anew the over-capacity and pricing problems plaguing the potash industry (*2*).

Since Saskatchewan potash became a major source of supply a few years ago, average prices have declined more than 25%—to a point

where only the largest of the new plants show a meager profit; and the older plants, such as those in Carlsbad, N.M., are unprofitable and are being closed down. These setbacks have shown up in the earnings statements of of U.S. potash producers and in the prices of their stock shares.

While low prices are a windfall for potash users, there is a potential danger in relying on sources outside of the U.S. for our major supply. These sources are subject to regulation by the Canadian federal or Saskatchewan provincial governments, and a weak domestic industry would be in no position to bargain.

Symptoms of Malaise. But the potash situation is just one example—one symptom—of a malaise that has affected, and in some cases is still affecting, other chemical products such as ammonia, synthetic fibers and plastics. Price competition in these and other products has trimmed profit margins in many companies to the point where cash flow is insufficient to meet rising costs, stockholders' expectations and investment needs, thereby forcing recourse to outside financing in a time of tight and expensive money. This in turn raises the cost of borrowing for other high-priority needs such as housing, consumer credit and public works.

Traditionally, new chemical products are introduced at prices that reflect low initial demand and correspondingly high unit production costs.

Then as markets grow, economies of larger-scale production justify lower prices, which in turn permit penetration into new markets. Also, process improvements or new processes utilizing lower-cost raw materials often trim production costs.

But eventually these once special products achieve—or, more properly, are relegated to—commodity status. At this point capacity is sufficient to satisfy known markets, new markets are difficult to find, and further growth approaches the rate of general industrial growth. No longer does a price cut expand the market; and if one producer cuts the price to garner a larger share of the existing market, his advantage is short-lived since other producers must either match his price or lose their business to him. Nobody wins—not even the consumer, for in the long run he will get poorer service or be forced to depend on a dwindling number of suppliers.

No Easy Path. Our antitrust laws properly regard conspiracy-fixed prices as a threat to competition, but unrealistically low prices pose a similar threat of reducing the number of competitors.

There is no easy path out of this maze. Very often a courageous price boost by one producer is timorously not followed by others.

We are not advocating inflation. Commodity chemical prices, with few exceptions have fallen or at best remained level during a long period of rising prices elsewhere in the economy. We are simply advocating a common-sense pricing philosophy that will conserve the financial health of all sectors of the chemical industry.

Excerpts taken from an article by Al Wyss *(4)* cite the investment opportunities in the chemical industry while at the same time stressing the need for selectivity:

The fading glamor of the chemical industry in the eyes of security analysts and investors in recent years is not without some justification but as is frequently the case the dimming process has extended too far and has become too all-inclusive, obscuring the big growth and profit potentials of some producers.

Increased Capacity. However, the chemical industry, even though growing vigorously has suffered increasingly in the last several years from an intensification of competition as various producers expanded capacity and new producers from other fields such as the petroleum industry, moved more and more into various areas of the chemical business. The resulting increase in the number of producers and in the production of many chemical products has been and still is an important factor in the squeeze on profit margins in this industry.

Although new and large and efficient facilities have resulted in lower production costs, the sharp rise in capacity has actually made it difficult in a number of chemicals to achieve price levels showing a good return.

Industry Wide Factors. Selectivity has, in fact, become even more important in the chemical industry than in other fields.—

For the industry generally, most economists and experts on chemicals agree that growth seems assured. But growth itself is a source of some of the problems the industry faces. The rapid growth of demand for such chemical products as fertilizers, synthetic fibers and plastics, to mention only a few of the more outstanding, has spurred a corresponding vast surge of expansion and attracted new producers. This has resulted in capacity in a number of instances, such as ammonia and nitrogen fertilizers, to run ahead of demand.

The impact of the surge of new production and new producers, both in the U.S. and around the world is, however, very complicated and the ability of various companies to weather intensifying competition varies. Some companies have a more balanced product mix or have more efficient marketing and distribution facilities which can give them the edge.

A number of companies in the industry also are taking steps to improve profitability of operations along several lines and it is interesting to note that in the past some have been more successful along such lines than others.

Why Be Concerned

Is the matter of satisfactory profits to the heavy chemical industry of sufficient concern to warrant prolonged and detailed discussion? After all, in spite of some of the problems cited, we are talking about big "blue chip" companies with hundreds of millions of dollars invested, with many millions of dollars of profits, and with impressive growth forecasted. First, we should remember that we are talking for the most part about product lines within broadly based chemical companies. Secondly, for proper perspective, it is vital that we focus on return on money invested in specific product lines rather than on total dollars of profit.

We are in a period of limited availability of capital with attendant high costs for borrowing and other means of financing. The continued forecasted growth in demand for our products, the very large sums required to build large, modern facilities, and the pressure to maintain or improve market penetration, all create substantial competition within companies for funds for various projects. Many companies today have more projects requiring funds than they are willing to provide for. Thus, return on investment becomes a very important basis for selection.

A relatively low return over an appreciable period of time can lead to a general delay of expansions and result in serious shortage. While a shortage of sufficient duration can help to correct pricing dislocations, and is really part of the competitive process we believe in, the lack of availability of the basic building blocks at the time needed can indeed have a serious effect on the economy of individual companies as well as industry in general.

Obviously, not all of the problems to be solved are the specific responsibility of marketing organizations. Problems such as compeitive technology, low-cost construction, high productivity, competitive labor costs, optimum plant locations, properly priced raw materials—all of these factors have a very important bearing on profits. General management and operations management have their work cut out for themselves. We have seen that any complacency about so-called mature processes can lead to a company being left behind the competitive parade.

Before attempting to state affirmative views respecting the solution of the unsatisfactory profit problem or challenge, it should be made abundantly clear that a market rig or a price agreement involving competitive producers does not offer an acceptable solution. Not only would such conduct violate our antitrust laws, and they are enforced these days by both the government and by private plaintiffs, but of at least equal importance that kind of conduct in the long run would most certainly destroy our free enterprise system. Further, it should be clear that this is no attempt to label all price reductions as bad marketing, or to imply that lower costs resulting from scale-up in size of producing units and technological developments may not very wisely be used as a basis for lower prices.

Specific Challenges

What then are some of the things we need to do better if we are to meet the marketing challenge of the Seventies?

First, we need to vastly improve our skills in market intelligence, forecasting, development, planning, and pricing strategy. We are not talking just about statistical skills, but we need to know a great deal more about customers and competitors, such as strengths, weaknesses, objectives, and probable reactions to various courses of action which might occur. We need to be sure we have a proper assessment of our own strengths and weaknesses in relation to our competitors.

Second, we need a dedication on the part of marketing management to the use of mature judgment in directing and controlling operations in such a way that the effects of basic strategies and decisions are measured in relation to profit and return on investment. Drive for volume at all costs, over-reaction to rumors in the market, decentralization of pricing responsibility too far down the line, the naive assumption that competitive facts are not lawfully revealed in the market place—all of these factors will diminish as marketing management successfully faces up to its task.

Rather simple solutions to a complex problem you may say. Perhaps, but the fact is that, simple or not, many have failed to meet the challenge of the Sixties and unless more attention is paid to the simple, basic solutions, more will miss the mark in the Seventies.

We have tried to deal frankly with some of the problems of some segments of the chemical industry but this should not be construed as pessimism, for there is a great deal to be optimistic about in this vital, exciting, and growing industry. Some companies are finding ways of meeting the challenge—more will. Those who do not, will fall by the wayside. The Seventies can offer all of the personal and corporate challenge that any of us could wish for if we are to meet the test of successful marketing—the creation and satisfaction of a demand at a satisfactory profit.

Literature Cited

(1) *Chemical Week* p. 5 (April 27, 1968).
(2) *Chemical Week* p. 98 (April 20, 1968).
(3) Gilbert, F. A., ADVAN. CHEM. SER. **24**, 23 (1959).
(4) Wyss, Al, *J. Commerce,* (May 6, 1968).

RECEIVED May 27, 1968.

The Challenges in Marketing for Organic Chemicals

J. P. CUNNINGHAM

Shell Chemical Co., New York, N. Y. 10020

The manufacture of tonnage organic chemicals, such as ethylene, benzene, and their major derivatives, has become a mature and sophisticated business. Prices have trended steadily downward at variance with the behavior of other commodities and of general economic indices. Capital has moved in from new sources, attracted by the lure of diversification, the promises of new engineering technology and the increasing availability of process know-how and patent licenses. Product specifications are becoming more widely standardized, and practices characteristics of other businesses, such as product exchanges and toll conversion agreements, are becoming more common. As competitors increase in number and attain equivalent production efficiency, greater responsibility devolves upon the marketing man who is called upon to support the risky or discretionary assumptions in the decision making process.

Organic chemicals are most simply described as compounds of carbon. The reader has already encountered products falling within this definition in an earlier chapter on agricultural chemicals as he will later in the chapter on plastics. Even after these two large areas have been carved out for separate attention, there remain so many organic chemicals of industrial importance that further narrowing of the field will be necessary to bring this discussion into focus. Since the trends of greatest interest to a marketing man are most clearly evident in the history of commercially established products, we shall confine ourselves arbitrarily to compounds for which the U.S. has in place or in prospect a production capability of at least a billion pounds per year. Typical are such aliphatics as ethylene, ethylene oxide, vinyl chloride, and acrylonitrile and such ring compounds as benzene, phenol, styrene, and cyclohexane.

Since the publication in 1959 of the predecessor volume "Chemical Marketing in the Competitive Sixties," the tonnage organic segment of the chemical industry has reached an advanced stage of maturity and sophistication. It has lived through shutdowns, acquisitions, mergers and a good many soul-searching corporate reorganizations. The men in white coats who appeared so regularly in its advertising have been giving way to incisive young men with order books at the ready. It has truly become "market oriented." Let us examine some of the factors which have accelerated this process and the lessons the recent past holds for the salesman preparing for the next decade.

Price

Time-honored practice in a market analysis such as this is to open with a comprehensive study of supply and demand, using more and more statistical refinements as the numbers grow larger and the differences between them more difficult to assess, and to wind up with a discussion of price tailored to fit the remaining available space. In years gone by, chemical marketers were sometimes permitted a similar approach, deferring the real point of their presentations until after they had established a sympathetic atmosphere. Unfortunately times have changed, particularly where major organic chemicals are concerned, and the salesman, as well as the writer who presumes to give him advice, is well advised to go directly to the heart of the matter, and that is product price.

As various organic chemicals have approached and entered the billion-pound category in recent years, their selling prices have tended to decline at rates well in excess of those projected by the most realistic industry forecasters. This has been the subject of many articles in the literature; from these, and standard reference sources, the following approximate unit prices have been picked for purposes of example:

	1958	(¢/lb.)	*1968*
Ethylene	5		3
Ethylene oxide	15		10
Vinyl chloride	12		6
Acrylonitrile	27		15
Benzene	5		3
Phenol	18		9
Styrene	12		8

The period was admittedly one of strong growth in consumer demand, but the same conditions also prevailed for other commodities, some of which are selling today at higher prices than they did ten years ago. The organic chemical business has obviously been subject to some special economic factors which merit separate mention and illustration.

New Sources of Capital

As diversification has become the popular route for corporate expansion, organic chemicals have displayed considerable appeal to entrepreneurs in other industries seeking investment opportunities for surplus cash. Among these have been several oil companies who found themselves supplying more and more feedstocks to neighboring chemical plants whose technology was becoming increasingly similar to their own. The flame of interest was further fanned by engineering and construction firms, many of whom have gone to great lengths to place themselves in position to offer their clients complete process designs and highly automated plants on a guaranteed turnkey basis. The late entrants appear in the marketplace with some new competitive advantages, not the least of which is the fact that they have been able to leapfrog the entire laborious research, process development and market development process which the traditional producer was staffed and organized to handle as a fact of life.

Process Licensing

Coincident with this broadening of the operating base was the expiration of many patents, and, more importantly, the willingness of many owners of new processes and know-how to make them available on a royalty basis. This had become common practice in the oil industry during World War II, and the licensing of petroleum refining processes has since become a highly competitive business.

A company entering the manufacture of many of the billion pound organic chemicals today can license all the patents he needs and acquire the operating know-how from his contractor; in some cases the latter will provide the complete package along with a computation of the profitability of the venture. Advertisements to this effect appear regularly in the trade journals. A handy reference for potential licensees was provided in *Chemical Engineering* under the heading "Chemical Technology for Sale or License" (*1*). This excellent review listed 114 licensor companies, with mailing addresses and telephone numbers, and the list of available chemical processes covered 22 pages of fine print.

Licensing has become widespread in inorganics, plastics and elsewhere. Among organic chemicals, ethylene oxide and acrylonitrile provide good examples of the extent to which it can change the domestic and world picture. Ethylene oxide, one of the earliest U.S. petrochemicals, had been traditionally manufactured from ethylene *via* ethylene chlorohydrin. As recently as 1961, the market was dominated by this process and by two major producers, although the direct oxidation of ethylene was known to be feasible and economically promising. Five years later, active licensing of the new process had completely

altered the situation, and a tabulation in *Chemical Week* (2) indicated that of some 50 plants of all types throughout the world, 28 were to be operated by licensees. More up-to-date information is more difficult to obtain in a period of continued activity and some plant changeovers, but it has been estimated that there is in the free world today, built or committed, direct oxidation capacity totalling 5 to 6 billion pounds, and that by 1970 at least 50% of the world supply will be by producers employing purchased patent rights and operating technology.

During the same period, the manufacture of acrylonitrile has undergone an even more striking change as improved new processes, based on the reaction of propylene and ammonia, became available for license. Prior to 1960, the bulk of the free world's annual output of some 300 million pounds was produced from acetylene and hydrogen cyanide. At the present time it is believed that only three plants employing this classic process are still in operation, and that by 1970 most, if not all, of the projected capacity of 3 billion pounds per year will be based on propylene. The major licensor will himself produce less than ten per cent of the total, and will undoubtedly enjoy greater income from royalties, which are currently estimated to be running at a rate in excess of $10,000,000 per year.

Chemical manufacturers who license their competitors can of course expect to meet them in the marketplace. The more conservative attitude of old-line companies in the past was based on a desire to maintain the advantages of their novel advances at least until their research and development costs had been recouped, and this is, of course, the principle behind the seventeen-year monopoly inherent in a U.S. patent. The recent change of view towards licensing can be attributed first to the increased availability and attractiveness of the opportunities, but also to an appreciation of the constant threat of process obsolescence. Modern enlightened self-interest, with its emphasis on the time value of money, tends to choose the course with the assured payout and let the salesman handle the market problems as they occur.

It is not surprising that countries whose industrial development lags behind our own greet our licensing representatives with special warmth, and are willing to devote scarce hard currency to the purchase of what they have to offer. For example, Czechoslovakia, in negotiating recently for a $400,000,000 loan in dollars from the Soviet Union, has given top priority to the acquisition of U.S. chemical processes, ahead of highway construction equipment and transport. Some of these countries, unfortunately, have different ideas than our own with regard to the protection of property rights, and reconciliation by international patent litigation may present some problems. They may also be counted on to ap-

pear in world markets as soon as their internal needs are satisfied, and to sell their marginal production as aggressively as necessary to secure needed foreign exchange.

Economics of Plant Scale

Pioneers in the manufacture of organic chemicals typically built relatively small and flexible plants which grew with the market, and moved to multiple sites to provide security of supply and prompt delivery service to their customers. The inclination of the new engineering-oriented competitors, on the other hand, has been to erect huge, single-line production units at locations of minimum cost and to develop distribution and marketing stategies to fit. Since some of these plants are practically inoperable below high percentages of rated capacity, some traditional approaches have been abandoned or telescoped in time and proprietary product merchandising has given way to the methods of commodity trading.

The trend towards giant units has been particularly striking in the case of ethylene. As recently as 1961, a plant with a rated capacity of 250 million pounds was considered large and was normally tied in with captive consuming operations. By 1966, 400 million pounds had become virtually standard for a new installation, and several had been built to serve the merchant market. At the present time, at least three units designed to produce 1 billion pounds per year each are either under construction or in various stages of final commitment in the United States.

Ethylene is of course a basic building block from which chemical synthesis may branch out in many directions. The move towards large units to shave fractions of cents from unit manufacturing costs, however, is extending to derivatives such as styrene and vinyl chloride. Until relatively recently a styrene plant could operate profitably at the rate of 100 to 200 million pounds per year. New engineering and risk capital have now raised this competitive threshold to around 300 million pounds, and units capable of one-half a billion are coming on stream.

The *Oil, Paint, and Drug Reporter* (3) carried an article scare-headed: "Vinyl Chloride Mart Upheaval: Small Plants Fleeing the Scene as Big Units Reach Completion," in which the recent demise of four small plants with a combined capacity of 270 million pounds capacity was recorded and closings affecting another 400 million pounds of older capacity were predicted to follow. The following table from that article shows the effect of the trend toward giant plants in the relatively short period of two years in which a net increase of 50% of U.S. capacity is expected:

Vinyl Chloride Capacities [a]

	Jan. '68	*Late '68*	*Late '69*
Allied	—	500	500
American Chemical	170	170	170
Conoco	600	600	600
Diamond	100	—	—
Dow	450	450	1,150
Ethyl	375	375	375
General Tire	20	—	—
Goodrich Chemical	520	1,000	1,000
Monochem	300	300	300
Monsanto	150	150	150
PPG	150	300	300
Tenneco	200	200	200
Union Carbide	350	350	350
Totals	3,385	4,395	5,095

[a] Millions of pounds per year

The Commodity Approach to Selling

The giant production unit and the degree of cost consciousness it generates place some traditional attitudes and selling practices in a new light. The new merchant producer, unencumbered by any long development history, takes a coldly realistic view of his product. He is quick to see and to convert into cents per pound the cost of multiple specifications and of special product grades for hopelessly small end-uses.

Viewing his product as a definable commodity, he can see no objection to exchanging with a competitor if by so doing he can realize some saving in freight or utilize additional storage to his advantage. As the customer becomes adjusted, he in turn may derive supply benefits equivalent to or greater than those he enjoyed under the direct-supply proprietary system.

It follows with equal logic that the realistic operator, conscious of the profitability of marginal production, will dispassionately consider utilizing surplus capacity to process a competitor's raw materials or intermediates into products identical with his own. On other occasions, the roles may be reversed and he may find it advantageous to reduce or suspend own manufacture to take advantage of an opportunity for more attractive toll conversion or outright purchase.

The salesman must recognize and adapt himself to these and other inevitable changes as part of the cost of competitive survival. Some of these will undoubtedly become sources of trouble at customer interfaces

which he had thought would adhere forever, and he will have to show new ingenuity and new vision to meet them and establish lasting relationships on a new basis.

The Challenge

It is abundantly clear that the marketing man will henceforth occupy a position of increasing importance in the justification of capital ventures in the organic chemical business. As the engineers reduce more and more of their variables to rigorous equations, attention will focus on the accuracy and credibility of the inputs he must supply such as forecasts of offtakes and price.

He will have to know a lot more about his customer, his customer's business, and the specific needs he can fill which will set him apart ever so slightly as a preferred source of supply. Since his long-range success must be founded on trust and confidence which will survive changes in purchasing personnel, he should not strive to maintain by superficial and expedient means relationships in which there are inherent weaknesses or flaws. Payment will ultimately be made only for value received and useful services rendered the consumer.

In providing these services he will not be able to pass on responsibility as freely as he may have in the past to supporting departments in his own organization who no longer have the same room for maneuver. He must be increasingly aware that extra grades, special quality requirements, emergency shipments, multiple warehouses, and extended credit all bear price tags that he cannot ignore.

His cost consciousness must extend into areas which may have previously enjoyed some organizational shelter. He must look critically for example, at perennial development products, and on occasion face up to the unpleasant duty of recognizing a fledgling which is never going to fly and taking appropriate action. He will be required to play a more active role in the justification and orientation of technical service and research programs.

Many aspects of the future may look forbidding, but the results of increased competition will be no different than they are in many other fields of human endeavor. The sharper the skill and the better the training of the contenders, the narrower the margin of victory, but the more satisfying its attainment and the greater the ultimate reward.

Literature Cited

(1) *Chem. Eng.* (Sept. 25, 1967).
(1) *Chem. Week* (March 5, 1966).
(3) *Oil, Paint, and Drug Reporter* (April 29, 1968).

RECEIVED May 15, 1968.

4

Plastics Marketing: The Challenge of the Seventies

G. A. FOWLES and M. W. OSBORNE

B. F. Goodrich Chemical Company, Cleveland, Ohio

From 4.5 billion pounds in 1958, U. S. production of plastics reached 14.2 billion pounds in 1967; it is expected to be in the range of 19 to 20 billion pounds by 1970 and 45 billion pounds by 1980. While prices in other product lines have risen during the past decade, plastics prices have declined, but this has opened new markets. Among the challenges of the Seventies are intelligent pricing, marketing levels to sustain margins that will support continuing R & D and plant expansion, improved forecasting, and developing marketing patterns toward commodity techniques.

In the summer of 1959, Paul Mayfield of Hercules, Inc., authored the previous article in this series entitled "The Challenge in Marketing for Plastics." He forsaw the Sixties as a decade of rather spectacular growth. U.S. production of plastics had hit 4.5 billion pounds in 1958 and Mayfield, referring to the official SPI forecast, estimated that this would more than double, to 9.5 billion pounds, by 1970. Let's take a minute to see just how spectacular the growth of the Sixties actually has been.

In 1967, U.S. production of plastics reached 14.2 billion pounds with sales at 13.1 billion pounds, according to *Modern Plastics*. It is now expected that the 1970 production figure will be in the range of 19 to 20 billion pounds. (*See* Figure 1).

Last year, production of one family of plastics, polyethylene, exceeded three billion pounds. This includes low, medium, and high density resins. Two other families, the vinyls and polystyrene including copolymers, reached production levels over two billion pounds. A fourth family, the phenolics, now has reached the billion pound production mark. Polypropylene, which was a plastics industry infant at the beginning of the decade, will probably join the "billion pound" club by 1970.

In 1958, plastics production reached and slightly exceeded total U.S. supply of aluminum, including imports. Figure 2 compares the growth of the two industries since 1960. In looking at this graph and considering

the future prospects of plastics, keep in mind that the aluminum industry has maintained an average annual growth rate of over 15% for the past 75 years!

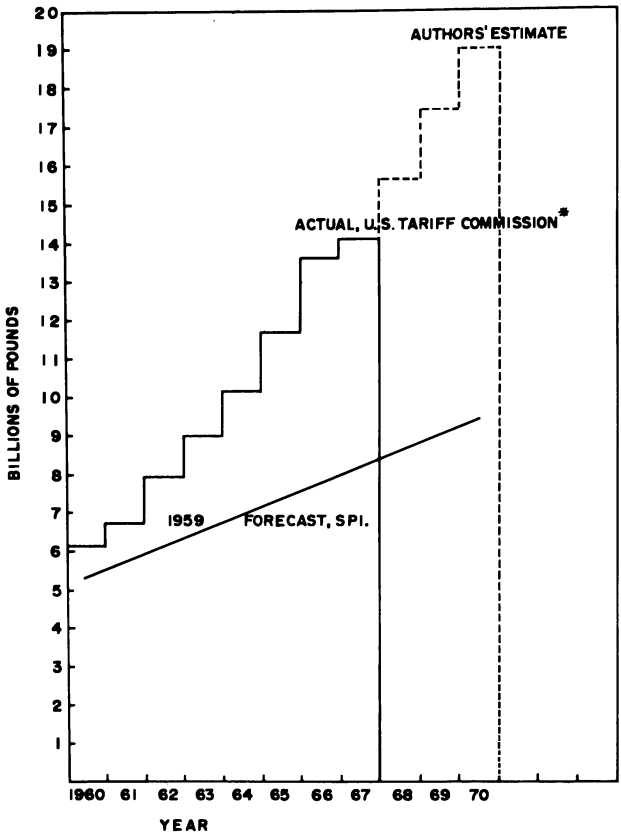


Figure 1. U. S. production of plastics

**1967 estimated*

It may be well to look at some of the key developments in the Sixties, for these are things that set the stage for the challenges of the Seventies.

In the major thermoplastics, there was more rapid price erosion than had been anticipated, accompanied by phenomenal growth in volume but serious degradation of profits. Statistical studies have indicated that individual plastics frequently have a price elasticity factor of 2 to 3 *i.e.*, a 1% price decline resulted in a 2 to 3% volume increase. The effect upon profits, however, was often just the reverse as the expanding volume was not sufficient to compensate for the drastically reduced profit margin. In some areas, such as low density polyethylene and general purpose poly-

(vinyl chloride) (PVC), prices have dropped to levels which seriously endanger future R&D expenditures and capital investment. The wholesale price index for plastic resins, with the 1957-59 base period equal to 100, stood at 89 in 1967. This compares with 107 for all industrial goods. Figure 3 shows the movement in the price indices of plastics and other basic products since the base period 1957-59.

As price levels for these materials have been reduced, entirely new markets have opened—markets previously held by other basic materials such as metals or wood. Some of these markets present truly staggering potential tonnages and in most cases, plastics have barely scratched the surface as yet. Take, for example, the use of PVC to make house siding. This application, which has matured to the commercial stage during the Sixties, represents a potential of approximately 5-6 million pounds of PVC for each 1% of market penetration.

Entirely new families of plastics have emerged in the last seven years—the polycarbonates, acetals, phenoxies and polyallomers to name just a few. As predicted by Mayfield in 1959, there has been a continued and accelerating growth in the number of happy marriages of plastics with non-plastics, and with each other in alloys.

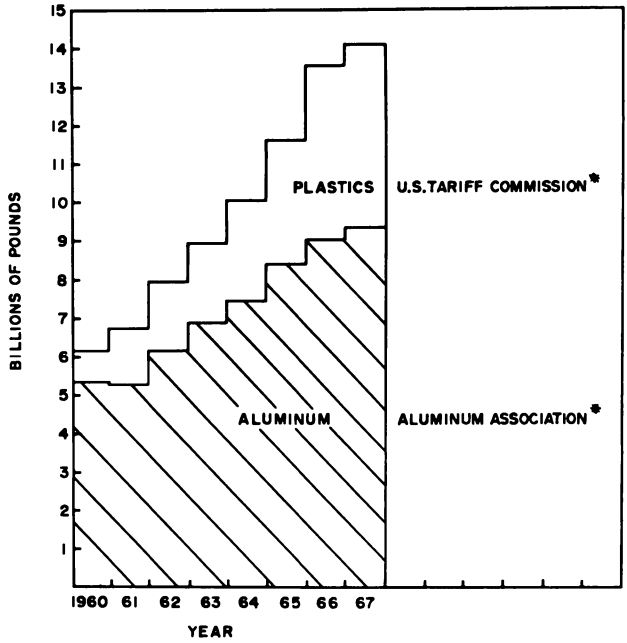


Figure 2. U. S. Production of plastics and U. S. supply of aluminum

**1967 estimated*

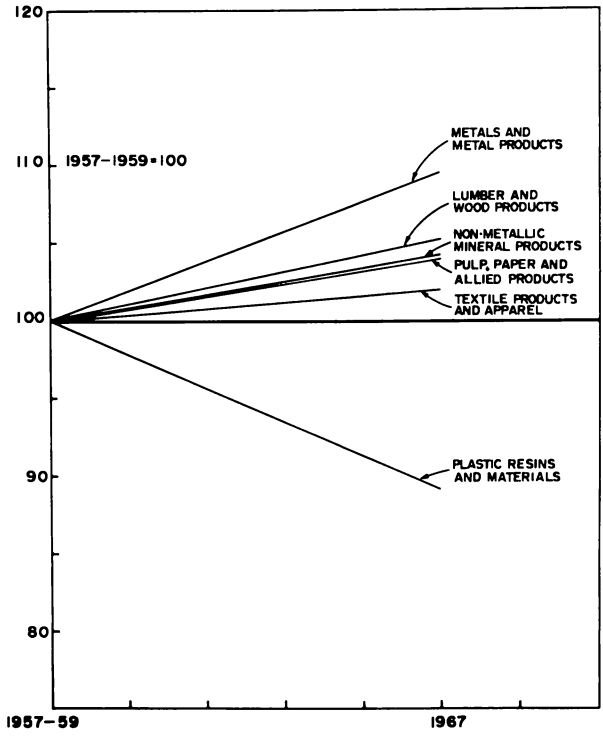


Figure 3. Wholesale price indices

We have seen the development of new and improved processing equipment such as the screw injection machine. It is interesting to consider that in the early days of thermoplastics, they were processed largely in equipment which had been developed for the rubber industry. Today there is an increasing amount of rubber, generally in powder or crumb form, being processed in plastics screw injection machines, both in this country and in Europe.

The rate of technological change in all phases of the plastics industry has continued to quicken, accompanied, inevitably, by increases in opportunity and risk. In summary, the Sixties have proven to be "everything and then some" of the decade forecast in 1959 by Mayfield.

The Seventies

Some of the important challenges to marketing as we approach the Seventies are quite clear and bear directly on the question of whether the plastics industry will continue to be a vigorous, healthy growth industry or whether it may begin to mature—or perhaps pre-mature would be

a better word—into a commodity type of industry which moves along sluggishly at about the growth rate of the overall economy. Intelligent pricing is a major challenge facing the marketing executive, particularly in the big volume thermoplastics industries and in a number of the important customer industries. Will price policies and pricing decisions made in the Seventies sustain the growth rate achieved in the Sixties? The elasticity of demand which has been displayed in recent years by the thermoplastics has been wonderful to behold. However, we must continually remind ourselves that a lower price level is not the only ingredient in a healthy growth. Continuing R&D and expansion of capacity are also necessary, and both cost a lot of money. Margins must be maintained to provide for them. If marketing management cannot meet this challenge, the brakes are going to be applied to this wonderful growth by boards of directors refusing to approve R&D expenditures and capital funds for further plant expansion.

Another important challenge facing the marketing man of the Seventies is the need for improved forecasting. The computer provides the means of storing and manipulating vast quantities of data—so much, in fact, that it is now quite feasible for sales departments to request and receive so many reports that the truly significant data for accurate forecasting may be obscured. The real challenge we face is to make intelligent use of this marvelous tool to upgrade forecasting in both accuracy and timeliness and to assure management that critically important projections are never out of date. In a sense, the day of the annual sales forecast has passed and the day of the perpetual "living" forecast is here.

The Seventies may see some fairly radical changes in traditional marketing patterns of the major chemical companies selling raw materials. The tremendous volume and the profit squeeze in the multi-billion pound materials are leading more and more to commodity marketing techniques. In the Sixties we have seen widespread adoption of the most modern bulk handling systems. In the Seventies, it is not unlikely to expect further moves aimed at reduction in marketing costs—bulk terminals, commodity-like distribution networks, and the like. Sometime in the future, but probably not in the Seventies, the development of a commodity exchange for the big volume, general purpose resins is not beyond the realm of belief. Certainly, the day is about over right now for the extensive, expensive technical service-oriented type of marketing for general purpose materials.

There will be a continuing reduction in the percentage of technically trained people in marketing forces of chemical companies because, primarily, of the excess of demand over college and university output of chemists and engineers. This does not imply a degradation in quality of the marketing programs of these companies, but it will mean some altera-

tions in structures of marketing organizations. For example, the technical service function, which is centralized in most marketing organizations, might tend to become decentralized to provide speedier assistance on field problems. Organizations may place even greater emphasis on sales training programs.

The decade of the Seventies will certainly produce its share of new, highly sophisticated special purpose materials. The present profit squeeze is having a certain amount of impact right now in redirecting some R&D into areas that show greater promise of upgrading earnings. It seems logical to expect the commercialization of new materials which extend the useful temperature limits of plastics, particularly at the upper end of the scale. There will be a continuation in the development of polymer alloys.

Innovations in systems marketing programs are likely, where one or more companies approach an industry with material, machine, and process to speed up the entry of plastics into new markets. Integration moves, both forward and backward, are expected to continue at about the same pace as in the Sixties, but it would seem that the acquisition route will become more and more difficult, particularly for large companies.

Plastics in packaging, particularly the polyethylenes, have experienced tremendous growth in the Sixties. Now it apears that the vinyls are at the threshold of very rapid growth in the blown bottle field and the 1970's should see this become one of the major markets for PVC. The packaging film field is another market where the vinyls are in the early stages of growth.

Finally, let's turn our thoughts again to the computer and the challenge it presents. The plastics marketing executive of the Seventies will use the computer as a routine tool in market planning, market research, and in auditing the results of marketing programs. Companies that fail to keep abreast on this frontier are probably in for trouble. Conversely, the manager of the future, armed with better, more complete and more timely information, will be in a position to make a higher percentage of sound decisions. Certainly, the decision-making process is going to become more sophisticated in all areas of marketing.

Summary and Conclusion

If these challenges which the Seventies present to plastics marketing people are successfully met, we can count on another exciting decade of rapid and healthy growth. Assuming that U.S. production of plastics reaches 19 billion pounds by 1970, then it is predicted that it will climb to 45 billion pounds by 1980. (*See* Figure 4). This prediction assumes

(a) that there will be no global conflict and (b) that the financial affairs of this country are managed in such a way as to avoid runaway inflation followed by a major recession.

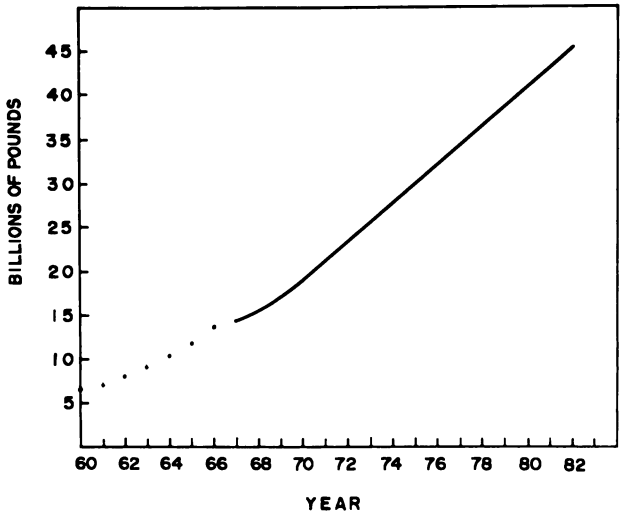


Figure 4. Estimated growth of U. S. plastics production to 1980

If a 45 billion lbs./year production level is reached in 1980, this will be 200 lbs. per capita based on current population projections. This would be almost a 200% per capita increase over the 1967 figure.

The major volume thermoplastics, and modifications of them as yet unknown, are expected to lead the way. By family, these production levels may be reached:

Polyethylenes	13 billion lbs.
Polypropylenes	4 billion lbs.
Vinyls	8 billion lbs.
Polystyrene & Copolymers	6 billion lbs.

If the challenge to profit margins in these industries is not met, these levels will not be achieved. This is the biggest single challenge of the Seventies.

RECEIVED May 15, 1968.

5

Organization for Marketing in a Large, Integrated Company

E. EDGAR FOGLE and GEORGE FORSTOT

Union Carbide Corp., New York, N. Y.

The structure of the chemical industry is changing to that of multi-national companies headquartered in the U.S. Large, integrated corporations are going global in their planning and operations. Factors that bear on this include the movement of industry into narrower market segments, the scale-up to larger producing units, and the growing tendency of governments to use tariffs as a means for stimulating favorable trade balances. To meet the challenges the corporation must strike a balance between the marketing function and production efficiency. One way is through the business team-functional organization combination whereby members of the traditional functional groups are at the same time members of marketing oriented business teams. These teams are modular and can be regrouped to meet changing needs.

The most important challenge to the chemical industry in the Seventies is the changing structure of the industry itself. In this period, the most significant influence on the structure of large integrated corporations of the chemical industry will continue to be the absolute necessity of going global in their planning and operations. The effects are apparent wherever one looks—in the frequent reorganization of international departments—in the significant changes in the self-image of corporations including name changes. In the past, most of our large chemical companies looked upon themselves as United States corporations with significant operations scattered around the world. The self-image is rapidly becoming one of multi-national chemical companies whose headquarters happen to be in the United States. Changes in names are reflecting the change in self-image. One large corporation recently dropped the appendage "—of America" from its name to eliminate this implied limitation. The global push is increased by competitive pres-

sures at home and abroad. Large oil companies with their world-wide orientation continue to penetrate chemical markets. Mergers and integration continue to move the industry toward larger companies. The mergers are forced often by intense competition—lower prices—which bring the necessity of larger production units to achieve the lowest possible costs. To a large degree, the technology required for the large scale-up exists. What is now being developed is the organization structure to meet the marketing needs of the global era.

To meet this increasing challenge, the entire skills and resources of an organization must be brought to bear on the marketing problems many of which have yet to be defined and solved. The organization structure needed to accomplish optimum results in this changing environment will vary from company to company depending on its history, the complexity of its product lines, and the opportunities it foresees for itself in world markets among other things. Thus the need for a more rapid tactical and strategic marketing and business decision-making capability based upon world-wide information in depth becomes of prime importance. Technological advantages will be less significant than in the past and those which might arise will most likely be short lived.

Organization of the Marketing Efforts

In organizing the marketing efforts of the large company to meet the challenge implied in the evolving world-wide industry structure, consideration must be given to the growing impact of certain major influences. The first is the increasing EDP capabilities available to marketers and management as a whole. The use of mathematical models of business to examine the options open in the planning efforts of world-wide purchasers on the one hand and the world-wide business modelling capability for plant location planning within the framework of global market needs on the other hand, will place a greater and greater burden on the information-gathering functions of the marketing organization. This information-gathering and organizing capability could well be the key to competitive advantage on a world-wide basis in an era where competitive advantage will be harder and harder to come by.

The second is the increasing need for marketing to help provide the direction for research efforts in order to assure a continuous market demand payoff for expenditures in this function as it becomes more and more difficult to gain a technological advantage. This, of course, requires a continuing capability in the marketing organization to search out new needs in the market place and to help R&D translate these into profitable, saleable products or services as quickly as possible.

Thirdly, the increasing movement of industry into narrower and narrower market segments indicates a need for flexible marketing organizations to allow the large company to be competitive in each of these

areas as they are defined. The definition of these market segment opportunities again is a burden upon the marketing functions information-gathering capability, to recognize the competitive move into a position of advantage in a specific segment early enough and beyond this, to seek out segment requirements to provide an initial advantage to the large company where previously the small company's flexibility often proved hard to match.

Fourth, the scale-up to larger and larger producing units in order to lower costs on a world-wide basis to counteract price reductions, real or anticipated, provides a capability for competition continually to meet pricing strategy moves by an individual producer. Because of the great investment involved in developing this ability, the corporation cannot allow itself to be out-maneuvered in pricing its products. This puts a greater and greater burden on organizing to compete by giving better service both physical and technological.

Fifth, the growing tendency for many governments to use tariff setting capabilities and monetary policy as a means for stimulating favorable trade balances becomes a two-edged sword within a company which has world-wide production and is maintaining a volume export business. Great complexities arise in world-wide marketing approaches in order to compensate for these manipulations.

Meeting the Challenge of the Changing Industry Structure

To meet the challenge of the changing industry structure and the new and growing influences now appearing on the horizon of the Seventies, it appears that certain organizational compromises may well be necessary. In the large integrated world-wide corporation of the future, the organization problem involves striking a balance between the marketing oriented business structure and the high efficiency, low cost, high quality requirement upon the functional elements of production, R&D, distribution, and engineering. In other words, it must be recognized that the corporation produces products but serves markets. The real strength in a large corporation lies mainly in its ability to bring all skills, all resources, financial, physical, and human to a point where they are making maximum contributions to its marketing goals. Organization structure therefore must be flexible enough to mesh its resources in different conformations to meet changing business and marketing problems both internal and external.

On way to accomplish this duality of purpose is the business team—functional organization combination. In this approach, members of the traditional functional groups perform within their functions to best provide the most efficient approach to producing products but at the same time are members of marketing oriented business teams. Within the business team, the functional allegiance is secondary to participation

(rather than representation) in the business decision-making and management process. Thus, while keeping a traditional functional organization (*see* Figure 1) the total expert capabilities of the organizaion is mustered to meet specific market and broad operational needs through the combining into operations teams and marketing-technology teams. (*see* Figures 2 and 3) These teams are essentially modular and can be organized and regrouped to provide a means for meeting changing needs. This type of organization, of course, is not without problems owing to its apparent need for highly refined communication capabilities and the need for functionally oriented people who are at the same time inclined to be entrepreneurial.

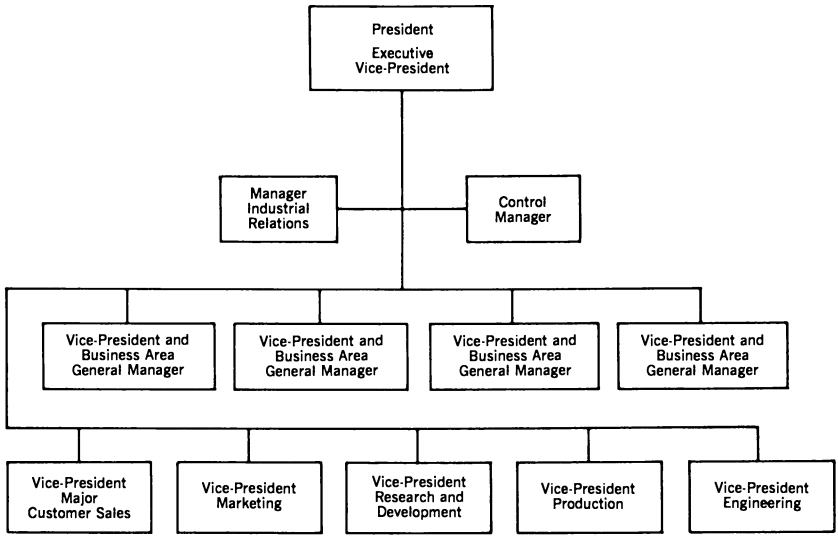


Figure 1. Business team—functional organization

As indicated in Figure 1, 2, and 3, a number of marketing-technology teams report to each vice president-general manager providing a market definition and segmentation at the lowest practical levels. The marketing-technology business teams buy product at agreed upon prices to fill the needs of their specific market place. New product and new end-use needs are searched out within the specific market by formal market exploration techniques and translated into research needs and short and long term demands upon the various operations teams.

A number of operations teams report to each of the same vice president-general managers. These operations teams provide the most efficient product producing capabilities. The product manager within this team is the marketing liaison focal point where the needs of the marketing teams are aggregated to provide production, inventory and

facility plans. These product demands may originate from any of the marketing teams within or without the vice president-general manager's area of responsibility. Product pricing is a joint responsibility of operatons and marketing and because of the intricacy of the organizational relationship, requires a highly developed communication capability as well as a complete willingness to work as a total business team no matter what the formal organizational relationships. With flexible business team organizational capabilities as indicated however, the problem of the increasing market segmentation can be met as a standard operating procedure. The development of specialized sales forces and market and product managers aimed at these narrow segments provides further flexibility and the ability at market-technology team level to aggregate industry strategies and at the operations team levels to aggregate product strategies. These strategy aggregations provide the natural point at which electronic data processing capabilities for modelling and providing organized access to the depth of information such an organization requires, can best be utilized. R&D personnel, being on the firing line as well as at the bench, cannot fail to gain a greater understanding of market needs which will pay off in a much shorter time period than if he is isolated from the business world as often has been the case in the past. Further, production and distribution gain much greater insight into their required contribution to servicing the customer.

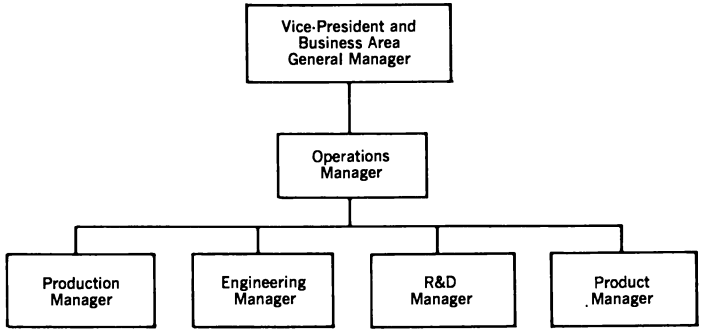


Figure 2. Typical operations team

Again, the ability to aggregate information, human, and technological resources on a world-wide basis and concentrate skill without the need for deep vertical, functional chains of communication before ideas can be brought together, far better provides the capability to meet the changing government influences.

The importance of the information-gathering, organizing, and analyzing capability in such an organization cannot be over-stressed. With narrowly segmented marketing areas, a large organization has an im-

portant advantage if it can take advantage of commercial intelligence and marketing research capabilities across organizational lines and from a multitude of sources in order to help in the decision-making in the narrower business area. The marketing exploration capability provided in the business team allows a formal search for business opportunities and a grass roots tactical intelligence source. The marketing research organization provides the strategic analytical capability and is the mechanism by which information for many areas can be made useful to the individual business team particularly if it is placed at a high enough level within the organization.

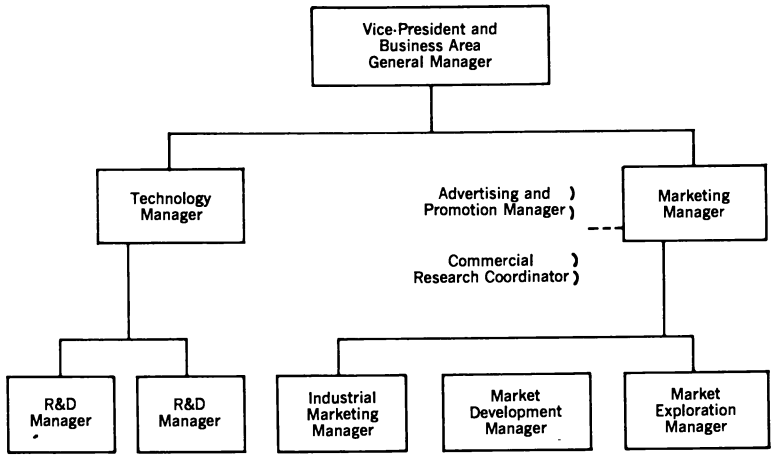


Figure 3 Typical marketing-operations team

The approach to meeting the challenge of the Seventies by organizational structure becomes useless however if one especially important problem all large organizations face in responding effectively to the global challenge is not faced directly—that is becoming truly global, multinational in fact as well as in name. It is the need to effectively change the corporate self-image. Most of our interests overseas have been, until recently, largely in exports. We need to move much beyond this concept as important as exports will continue to be. "International trade" as we have generally looked upon it will be superseded by what is now called by some "international production." This is defined as the sales which one nation makes in the markets of another of products which are produced locally instead of facilities in the headquarter's country. This is not a new development by any means but the perspective is changed significantly. The question, shall we operate in this international production frame-work is irrelevant. The question now is, how can we best operate! The problems of creating the right managerial

atmosphere are many and varied. They are political, financial, geographic, demographic, technological, sociological, psychological, and perhaps biological. The solution to these many managerial problems will be substantially affected by the corporate attitude towards its role in the scheme of things—its self-image. The life style it adopts for itself. The organization structure which has been discussed earlier needs close and continuing attention. But the dedication to truly global operations can be achieved only by equally careful attention. Careful attention to be sure that the life style is fully one of a multi-national organization. Only then can the global challenges of the Seventies be fully met. Only then will the corporation make its products, its skills, its total resources serve the interest of its customers and the market needs, wherever in the world they may be found. It will be truly a citizen of the world and a foreigner nowhere.

Conclusion

The Seventies will truly provide a major challenge to the large integrated company's approach to organizing for marketing. The world-wide aspect will provide a complexity never before encountered in the chemical industry. Technical advances in communication, information development, and business planning will allow broadly based, extremely rapid decision-making capabilities. At the same time however, the increasing world-wide investment requirements in facility scale-up and the shorter and shorter life span of technical advantage is causing the cost of tactical and strategic error to grow dramatically. As a result, the organizational, entrepreneurial and "people" capabilities of the large corporation will be taxed to the utmost. There is, of course, no rigid formula for meeting this challenge now or in the future.

RECEIVED June 7, 1968.

6

Organizing for Marketing in a Medium Sized Chemical Company

W. WARD JACKSON

Commercial Solvents Corporation, New York, N. Y.

The inherent advantages of medium size will be a valuable asset in the changing times that lie ahead. The ability to move faster, respond quicker, and adjust more readily to new conditions will be especially important in the marketing area. More so than ever before, the marketing arm must operate both as a member of the management team and as a functional marketer. A specific marketing program for each product and product line should be established on the basis of the greatly increased flow of data that will be available in the Seventies. Cost center consciousness will become increasingly important in the 70's. Equally important are value analyses which accurately appraise the marketing team of the results being obtained from dollars spent for advertising, sales promotion, technical literature, critical matter of centralization vs. *decentralization cannot be overstressed in gearing up for the 70's.*

The marketing challenges offered to the chemical industry in the 1970's are being generated by the intense competition, substantial growth, technology advancement and superior management and marketing tools of the 1960's.

The Marketing Environment of the 1970's

Expanding markets, larger product lines, greater diversification, and the technological progress of chemical customers will demand new, higher levels of sophistication in chemical marketing. A strong marketing organization and well defined marketing program for the medium sized chemical company in the 1970's will reflect the pressured business experi-

ence of the 1960's in more efficient approaches to challenges and opportunities of larger scope and complexity.

The medium sized company, confronted by the growing capabilities of large and more diversified competitors, will have to be especially sensitive in shaping its marketing program to maintain the advantages of medium size while adopting the techniques and procedures of larger companies, which will become increasingly within reach. Organizational structure, cost concepts, personnel selection and training, management-marketing relationships, sales intelligence, interdepartmental support, and responsive customer relationships are vital considerations in this regard for marketing planners. Describing "medium size" to everyone's satisfaction is like trying to explain the colors meant by "tangerine," "desert gold" and "azure." Meanings will vary in each person's mind depending upon his frame of reference. For purposes of this projection, a medium sized company is seen as one with annual sales in the 50 to 200 million dollar range.

Factors in Shaping a Marketing Program for the 70's

We can expect that:

1. Technology improvements will continue to lower costs and, as a result, will force older, non-adaptable plants into obsolescence.

2. Labor costs will continue to rise, heightening the need for cost improvement in product development, production, marketing and all other areas that affect profit margins.

3. Greater use will be made by both chemical companies and their customers of competitive bid purchasing, often on a world market scale, in search of lower cost chemical raw materials.

4. Competition from chemical companies in other countries will increase at home and abroad as tariff barriers come down and these companies grow in size and capability.

5. Advances in data processing techniques and greater skill in putting them to work will be reflected in the precision and accuracy of marketing in the 70's.

6. Large non-chemically oriented companies will enter and expand in the chemical field, bringing with them different marketing techniques and strategies which will have to be understood and dealt with.

7. As large, well-integrated companies continue to grow through merger and acquisition which add to their sales, distribution, purchasing, and production capabilities, medium sized companies are going to feel increased pressure in the market place.

The Medium Sized Chemical Company of the 70's

The inherent advantages of medium size will be a valuable asset in the changing times that lie ahead. The ability to move faster, respond

quicker, and adjust more readily to new conditions will be especially important in the marketing area.

"Medium size" is, of course, a relative term. With the continuation of a conducive business climate, today's medium sized companies can be expected to grow and, in so doing, to acquire the problems as well as the capabilities of bigness. The challenge is to preserve and enhance such assets as speed and flexibility while increasing dimension and profitability.

The competitive conditions of the 1960's suggest the advisability for chemical companies regardless of size to pursue the advantages of medium size in the way they run their marketing operations. This is most likely to be a matter of top level direction, organizational structure, personnel recruitment and assignment, and operating procedure. In these regards, larger companies may be confronted with such factors as the need for top management participation in operations as well as in planning and development to speed the decision making process and give overall direction for specific areas of their operations which often are as large as a small or medium sized company. Smaller companies, with their built-in potential for swift reaction to changing conditions, are more likely to face the necessity of compensating for the greater resources of their medium sized and large competitors.

Regardless of company size, the marketing arm will have to work at maintaining the speed and accuracy of its decision-making process, at communicating rapidly and effectively to and within management as an integral part thereof, at building on its advantages of product orientation and specialization, at reacting internally in the shortest time possible to changes in the market place, and implementing these reactions with immediate sales action.

At the same time, we should be prepared to take advantage of the strength and resources that come with healthy growth. A broader base of operations will generate a greater potential for marketing intelligence, technical backup, advertising and sales promotion, improved distribution facilities, and access to high speed tools for the analysis of marketing factors.

In this latter regard, the increased availability of hardware and trained manpower in automatic data processing and related fields will be a distinct plus for marketing. The challenge here is to be prepared to utilize this availability and to apply quickly the results obtained.

The competitive medium sized chemical company will have to make the most of its advantages in the 1970's. It should be among the first to recognize and respond to changes in the market place, to anticipate and meet new customer requirements, to adapt better distribution methods to its needs and those of its customers, to adjust its product mix as market

conditions dictate, and to make the most of its resources of people, technology and dollars.

Requirement of the Marketing Arm in the 70's

More so than ever before, the marketing arm must operate both as a member of the management team and as a functional marketer.

Marketing often bears the prime responsibility for reaching management goals. The fundamental requirement of making a profit frequently rests with the sales organization. When the basic responsibility for attaining specified goals is assigned elsewhere, then the marketing arm should be prepared and equipped to provide constructive guidance and support.

A specific marketing program for each product and product line should be established on the basis of the greatly increased flow of pertinent data and intelligence that will be available in the 1970's. At the same time, however, the marketing arm must be prepared to alter these programs whenever indicated in order to enjoy the full benefit of flexibility inherent in medium size. No program, regardless of how much effort has gone into its devisement and execution, should be considered inviolate when marketing conditions change. The ability to adjust quickly is a marketing asset not to be watered down by seeming comfort of the *status quo*.

Cost center consciousness will become increasingly important to the 70's. Sensitivity to the fact that marketing profits are directly related to the point of manufacture, available methods of distribution, and related considerations is essential in the contribution of the marketing function to profitable results.

Cost center studies should include programs which help the salesman to keep his selling costs at minimum levels and enable him to make the maximum contribution to profits of which he is capable. Equally important in implementing the cost center concepts are value analyses which accurately apprise the marketing team of the results being obtained from dollars spent for advertising, sales promotion, technical literature, and related aids.

To offset the greater capability of the large company in gathering information, the marketing arm of the medium sized company must make maximum use of the sources of information available to it. The close relationships of company personnel with customers, suppliers, and others in trade channels are the bases on which to build. A pervading consciousness must be shaped in the minds of the sales organization to perform the intelligence and information gathering function with the same thoroughness that they do the merchandising job. Systems for evaluating information acquired by salesmen in the field should be kept under con-

tinuing review to improve the speed and effectiveness with which this information is gathered, analyzed, utilized, and applied.

The Management Team's Responsibility to Marketing

By the same token that marketing's responsibility includes the speedy transmittal of business intelligence to management, so must all members of the management team get information essential to profitable sales to the marketing planners with all possible speed. Quick decisions and flexibility in meeting changing conditions are nowhere more important than in marketing.

Developments and information generated by production, engineering, research, financial, legal, public relations, and top management are often vital in shaping sales operations. The competitive challenge of the 1970's will require full use of the informality and ready access that typify medium size organizations.

Reaching sound decisions on the critical matter of centralization *vs.* decentralization cannot be overstressed in gearing up for the 1970's. As the medium sized company grows in size and scope of operations, its range of possible courses of action in the market place will expand accordingly. Enlightened determination of overall marketing philosophy, as well as programs for specific major areas, will become increasingly important, requiring the best thinking of all members of the management team. The successful company of the 1970's will assure that adequate organization is provided to implement its decisions in these regards.

The Chemical Salesman of the 70's

If the medium sized company is to make the most of challenges offered by the 1970's, its sales personnel will require three basic qualifications: competence in selling under extremely competitive conditions, ability to gather useful intelligence in the market place, and up-to-date technical knowledge.

In competing with the extensive services offered to customers by larger companies on a routine basis, the medium sized company must make maximum use of personal selling techniques. The sales organization is, of course, the principal means for doing so. Close contact with the customer, a perceiving knowledge of the customer's operations, and a sensitivity to his profitable progress will be highly sought after qualities in sales personnel. Recognizing customer needs even before the customer does will be an increasingly valuable capability. More tomorrow than today, the customer cannot be expected to know promptly of new chemical products and applications that will contribute to his forward movement. The competent sales manager will assure that his salesmen

bring such opportunities to the attention of the customer when it is proper to do so. The judgment required here to a great degree will come from the salesman's technical background and from his up-to-date knowledge of new developments as regards the products he sells, those of his competition, and those of his customers.

Keeping the sales organization current in such matters is, of course, the responsibility of marketing management, working closely with research and development, engineering, financial, and with production personnel. Additionally, we can anticipate greater use of professional education, in chemistry as well as marketing subjects, to maintain the sales organization at maximal proficiency levels.

Thus the chemical salesman of the 1970's must not only be basically qualified in his field; he must be prepared to absorb quickly new information and instruction which will enable him to contribute effectively to the flexibility of the medium sized company as it reacts to progress and change.

Organizational Guidelines

In shaping and tuning a marketing organization for the 1970's to meet its own particular needs, each company will have many decisions to make on the basis of such classic factors as the specific nature of its operations, the assignments of individuals, budget, product mix, and distribution patterns. Nonetheless, a number of organizational concepts would seem at the point in time of this writing to be generally applicable.

As competition intensifies, decisions as to the orientation of a marketing organization in terms of geography, industry, or product line will become increasingly critical. The ramifications of these fundamental alternatives in determining organizational structure will have to be more consciously and carefully explored in terms of the competition from large chemical companies and from companies of other industries entering chemical markets and to assure the continuing effectiveness of flexibility and personalized customer service which are the medium sized chemical company's major marketing advantages.

As the number of sophisticated chemical products with specific end uses and applications continue to increase and as customer requirements become more selective and demanding, the entire marketing organization will have to provide greater support to the salesman and be geared for getting more feedback from him. One approach to this is the unit team concept of marketing wherein each salesman is supported by specific individuals representing the advertising, sales promotion, distribution, and technical service functions. The close working relationship of unit team members provides the basis for both quick reaction to customer require-

ments and for the efficient receipt and application of marketing intelligence gathered by the salesman. For the medium sized chemical company with limited numbers of people available, a given individual in each of the marketing functions other than sales could serve on a number of such unit teams.

The increasing importance in the 1970's of the educational requirement for sales personnel and, for that matter, all others on the marketing team, will require some organizational provision to meet this need. As the medium sized chemical company grows larger, the justification and wherewithal for staffing an educational program on a fulltime basis can be expected to increase. Like other functions, this can, of course, be handled in various other ways, as through the use of outside part-time services. However it is done, it should not be overlooked or administered in a haphazard way. Structured programs for advancing the knowledgeability of the marketing group should exist. The curriculum should be designed to include both appropriate technical areas and more general marketing concepts and practices.

The Multi-National Concept of Companies in the 70's

U.S. companies cannot afford to rely on the U.S. market for their profitable growth in the 1970's. The success of larger companies in the chemical industry clearly reflects this. It is incumbent on the medium sized company to recognize this fact and act upon it. At a time when demand in this country should be catching up with supply, added competition from foreign producers and lower U.S. tariffs will continue to exert competitive pressure on domestic operations.

On the positive side, the growth of industrial economies in other nations, with resultant increased requirements and buying power for chemical products, opens broad new challenges for medium sized companies outside the United States. To see this potential of the 1970's as mainly an export matter is shortsighted and unrealistic. Viewed in the context of our times, the course of greater return is more likely to be that of the multi-national company, capable of establishing and conducting operations, not as a U.S. company with operations overseas, but as an integral part of each economy in which it is located.

The major promise of the 1970's for chemical companies of medium size may well be the application of their flexibility and fast reaction to the multi-national concept of operations throughout the world.

RECEIVED May 21, 1968.

Advertising Measurement—the Challenge of the Seventies

GILBERT M. MILLER

Advertising Department, E. I. du Pont de Nemours & Co., Wilmington, Del.

For the future, advertising research will not lead to new advertising practices as much as it will confirm basic principles that are known but often ignored. For example, many measurement devices have proved that reader involvement is a key to genuine communication in advertising. Yet, too many ads are still written from the standpoint of selling rather than buying. Readership studies show it is difficult to establish more than one idea in a single ad. In the future more ads will be based on a single, dominant idea rather than trying to cover every sales point. More ads will be based on concept selling in the years ahead; for unique products it is often necessary to establish the concept behind them before running the product information ads. The use of the task method of preparing advertising budgets will increase; rather than set as a fixed percentage of sales, the budget is built item by item to meet specific goals. While advertising practices and techniques will change some in the Seventies, the greatest single change will be in the area of improved measurement techniques and their use by advertising management.

Advertising is essentially a device for communicating with large numbers of people at low cost. As such, advertising in the 70's will continue to serve business management as a tool through which they can communicate effectively and economically to their target audiences.

In the years ahead, however, we would expect business management to make increasingly greater use of advertising research techniques in order to more effectively measure the results of their advertising programs.

Up until 15 or 20 years ago, advertising effectiveness was largely synonymous with advertising readership. It was felt that the purpose

of an advertisement was to be read and to deliver a message. Research techniques that were available reported on advertising readership but unfortunately they touched very lightly, if at all, on the degree to which the message was registered with the reader. Most advertising research programs consisted largely of interviews with known readers of a publication and subsequent measurements of the number of readers who had either seen the ad, seen it and associated it with the manufacturer, or had read most of the advertisement. Industrial readership studies as well as consumer readership studies were largely reports on percentages of prospective readers who actually read an individual advertisement.

While this type of measurement was of some help, it left much to be desired. For example, it is possible for a person to read an advertisement and still miss the message. Or worse still, it is possible for a reader to read an advertisement and get the wrong message. Such weaknesses were not revealed by simple readership studies.

The next major developments in advertising research were studies which measured reader comprehension of an advertisement. These studies required the person who claimed to have read an advertisement to play back to the interviewer the principal message of the advertisement as he or she understood it. Various types of comprehension services are being used and they are valuable in indicating the degree to which the advertiser's message is actually being communicated to the mind of the reader.

The most significant step forward in measuring advertising effectiveness was probably the step taken by the Association of National Advertisers in 1959 when they hired Russell H. Colley, a management consultant, and charged him with the responsibility of interviewing top management in a cross section of American industry. He was to determine what they expected from their advertising and how their expectations might be met. Colley's study revealed that, in general, top management was interested in having more information about:

(1) The amount of money to spend for advertising;

(2) How to allocate expenditures for products, markets, and media;

(3) Ways to judge the share of advertising that should be devoted to near-term sales pay-off as opposed to long-term investment.

Under the guidance of the Association of National Advertisers Planning and Evaluation Committee, Colley's study was published in 1961 under the title "Defining Advertising Goals for Measured Advertising Results."

The principal thought advanced in this book was that advertising is essentially a communications device and that the results of advertising should therefore be measured in terms of communications goals. It

suggested that advertising cannot be measured unless specific communication goals are set in advance and that advertising results are best measured against the specific communication goals established for it. The book advanced the idea that in most cases the proper way to establish a communication goal was to set up three criteria in advance of any advertising program:

(1) Who are the people to whom the advertising program is directed?

(2) What is the specific message that is to be registered by the advertising program?

(3) What length of time is available in which the message is to be established?

Against criteria like this an advertiser might, for example, establish as his goal:

To register with 50% of industrial design engineers, at the end of one year, the fact that Product X makes available a corrosion resistant finish which can be sprayed on any surface no matter how intricate in design.

Here we have the three elements of a specific audience, a specific message, and a specific time period.

Largely as a result of Colley's study(1) plus a series of workshops and seminars sponsored by the Planning and Evaluation Committee of A.N.A., this concept has been adopted by many manufacturers. As a result, communication goals are much more clearly defined than they have been in the past, and advertising in many instances is now being measured against specific communications goals. It is perhaps unfortunate that consumer advertisers, in general, have been more responsive to this technique and have put it to greater use than most industrial manufacturers. There seems to be a feeling among many industrial companies that this philosophy is well suited to consumer advertising but that it is difficult to apply in the industrial field. However, it does have definite applications in industrial advertising, and the problem of getting management to agree in advance on specific communications goals seems to be difficult in both consumer oriented companies and industrial organizations.

The technique just referred to has been put to use widely by Du Pont in its advertising but we have felt compelled to try to go beyond setting communications goals. Since the ultimate purpose of our business is to make a profit, it follows that our advertising should be measured in terms of what it is contributing to the company's profit. Because of the many other factors affecting profit, it is difficult to isolate the effect of advertising, but we have been able to do it in several cases. Since we have been able to do it in some instances, this remains our

No. 1 objective. In those cases where we cannot measure advertising in terms of its contribution to profit, we try to measure its contributions to sales. This too is a difficult operation because of the many elements contributing to sales effectiveness in addition to advertising. But here again, since we have been able to do it in several instances this remains our secondary goal.

An example of a profit-oriented measurement study can be found in the program we set up when we first introduced Teflon non-stick finish to the cookware industry. Before we advertised the advantages of cookware coated with Teflon, we ran test advertising operations in 13 separate markets to determine what level of advertising budget would be most profitable in terms of net return to our company. In the test cities we advertised at various levels, from what we considered to be low, to medium, to high. Measurements were taken not in terms of awareness of product message, but rather in terms of actual sales of items coated with Teflon. As a result of this audit, it was definitely established that both the low-level and medium-level budgets were insufficient to move enough merchandise to be worthwhile. As a matter of fact, sales in these markets were no better than in control cities in which we ran no advertising. However, in the high-level cities we found that we had established a satisfactory share of market in only four months. As a result of this, we based our first year's national advertising on the high figure. The following year we again tested levels higher than our national rate to try to determine the point at which advertising expenditures ceased to be profitable. The second year's studies in the test markets indicated that a higher level than the original national rate was more efficient in terms of profits returned to Du Pont. As a result of this information, our national advertising the second year was raised to the level suggested by the field research. In subsequent years test advertising was continued in order to give us a meaningful measurement of the productivity of our advertising in terms of profit contribution.

While some advertising research programs are highly sophisticated and call for a large investment over considerable lengths of time, effective advertising research can sometimes be quite simple. Here is an example of an unsophisticated but reliable measurement in the area of sales. Several years ago we introduced a product which was sold through distributors and its sales performance was disappointing. It was determined that the distributors' salesmen were not particularly enthusiastic about the product and that a change in their attitude would be necessary if we were to improve our situation. So, we planned a series of six direct mail letters intended to inform and enthuse the 350 distributor salesmen about the merits of our product. Then we asked ourselves, "How will we know

whether or not the series of letters really affected sales?" The research technique used in this particular case was quite simple. With the cooperation of our distributors, we mailed the series of six letters to 300 of the 350 salesmen and withheld the letters from the remaining 50. At the end of the 4-months' test period we obtained from the distributors' records, dollar sales per salesman plus a comparison with his previous performance. The figures clearly indicated that those salesmen receiving the letters on the average had increased their sales of our product by 35% in comparison with those who did not get the mailings. The out-of-pocket costs on this particular study were only a few hundred dollars, but it gave us a valuable guide and measurement of the sales effectiveness of this particular campaign.

If advertising measurement is an effective tool in decision making, you might expect that it is being widely used by advertising practitioners. Unfortunately, such is not the case. There are a great many frustrations that develop in the field of advertising measurement and it can be a slow and discouraging process. If advertising measurement is to be effective, it must become a way of life for all of those involved in advertising plans and budgets. Otherwise the frustrations are sufficient to kill most of the projects along the way. Here are some of the roadblocks that make life difficult for anyone seriously planning advertising measurement studies:

(1) First of all, measurement studies force advertising and sales managers to be specific in their objectives. It forces them to put things in writing. After all, you can not put specific measurements against general objectives. Since it is much easier to work in generalities than in specifics, it is probably not surprising that some management men still avoid measurement studies because they really do not have specific written objectives.

(2) Another difficulty is fear that the measurement results may upset the present pattern and call for radically new approaches. While all of us give lip service to new and different approaches, the fact remains that most people just do not like change. We are apt to be comfortable with what we have and to fear the discomforts that will arise in a new situation.

(3) There is often a feeling that one can not afford advertising measurement. While it is true that some measurement studies are expensive, it is also true that there is nothing inexpensive about following a path in which you do not know where you are going or where you are. In many cases the "can not afford" attitude is just an alibi put up by those who do not want to have a measurement program for other reasons.

(4) In the case of industrial companies there is a feeling that advertising measurement has a place in consumer advertising but not in industrial advertising. It's a variation of the old attitude, "Our problem is different." While the problems facing industrial advertisers are often different from those facing consumer advertisers, it is not true that advertising measurement is only for the consumer field. It is probably true

that most of the advertising measurement work is being carried on for consumer products. However, the techniques involved in consumer advertising measurement are easily and quickly adaptable to industrial advertising studies. In industrial advertising we have to make decisions on what to say, how to say it, where to say it, and how much to spend in saying it. These are exactly the same decisions that are made in consumer advertising. Industrial audiences are different from consumer audiences, but the advertising elements in each are measurable and should be measured.

(5) In actual practice we find that it is not too difficult to get measurements on most of the things we want to know. In too many instances our principal difficulty is not finding a way to measure advertising results, but rather in getting agreement among ourselves as to what results we are really striving for. One of the corollaries of an advertising measurement program is that it often focuses attention on the fact that advertising and marketing people need to do a better job in defining their objectives and more realistically appraising their sales situation.

(6) The time lag can be an annoying factor. Good research does require time and in only too many cases the measurement results are not available in time to meet the decision-making timetable. Naturally, preplanning helps but not in all cases.

(7) Another frustration is to find that you can measure certain attributes accurately only to realize that you do not really know the degree to which they affect total results. For example, you may measure product awareness only to realize that you do not know what relationship there is between product awareness and sales in your particular product area.

(8) Sooner or later you will probably run across an instance in which there is an inclination to allow costs to control the quality of the research in terms of scope or depth. This is a red flag for all to heed. I believe there is common agreement among professional researchers that poor measurement studies are worse than no measurement studies.

(9) It would be nice if the marketplace stood still while you are conducting your measurement projects. Some are of a static nature, but many are dynamic and complex. Some marketing areas are so dynamic that the facts of life change materially from the time the measurement study is launched until the results are in. For example, a competitor may introduce a new product right in the middle of your study or a new producer may enter your market before the study is completed.

(10) Professional researchers themselves sometimes contribute to poor test results by insisting on "improving" the design or experiment as the test goes on. All of you who have been active in the field of advertising measurement know of instances where "improvements" in the study form over different phases of the research have been commendable in themselves but unfortunately have affected the responses in subtle ways that weakened the comparability of each set of results.

(11) There is a semantics problem that confuses and frustrates most marketing and advertising people. I realize that research technicians must have precise terms in order to measure and report scientifically.

It is unfortunate, however, that these terms are confusing to the average marketing man, and most research people are not very good at translating their research jargon into the kind of action terms that sales and advertising people are looking for.

(12) There is another gulf between research men and marketing men. Researchers in general are vitally interested in techniques and are justifiably proud when they develop a new technique. Unfortunately, however, in reporting measurement results researchers often dwell at length on the technique involved before they get to the action elements that sales and advertising people are looking for and paying for. One simple cure for this is to have the research people report the action elements first keeping the technique part of the study separate and putting it into an appendix rather than in the main body of the report.

(13) A good research project will point out in advance the limitations that should be placed against the results when they are completed. Sometimes this does not happen and bad feelings develop when the sales or advertising man reads the completed project only to find out for the first time that the major conclusion is necessarily qualified or hedged in a way that makes it useless for his purpose.

(14) Then there is the case where the measurement study does not separate the men from the boys as you hoped it would do. Perhaps you tested three different techniques in an attempt to find which would be most productive. Often you do find which is most productive, but there are times when what you learn is that all three are equally productive or equally non-productive.

Looking into the future, what are some of the changes that we may anticipate in advertising practices as a result of information coming out of measurement studies. In our opinion, research results will not lead to new advertising practices as much as they will confirm basic advertising principles already known to professionals but often ignored by them. For example, comprehensive studies, readership scores, literature requests, coupon counts, and other measurement devices prove that "reader involvement" is the key to genuine communication in advertising. An advertisement that gets results is essentially one that speaks to the reader in terms of his interests and his problems rather than in terms of the manufacturer's product and its properties. Too many advertisements are still written from the standpoint of providing selling information to the reader rather than buying information. There is a tremendous difference. Advertising that speaks in terms of the reader's interest has a good chance of getting him involved in your product as a solution to the problem he faces. Certainly, it is a more direct route for involvement than starting with what you believe to be your principal sales points, assuming that the reader will be interested in them.

Readership studies have indicated that it is difficult to establish more than one idea in a single advertisement. In the future we expect more advertisements to be based on a single dominant idea rather than trying to cover every sales point in a single advertisement. Advertising

men know but sometimes seem to forget that advertising usually works over the period of a campaign and not as the result of a single advertisement.

We expect more advertisements to be based on concept selling in the years ahead. As new technologies are introduced it is often necessary to establish clearly the concept in which a product makes a contribution before you can gain interest for the product itself. When advertisers have truly unique products, they must learn to take the time to establish the concept behind their products before they forge ahead with the usual product information advertisements.

It would seem obvious that industrial advertising should be relevant to the problems of the readers addressed, and we believe that more effort will be made in the future to see that the headlines and illustrations especially are relevant to readers' problems. The necessity to attract attention will remain a basic function of advertising, but more and more advertisers will come to understand that attention should be attracted in a meaningful way and not through a gimmick approach.

Advertising measurement studies will continue to remind business management that advertising is not something in itself but is rather one tool that should be coordinated with other elements in the marketing plan, such as direct sales, technical literature, and technical service.

The years ahead will see increased use of the "task" method of preparing advertising budgets. Business management will see that setting an advertising budget by means of an historical figure, a fixed percent of sales, or a fixed cost per item are basically inflexible systems with no true relationship to the marketing job at hand. They do not take into consideration such variables as the state of competition, the position of the product in its life cycle, the relative complexity of the story to be told, and the number of decision makers involved in a purchase. On the other hand, if the marketing plan clearly defines the advertising goals, the advertising budget can be built item by item to meet those specific goals, and can then be measured in terms of specific results achieved. The "task" method may not result in the right budget the first time it is tried, but it is flexible and it does relate to the communications job expected of the advertising, and no better method has yet been devised.

In the next decade, advertising techniques will be put under measurement meters, and as a result more attention will be paid to the mechanics of advertising. Color will be used largely for its functional value rather than merely for decorative purposes. More and more advertisers will learn that the basic layout of any advertisement does affect readership, and that simple, uncluttered layouts with a natural focal point consistently outpull tricky and cluttered advertisements. More attention will be paid to the placement of headlines and to the

fact that headlines should serve as a bridge between the illustration and the copy. When two-page spreads are used, advertisers will integrate the two pages so that they function as a unit for easier reading and comprehension rather than letting them serve as competing pages. There will be greater recognition of the fact that large size type does not necessarily mean more readership. Since upper and lower case sentences are easier to read than headlines in all caps, perhaps we will even see the demise of "all cap" headlines. Advertisers to a greater extent than ever will employ a realistic photographic style in their illustrations rather than resorting to artwork. And finally, we expect to see greater realization of the efficiency of repeating advertisements. Despite the fact that studies continue to show the third and fourth repeat of an advertisement pulling as well as the original version, there seems an aversion to this practice.

While advertising practices and techniques will change some in the Seventies, we expect the greatest single change in advertising to be in the area of improved measurement techniques and increased usage of measurement tools by advertising management. During the Seventies, business management will expect their advertising programs and budgets to be backed up by measurement programs that prove their worth and indicate problem areas for future development. Advertising can never be an exact science since it deals with people, and unfortunately people do not stand still to be measured like things in the physical sciences. The judgment of experienced advertising professionals will be needed in the Seventies to make major decisions, but advertising measurement studies will narrow the areas within which advertisers must make these decisions. This is an important area for study and one that will demand increasing time and attention.

Literature Cited

(1) Colley, Russell H., "Defining Advertising Goals for Measured Advertising Results," Association of National Advertisers, New York, N.Y., 1961.

RECEIVED May 15, 1968.

8

The Challenge of Selling Domestic Industrial Chemicals in the Seventies

P. R. MONAGHAN

Jefferson Chemical Company, Inc., Houston, Texas

Competition in the Seventies will be very keen. Cost effectiveness will play a major role. Technical expertise will be an increasing factor in successful industrial chemical marketing. The challenge for selling during the next decade can be summarized in one sentence—"We must increase the relative productivity of selling personnel." Management must maintain a high marketing orientation. "Value Analysis" and other scientific purchasing methods will place emphasis on salesmen. There is a need to create an awareness on the college campuses of the profession of selling. The salesmen will continue as part of the marketing team. Advertising must play increasing role. Chemical salesmen cannot become automatons. Empathy, doggedness, forthrightness, descretion, integrity, discipline—all continue to be important in the Seventies.

In discussing the challenges of selling industrial chemicals domestically in the next decade, it would appear to be in order to look ahead and visualize the conditions which are expected to prevail. What will be the degree of competition? Will the nature of products being sold have changed from today? Will the industrial market have changed either in the sense of types of buyers, or in a geographic sense?

Let me give my answers to these questions of outlook in inverse order and in a highly simplified form.

Geographic changes will probably occur in industrial chemical markets as a result of the trend toward duty-free markets worldwide. This combined with constant improvement in transportation of bulk chemicals will tend to make a one-world market. Chemical companies and their customers are increasingly becoming global. This trend should continue. Purchasing is today being done globally by some and this trend will con-

tinue. Decisions made in Detroit will have influence in Düsseldorf and *vice versa.*

Market composition in terms of customers will change as the result of consolidations, mergers, integrations, and new company formations. This evolutionary process has been going on and will continue.

What products will we be selling? It is unlikely that we will not be selling all of the products we are currently selling. There are no obsolete chemicals, and we do not expect there will be. New industrial chemicals will come along, and increasingly the chemical industry will move toward producing materials to replace natural products. Chemicals based on fatty acids or other foodstuffs will change to synthetic materials as the world food supply becomes more critical. Similarly, the construction and building industry currently using wood will turn to synthetic products such as urethane paneling as wood availability becomes limited.

What about the degree of competition in the Seventies? All that we see tells us it will be very keen. Cost effectiveness will play a major role, as it does today, and the likelihood of continuing inflation will place an increasing demand on the chemical industry to supply products with a cost effectiveness which helps to offset inflation. Technical expertise will be an increasing factor in successful industrial chemical marketing. This technical expertise must exist at all levels—manufacturing, distribution, product application, technical service, and sales.

Management effectiveness will be an increasing challenge. As our business becomes increasingly complex with new products, new processes, new markets, we will increasingly challenge our ability to maintain good communications through all functions of our organization and with our customers.

Will the direct selling effort change with the effect of these various forces at play?

If I were to summarize the challenge for selling domestic industrial chemicals during the next decade in one sentence, it would be—"We must increase the relative productivity of selling personnel."

Frankly, we must do a better selling job with fewer people, that is fewer people as a ratio to the volume of chemicals marketed. Why? Simply because the availability of chemists and chemical egineers for marketing careers is not increasing as rapidly as the need.

Also, aproximately 80% of graduating B.S. chemists and 60% of graduating B.S. chemical engineers contemplate some form of graduate work toward higher degrees. Relatively few holders of advanced degrees elect to go into chemical marketing which further narrows the number of candidates available to us.

Then, very obviously, if it becomes increasingly difficult to obtain talented young men for sales and marketing careers, we shall have to make optimum utilization of those who are available.

To increase the productivity of the chemical salesman, he must not only be trained better than today, but he will need to be supported with more supplemental help in the form of higher quality technical service, product management, advertising, and sales aids. The more productive salesman will channel his activities where his technology and expertise will have the greatest benefit. He will develop greater skill as a time manager. He will need and use mechanical aids and non-technical help for most of the necessary but non-productive clerical and organizational work. Market research, market intelligence, and knowledge of competitors must be readily available to him. Information gathering and activity reporting which now require so much of the salesman's time must be streamlined through better communication methods. Increasingly, more sophisticated techniques must be found to train the salesmen, to keep them current and to maintain clear, current two-way communications utilizing less, not more, of the salesman's time than we do today.

Only through rigid conservation of the clock can the salesman devote himself to the "Bridge" concept of selling in depth. By "Bridge" concept, we mean that concept whereby the salesman is an extension of his company's management and is their representative in the customer's shop. His focal contract is with Purchasing. When appropriate, and with Purchasing agreement, he maintains liaison with other departments in the customer organization. With greater time economies behind the contact line, he will be better prepared and better qualified to conduct business with the purchasing influence within his customer.

Furthermore, this more productive salesman will call in the "flying wedge" more often in his selling efforts. That is, he will rely on his company's R&D management, manufacturing management, treasurer, and even president, to call with him on their counterparts in the customer company when such meetings are warranted and when they promise to make a mutually useful contribution. In fact, all levels of management must maintain a high marketing orientation in the highly competitive years ahead.

This more efficient salesman of the future will assume greater profit responsibility. He will not waste valuable time pursuing marginal business. He will be far more responsible and sophisticated in his pricing recommendations. He will assume a more important role in contributing to home office marketing intelligence.

The prevalence and increasing use of "Value Analysis" and other scientific purchasing methods will place even more emphasis on our sales-

men. The productive salesman will adjust to these methods and know their procedures as well as the purchasing people. To cope, he must not only know there is a demand for his products, but why, and what can keep his company competitive. A sound knowledge of secondary marketing or the needs of his customers' customers will be essential. To sell urethane polyols, for example, he should know the relative merits of urethane sandwich panels *vs.* other construction materials, and the myriad other uses of urethanes.

How are we to beget and train these superior salesmen? Better screening of applicants is a partial answer. Certainly we must seek only quality and not be satisfied with just bodies to fill vacancies. We have been accused of the practice of turning this year's trainees over to last year's trainees. Unfortunately, there is some truth in this indictment. This must be improved. We feel that there is a great need to create an awareness on the college campuses of the existence of the profession of selling, and to stimulate colleges and universities to step up and improve courses offered in marketing and in selling. These should be available to chemists and engineers, not just to business students. They should be practical and not totally theoretical and should be applicable to the line salesman and not to the board chairman. The newly graduated apprentice to marketing must be given a highly effective indoctrination into the company's business. He must be given concentrated courses and tests. We seem to do a good job of teaching our products, how they are made and how they are used. We do less well in teaching selling skills and time management. We need to improve this. The use of video tape which is just becoming commercially available as a tool to simulate practical field problems is one method.

Programmed training and problem simulation are becoming available commercially. Some of these are relatively simple and allow one man to teach himself. Others involve the use of a sophisticated program in central computers at major universities and data processing centers. These will provide for team participation and competition.

But one of the most essential needs in the making of a salesman is to have more scientific methods of measuring his performance and giving him corrective guidance. His sales *per se*, while of ultimate importance, are an inadequate yardstick, as are his relationships with a limited group of customers. This is particularly true in industrial chemical selling which frequently involves multi-level contact. We need better methods of measuring his overall contributions, many of which are subtle indeed. We must be able to better evaluate his time utilization, his empathy, his ambition, his creativity, and his loyalty.

And given realistic performance indices, then we can more intelligently plan the rewarding and upgrading of the individuals' talents. Must all

salesmen advance to management positions to be properly rewarded? I say no, although this has been somewhat the pattern in the chemical industry. There is no reason why we shouldn't compensate a highly productive salesman more than say his district or even regional manager rather than shoulder him with management responsibility for which he has little interest or is ill-suited. If his best productivity is direct sales, he should be allowed to continue in direct sales and be adequately compensated for his contribution. Better performance measurement would give the guiding answers to many salesmen moves—lateral, up, or cross-fertilizing their experience.

Let's discuss selling *vs.* servicing. This ratio will vary greatly from company to company, by nature of the products marketed, and, of course, on the technical competence level of the salesmen. Some salesmen double as technical service men, and some may go so far as to be research advisors. Here again, a much better assessment of how the salesman can spend his time most profitably is needed. Just as researchers have technicians to carry on much of their routine work, it may be wise to assign "sales technicians" to productive salesmen. Certainly the complexity of the salesman's job is not going to decrease. With the wide proliferation of products, the compaction of obsolescence, and the breaking down of the walls between scientific disciplines, the salesman will be required to be even more knowledgeable and ubiquitous.

The salesmen will continue working as part of the total marketing team. The activities of product management, technical service, market research, and market development will continue to be absolutely essential to his success.

A considerable percentage estimated at one-third of 1975 sales in the chemical industry will be of products now in the laboratory. Marketing's job will be to shorten the time lag between invention and profitable sales. With greater than ever demands on the salesmen, advertising must play an increasing rather than decreasing role in launching new products. The chemical industry will be spending approximately one billion dollars by 1975 on advertising to supplement direct sales efforts. Though this sounds like and is, in fact, a tremendous expense, it is still our most economical means of creating a rapid awareness of our products, services and company. Much must be done to improve and prove advertising's effectiveness, but the successful marketing team of the future will make maximum use of coordinated sales/advertising efforts and interdependence.

The premium on true professionalism in a salesman will be felt to even greater degrees in the years ahead. Not only will his knowledge have to be compounded over much broader fields, he shall have to develop the ability to communicate this knowledge in a no-nonsense

manner. Although the drummer type of selling industrial chemicals is passé now, it will have even less place in the "give me facts/performance/service" market of the future. I do not wish to imply that the buyer/seller relationship will be carried on by computers and be devoid of human associations. Far from it. There should be even greater interdependence between the purchasing man and salesman for both will be sorely taxed to keep up with the complexities of their respective jobs. And both will need all the help and information they can mutually exchange.

For the same reason, the future chemical salesman cannot become an automaton. He must possess the same human qualities he now has with a minimum of frailties. Empathy, doggedness, forthrightness, discretion, integrity, discipline—all will be as important in the spirited Seventies as they are today.

RECEIVED June 18, 1968

9

The Challenge in Marketing for Domestic Sales in Plastics

B. W. COLAIANNI

Chevron Chemical Co., Union, N. J.

The plastics industry is growing at the rate of 13 to 15% per year, compared with a rate of 4 to 5% for all other industry. This rate of growth for plastic industry is adding more volume and new products to meet this demand. Perhaps 50% of the products to be sold in the late 70's are unknown today, or are unavailable in large quantities. Such a dynamic industry—which is a major factor in our domestic economy—will demand a sales organization equally dynamic and innovated in its approach. It must be more adaptable, more flexible and be able to specialize its efforts in a manner not fully applied today. The new plastics sales organization of the 70's will move larger volumes of products, will sell more on a contract basis, and will direct its sales efforts based on centralized bulk terminals or off-plant manufacturing sites. Also, the more common use of distributors will come into play, the computer will help reduce costs and increase efficiency, and possibly it may even sell on a catalog type approach.

Looking from the vantage point of the late 60's, the so-called "Golden Decade," it is not difficult to foresee an even more incredible growth for the plastics industry—The Golden Decade will spill over its dynamic surge into the "Soaring 70's." An industry whose growth rate of 13 to 15% per year will continue into the 70's, (compared with all other industry of 4–5% a year), presents a formidable challenge to the plastics sales organization. It will demand flexibility in sales policies and procedures and it will, of necessity, require a specialization that we have talked about but hesitated to do much about.

I agree with the statement made by Paul Mayfield ten years ago at this Symposium that the marketing challenge in the 60's was to put the

right team, with the right products, selling at the right price (and I might add at a right profit), in the right market. I also agree with Jim Williams who ten years ago stated that you reached this market—this customer—through a properly organized, well-trained sales organization.

But looking into the Soaring 70's, this right team, with its proper direction, needs in addition the added characteristic of change. We cannot cling to the stereotyped sales organization with its fixed areas, covered on routine basis, if we are to sustain this tremendous growth and add new products to be sold at a reasonable and fair profit.

The change to meet the challenge of the 70's will add a new dimension to the plastics sales organization; it shall couple foresight with action.

The Salesman

I do not propose to write a job description here for the plastic salesman of the 70's. There are enough training manuals and books written on the subject by far more knowledgeable people than I that cover this subject adequately. Neither do I propose to type a person as a plastic salesman nor advise as to how you go about selecting him—or her. I throw a "her" in here—for this could be one of the changes in the 70's, and it could be an effective way to go.

For the plastic salesman of the 70's, we must assume that we have an intelligent, well-selected, well-trained individual, who in my estimation must have two basic characteristics—*i.e.*, initiative and imagination. If he is married, he must—yes must—have a salesman's wife. I will only interject one point here about recruiting—meet the prospect's wife. One lunch, one dinner, and a few leading questions will reveal much and possibly save you from many headaches later on. Many men feel that they are married to a traveling man's girl—that is, until they are confronted with his nights away, a relocation, or the time to entertain a bore of a customer. Training can be rather basic—policies, procedures, services, and products—especially for the more mature fellow, for I have found the person with strong drive, enthusiasm, and imagination can train himself in the plastics field—on the job. Most of all, this plastics salesman of the 70's will find himself in a changed organization requiring more flexibility. He must be ready to adapt to different situations. He will find too that he has more responsibility.

The Sales Organization

The greatest challenge, I feel, will be for the sales organization itself. It will be customer oriented—but oriented in a special way—so that the larger volumes of plastics raw materials and products of the 70's can be sold profitably. I strongly feel that properly organized, the plas-

tic sales group of the 70's can move these volumes at proportionally and substantially reduced marketing–sales costs, which will help offset the increasing cost spiral continuously developing from other directions.

The customer of the 70's for the basic plastics producer will be buying larger volumes, probably on a contract basis, and will be in fields ranging from films to fibers, packaging to construction, and transportation to medical products. The real sales challenge will be to keep these volumes moving profitably and thus the domestic plastics sales organization must adapt its approach to volume. This means that the plastic salesman of the 70's will have larger account responsibility and his sales effort will truly result in an in-depth penetration of an account. Disregarding geographic boundaries in some cases, his knowledge of the customer will be complete from research to production and purchasing to marketing.

He will assist in reducing the transportation and handling costs of his customer, service his product through engineering and production, and even find new outlets for his customer's products, (where applicable), as well as his own. For fear that it might be said that this will be the ubiquitous plastic salesman of the 70's, let it be said that his effort will be only as strong as the support he receives from other equally functional elements of his organization. His whole marketing organization must be involved from management to staff, technical service to research, and accounting to advertising. These organizational elements are all part of the sales team, and they should constantly be aware of the fact. For profitable sales are their future too and that is the name of the game —prof.t.

Distributors

Where to draw the line between the high volume type business we have been describing and the next level, offers a further challenge to the plastics sales organization. Being interested in larger volume solicitation, at reduced marketing costs is fine, but what about the other customers? Here, too, change and adaptation will come into play. I envision a network of bulk terminals and distributors handling the plastic needs (both resins and converted products) of the medium to small account. A well-trained, industrious distributor organization guided by the hands of a creative salesman who is assisted by the complete sales organization, can do much to increase sales and broaden customer lines. Such a system will not only reduce direct sales costs, but still enable the large basic producer to maintain its integrity of quality of products, quality of service, and the overall customer support required by larger volume accounts.

The sales organization is the one group which can best guide management as to the most strategic location for bulk storage and processing

of products, as well as the distribution channels for these products. Some sales from such bulk terminals may be sold direct—as blending and formulating are done on location so to speak—to meet the product needs of the medium size customer. Others will require the speed and flexibility indicative of a sound jobber or distributor. This will be another challenge in the 70's for the plastics sales organization. To determine the most economical channels of distribution based on the volume and area requirements of the 70's, the sales organization must rely on the use of a new tool now coming into great popularity as marked by its increasing usage, namely, the computer.

Computer

I believe the computer and computerized techniques will come into prominence as a sales aid in the 70's—with its proper application being, for example, to advise when to and when not to sell direct and which areas to emphasize. Utilization of computer-generated data by competition will prove a strong challenge to the domestic plastics sales organization in the 70's. Skilled programming of computers can provide in short time periods your complete costs of solicitation in one area *vs.* another, which are the most profitable areas, which are the least profitable, and what variable can influence each of these.

Among an unlimited host of advantages offered through computerized operations is the speed with which business decisions may be resolved thereby freeing the plastics sales or marketing manager from routine drudgery to becoming once again customer oriented. Far too many of these managers today are so bogged down with the details of decision making that regretfully, not enough time is available to measure changing customer needs, wants, attitudes, and buying habits—as well as his own organization's performance, reliability, quality, price, and customer service. If this additional time made available to him through proper computer use is spent in re-orienting himself to the customer and the marketplace, the plastics sales manager will quickly recognize opportunities again for improving existing products and services as well as the development of new ones. Consequently, emphasis may be directed again to the profitable movement of large volumes of materials. Yes, the plastics sales and marketing manager must develop a real understanding of the computer and its role in the decision making process.

I feel that a computer memory or storage bank will help improve customer service and reduce costs by having available to customers certain routine information on product specifications, applications, and test methods, which formerly would have to be hand carried, mailed, or otherwise require the time of sales or staff people to answer. Customers could

have access to this information through a time-sharing system available broadly or on a selective basis as is required.

Harnessing this power of the computer to his sales vehicle will enable the plastics sales executive to grasp the concept of his business as a completely integrated system—one which encompasses the contributions of all; the individual salesman, the organization, his services, his staff functions, and the customer—toward the common goals of each—fair and reasonable profits.

Putting the computer to use effectively offers not only a challenge but a great opportunity for all of chemical marketing in the future. This will certainly be one of the real challenges of the 70's for plastics sales.

Sales Wisdom

One word should be said about a constant challenge to all who direct plastics marketing activities—one which has been with us since the early days of plastics and one which will be with us, I am sure in the 70's. This problem is one of maintaining statesmanship and integrity in all of our marketing efforts. Too often has the plastics sales organization found itself in the dilemma of moving product at poor returns in relation to its investments, or at no profit at all. Over capacity or slow developing markets have further complicated the situation. However, some of the fault must lie at the desk of the plastic sales manager. Call it hitting the panic button or excessive topside pressures, he has at times allowed his product to be sold at unrealistic prices based on incomplete competitive data or hearsay alone. Proper documentation of competitive situations and market conditions are a must before any sales or marketing manager can make a decision; and going back to an earlier statement I made, the plastics marketing man must remain customer and market oriented and know the strengths and weaknesses of his own organization at all times. Having accomplished this, sound and intelligent pricing decisions can be made judiciously.

Historically, the price trends of all plastics have been downward—a tribute to the industry's technological and market development advances. However, the plastics industry cannot long survive if it cannot sell its products at a fair price for a reasonable profit. If it is to continue its advancement in the 70's at the 13–15% growth rate and offer new and improved products to its customers (it is estimated that in the late 70's, perhaps 50% of the products to be sold are unknown today or not available in large quantities), a proper return on investment must be maintained.

Customers also should be aware that unreasonable returns will result in small expansion, with tighter markets prevailing and, of course, at increased costs to him. Newer and lower cost products are being devel-

oped each day and compared with the non-plastic materials they are replacing, the cost of plastic raw materials and products are a real bargain. Maintaining sound principles in marketing and pricing shall continue to be a challenge in the 70's.

Conclusion

What then are the challenges of the Soaring 70's for domestic sales of plastics? As I see it, it is the challenge to accept change and adapting that change to a more flexible and progressive sales organization. The challenges are (1) to move larger volumes at lower costs and increased profits; (2) to utilize sales manpower to move these increased volumes; (3) to adjust salesmen to accounts not geography; (4) to use strategic bulk processing terminals and industrious distributors to better service medium and small accounts; (5) to properly use all the new tools of change, especially the electronic genius, the computer; (6) to locate markets, provide for marketing and profit emphasis and relieve the sales and marketing managers of details so that they can go about their business of selling and finally (7) to maintain continued statesmanship in sales pricing and policies so that fair and reasonable returns will stimulate future growth for the plastics industry.

As illustrated in a recent *Modern Plastics* presentation (*1*), plastics are becoming a vital part of everyone's business and by 1980 plastics will be the most important world-wide material.

Being an integral part of our lives—which are under constant change —why cannot plastics sales of the 70's accept this challenge of change for the better—better products, better satisfaction, and better profits.

Literature Cited

(1) "Plastics: A 15 Year Outlook," a *Modern Plastics* Presentation, Spring, 1968. (*See Modern Plastics* **45** (11), 79 (July 1968).

RECEIVED July 15, 1968.

10

Domestic Sales—Agriculture Chemicals

K. R. FITZSIMMONS and L. G. SMITH

Shell Chemical Co., Agricultural Chemicals Division, New York, N.Y.

A number of changes took place in the Sixties that will influence the marketing of agricultural chemicals in the Seventies; among them are the expansion of the number of producers, many of whom are in both pesticides and fertilizers, the decline in the number of farms and the increasing size of the farm enterprise; the expansion of services to the farmer by retail outlets. Opportunities in the product area include selective systemics to replace products that have become ineffective, new systemic soil nematocides, new systemic foliar fungicides for cereals and fruits. Sales of basic toxicants at the manufacturers' level will reach $700 million in 1968, over $1 billion by the mid-Seventies.

The "Sixties" fostered a number of influential changes within the Agricultural Chemicals Industry—especially in Marketing. Since most changes are merely extensions of or improvements on the past, we can see, as we look into the "Seventies", a need for careful appraisal and probable consolidation of certain industry marketing programs.

The potential profits to be derived from a proprietary position in the pesticide market have attracted increased capital and technical competence to the agricultural chemicals industry during the past decade. Even so, it seems pertinent to point out here that the pesticide industry is one of the most regulated of any business, including the drug industry. Few people, outside of those in the industry, are aware of the research efforts and costs necessary to provide the ever increasing data required to support a pesticide petition for label registration. More data is now required in the areas of toxicology, residue chemistry, metabolism (plant and animal), and in environmental considerations.

Once a label has been granted and the pesticide is launched in the marketplace, it comes under the continuous scrutiny of federal and state agencies and all those who have responsibility for recommendations for

pesticide use. Also, it becomes one of those "pesticides" which are spasmodically attacked by pressure groups who are opposed to the use of pesticides and claim that they are not necessary and that they contaminate our food supply and our environment.

The increased regulations, the continuing review and evaluation of pesticides by specific committees, domestic as well as international, the delays in obtaining registration which can cost a complete season's sales, and the frequent harassment by pressure groups are factors having a pronounced effect on our pesticide industry. These conditions are contributing to a rapid rise in costs and an increase in the risks associated with our business. As a result, a number of chemical companies have abandoned their research programs, and others have curtailed their research efforts. Nevertheless, there are many companies in the pesticide business and many good products on the market.

The growing competition in the marketplace has convinced many companies that they must know more about what is going on, at the grass roots level, and that they must make a greater effort to influence the farmer in his choice of products and, therefore, more closely direct the marketing effort through all distribution steps to the farmer.

A number of significant changes took place during the 1960's which will influence the marketing of agricultural chemicals in the 1970's—of interest are:

(1) The expansion of major oil companies and natural gas companies into the fertilizer field through mergers, acquisitions, or construction of new plants. Nearly one-half of these companies are now manufacturers/formulators of pesticides.

(2) The expansion of basic producers of pesticides into the fertilizer business. Over 60% of them are now in both pesticide and fertilizer production.

(3) The expansion of the major fertilizer producers into retail marketing through mergers, acquisitions, or construction of dry and liquid bulk-blend plant and farm service centers. Of the major companies engaged in manufacturing of fertilizers, over 60% own retail outlets.

(4) The entrance of companies representing other segments of the industry into agricultural chemicals:

e.g. drug, food, steel, aluminum, railroad

(5) The growth of large regional farm cooperatives through mergers and their expansion in the fertilizer and pesticide fields.

(6) The increase of patent protected pesticides which are marketed as proprietary products by basic producers in contrast with technical chemicals marketed a decade earlier.

(7) The expansion of combined marketing of fertilizers and pesticides by former fertilizer retail outlets.

(8) The expansion of services to the farmer by retail outlets.

These changes represent a significant transition in our industry. To the basic producer of pesticides, it means increasing dominance of pesti-

cide distribution by large, integrated companies, a change in customers, and a change in competitive marketing strategies.

A company cannot "mean all things to all people" because each company is inclined to do those things it does best. Some invest their capital in research and technical know-how, some, because of their raw material position, are dominant in manufacturing while others invest and develop a strong position in marketing and services.

In trying to orient our thinking to marketing in the 1970's, we might best do this by consideration of three areas:

The Products
The Markets and Distribution Patterns
The Selling Patterns

The Products

Protective patents on several of the present major insecticides, fungicides, and herbicides will expire during the 1970's. Since these products will become commodities, it can be assumed that some domestic as well as foreign producers, who have a good raw material and manufacturing position, will offer them in an already-established domestic market. This situation could give rise to a weakening of prices and a subsequent strain on profits. Also, it could have some influence on the development and introduction of new patent protected chemicals.

With low cost commodity products dominating the major crop markets and the high cost of developing new products, companies with heavy investments in research and development must concentrate on those new compounds that will either excel or fill a gap in the pest control programs.

Some of these areas of opportunity will be:

(1) Selective systemics to replace those products which have become ineffective because pests have developed resistance to them.

(2) New systemic soil insecticides (nematocides) which will give seasonal control of resistant insects as well as nematodes.

(3) New systemic foliar fungicides for disease control on cereals and fruits.

(4) New soil fungicides for control of root rots and wilt organisms on cotton, tomatoes, and fruits and to control seedling diseases to improve crop stand.

Federal and state agencies are expanding research on biological and integrated control concepts directed to reducing environmental contamination, protecting wildlife, and alleviating certain public health problems. Such control programs require that industry provide products with designed specificity to suppress certain insects yet allow parasites and predators to flourish. However, it is doubtful that industry will put forth

much research effort on chemicals such as chemosterilants, insect hormones, and metabolic inhibitors, because the quantities required will be limited.

Other opportunities for new chemicals will likely be in those areas associated with increased mechanization in agriculture. Time and labor saving machines along with chemicals that will complement their use will contribute to increased farm efficiency.

Improved selective herbicides are needed to give more effective control of a wider range of weeds in our major food crops. Also, development and wider use of chemical plant growth regulators is needed to enable the farmer to exert more control over growth habits of his crops (*16, 17, 18, 19, 20*). Examples of the use of growth regulators are as follows:

(1) to retard growth and/or hasten maturity for uniform harvesting,
(2) to defoliate to aid harvesting,
(3) to delay fruiting to escape frosts,
(4) to provide resistance to drought or frost,
(5) to induce fruit set—thin and increase fruit size,
(6) to inhibit senescence and improve appearance and keeping qualities of fresh fruits and vegetables.

The Markets and Distribution Patterns

The expected increase in population and the corresponding demand for food leaves no doubt as to the growing need for pesticides. As we explore the pesticide markets and distribution patterns in the future, we must take into consideration the size of the market, the increasing size of the farm enterprise, and the changes taking place in distribution patterns to supply and service these larger crop producing units.

The growth rate of pesticide sales over the past five years has been about 14% a year. It is estimated that sales of basic toxicants at the manufacturers' level will reach about $700 million in 1968 (*1, 2, 3, 4, 5, 6*). Based on a conservative growth pattern, say 10% per year, by the mid-Seventies pesticide sales would be over $1 billion (Figure 1).

Historically, we have had a three step marketing system. The manufacturer sold to a formulator/distributor, who in turn sold to dealers and the dealers sold to the farmers. As pointed out earlier, this pattern has changed and continues to change. First of all, the number of farms is decreasing while the size of the farms is increasing. Over the past 20 years, the number of farms has declined some 44%—from about 5.8 million to about 3.2 million (*8, 9, 10, 11*). It is now predicted that within the next year the number of farms will fall below 3 million—down from

4 million in 1960; a drop of about 1 million in less than a decade (*15*). As a result, small farms which can no longer generate the capital necessary to operate economically are being absorbed into the larger farming units. Results of recent studies show that investment in some of the larger, better farms in the Midwest has increased to an average of about $170,000 from around $40,000 just after World War II (*8, 9, 10, 11*). It has increased even more in some other areas. A recent article in the *U.S. News and World Report* stated that in California the average capital investment in commercial farms has risen from $40 thousand to $260 thousand in the past 18 year (*15*).

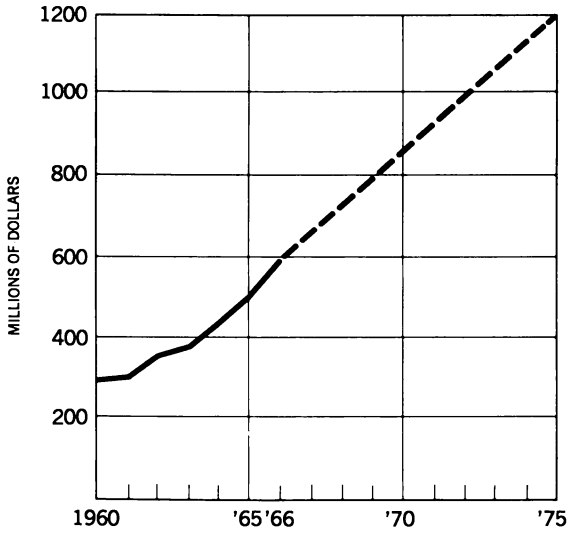


Figure 1. Estimated U. S. pesticide chemical sales at basic manufacturers' level.

As to the size of farms, the 1964 census shows the average farm was about 350 acres. Recent studies in California, as reported in the *San Francisco Chronicle*, concluded that 640 acres is more realistic as an efficient and competitive enterprise. However, in certain crop areas such as the Imperial Valley of California, up to 1,500–2,000 acres are needed; and in the Palouse area of Eastern Washington, 1,600 acres are considered the best size for wheat and pea farms (*14*).

Corporate farming is on the increase and is not necessarily limited to large companies. In an effort to remain competitive two, three, or more family farms are joining together to form a corporation. Some of the advantages accruing to this type of operation are: purchasing power, better credit, better use of equipment and mechanization, spread of the

risks and liability, and more efficient management and marketing practices.

Many large corporations have entered into crop and livestock production. Each company may have a different motive: to acquire land as an investment, to hedge against inflation, to assure a market for farm inputs which they sell, to make a profit by applying business practices to farming, to assure a supply of products they need for processing, or to just plain diversify their business (*7*). It has been reported that livestock and foodstuffs marketed in 1967 amounted to about $43 billion and 5% of this was contributed by corporate farms (*12, 13*). These companies are primarily engaged in commodity production—*e.g.*, grains, cotton, beef, hogs, and poultry.

The basic fertilizer producer who is integrated direct to the farmer through his own retail outlets and the regional farm cooperative through the co-op stores constitutes a growing market outlet for pesticides. These retail outlets, now referred to as farm service centers, in addition to supplying production input items—fertilizer, pesticides, seeds, etc.—will provide custom application equipment and various technical services to the farmer.

The regional formulators and distributors and their independent dealer outlets have been an important segment of the distribution system for the basic manufacturer of pesticides. Many of these independent companies because of their flexibility and service have established a strong position in localized areas. However, their future is becoming more dependent on the marketing policies adopted by the basic producer of pesticides.

It is believed that as the farms become larger and the need for technological service increases, the farmer will come to rely more and more on the services of custom applicators. Custom application can be provided by the farm service center or companies specializing in this service. These applicators will provide the farmer a complete pest control program under contract. This frees up the farmer's time, reduces capital outlay for special equipment, and reduces required skilled labor.

As our technology advances, we can foresee farmers forming pest control districts to enable them to utilize area-wide conrol of specific pests and to facilitate adoption of certain integrated control programs.

Therefore, as we view the future distribution outlets, we see an increased number of outlets and a marked trend to more direct selling to the large farmer, the corporate farmer, the custom applicator, the fertilizer company, and co-op retail outlets as well as the independent regional distributor and dealer.

In other words, the marketing outlets for pesticides will be in the hands of professionals—it will become a business—not just a sideline.

The Selling Patterns

We will now direct our attention to changes we see in selling patterns that will be necessary in view of changes in products and marketing patterns.

The farm enterprise will become a food and fiber factory. With the pressure on efficiency in production, we will see increasing emphasis on better land use. Gradually major crop production will shift to those areas, and even farms, where the soil, climate, and related factors offer the greatest potentional for maximum yields. A counterpart to efficient land use is continuous cropping and this practice will intensify related infestations of insects, weeds, etc., thereby requiring greater use of pesticides.

The farm enterprise will be well managed and financed and will utilize modern technology in products, seeds, mechanization, and cultural practices designed toward increased efficiency and maximum production. With the farm established as a commercial production enterprise, the farmer-manager will purchase his input items and services from the supplier who can best provide his needs. The classification of the supplier whether a manufacturer, a distributor, a company retail outlet, or an independent dealer will vary according to the crop area, the size of the farm unit, credit requirements, etc. Therefore, the pesticide manufacturer's marketing program will need to be tailored to supply his products and services through those distribution outlets which can best serve the farm enterprise.

As basic manufacturers of pesticides, we will need to make some further adjustments in our approach to these changing needs of the farm enterprise. There will have to be close coordination of research and development, market research, and marketing to:

(1) Define and determine the size of each market
(2) Develop products for specific markets
(3) Program our research efforts on toxicology, residue, and performance so that we will have adequate data for label clearance to permit orderly sales entry into these markets.

Because the farm enterprise will require more technical service, it is reasonable to assume that our sales representatives will become more technically oriented in order to provide farmers, farm managers, and distributors the technical information required. They will have to be crop specialists because they will be selling crop programs, not just products. Support of these personnel and services will require more sophisticated educational and communication techniques to insure effective and safe use of pesticides.

Electronic computers will play an increasing role in farm management decisions. As records are accumulated on past operations and

costs, proper programing can provide information needed in areas such as selection of crops, varieties, rate of seeding, and fertilization. Such services will become available through federal and state agencies or companies specializing in these services, and probably, but hopefully not, the suppliers.

In our attempt to project the uncertain direction of the future, we cannot overlook some fundamental facts.

The competition for the farmers' pesticide expenditures by several basic companies with similar products producing similar results will no doubt lead to a more selective and closer relationship between the manufacturer and the distributor, based on performance. The basic manufacturer will be required to give more loyalty and support to the distributors who truly do a successful marketing job for him and in return the manufacturer has the right to expect loyalty and support from the distributors.

Therefore, competition will require that the basic producer of pesticides place increased emphasis on sophisticated marketing techniques, marketing research, technical service, advertising, sales promotion, and merchandising programs all directed to influence the farmer and support his selected distributors.

Literature Cited

(1) *Farm Chem.* p. 16 (Jan. 1968).
(2) *Ibid.*, p. 22.
(3) *Ibid.*, p. 24.
(4) *Ibid.*, p. 102.
(5) *Ibid.*, p. 104.
(6) *Ibid.*, p. 106.
(7) Goetsch, Forest L., *Doane's Agr. Rept.* (Jan. 8, 1968).
(8) Meyers, Harold B., *Fortune* 54(7), 141 (Dec. 1966).
(9) *Ibid.*, p. 232.
(10) *Ibid.* p. 234.
(11) *Ibid.*, p. 239.
(12) Prestbo, John A., *Wall Street J.* p. 1 (Aug. 9, 1968).
(13) *Ibid.*, p. 9.
(14) Schacht, Henry, *San Francisco Chronicle*, p. 47 (March 6, 1968).
(15) *U. S. News and World Report* 64(11), 78 (March 11, 1968).
(16) Wittwer, S. H., *Farm Chem.*, p. 62 (Feb. 1968).
(17) *Ibid.*, p. 64.
(18) *Ibid.*, p. 66.
(19) *Ibid.*, p. 68.
(20) *Ibid.*, p. 133.

RECEIVED May 13, 1968.

11

Sales *via* Distribution and Agents

REID W. MALCOLM, JR.

McKesson Chemical Co., New York, N. Y.

The distributor is valued as an important member of the chemical manufacturer's selling and servicing efforts and is a real constructive force, filling a necessary economic function. With the chemical industry looking at growth rates in the areas of 8 to 10% per year, and with the expectation that the distributor will continue to grow at these rates, perhaps in excess of them, the challenge to cover this huge market properly is great. As the chemical distributor becomes more knowledgeable and more highly developed in the fields of industrial selling and in creating better services to the chemical user, he will expand his usefulness to the manufacturer and the customer and will share a larger percentage of chemical markets.

The growing status of the distributor in the chemical industry, as well as the important function that he performs in the marketing of chemicals, is being more widely recognized today. Evidence of this lies in the fact that a brand new chapter on the subject "Sales *via* Distributors and Agents" is being added to this monograph—"Chemical Marketing: The Challenges of the Seventies."

At the beginning it may be helpful to define the terms, "distributor" and "agent" along with some related terms, which have been used in this area, sometimes resulting in misunderstanding the functions that these people perform.

Agent—In general, one who is authorized or empowered to act for another in particular matters or in general. Under law, any contracts made by an agent in the ordinary course of business, are binding upon his principal.

There are many kinds of agents—*i.e.*, purchasing agents, insurance, etc.—but of specific interest in our field are:

(a) *Manufacturer's Agent*—A person or organization engaged in selling the products of one or more manufacturers to users. He does not

take title to the products, nor does he warehouse them. He acts under a continuing contractual arrangement with the manufacturer.

(b) *Broker*—An independent agent, who sells, but does not take title to the products, and works on a single transaction basis.

Distributor—An organization performing the function of distributing the products of a manufacturer to customers or to dealers.

Since the agent is principally concerned with only one major phase of the distributor's function, namely sales, we will focus our attention on the more comprehensive activities of the full service chemical distributor.

Principal Distributor Functions

The principal functions of the chemical distributor are:

(1) To satisfy the chemical needs of industrial consumers, both large and small, on all types of chemicals. The distributor's major market is in the less carload, less truckload, and small bulk requirements of these chemical consumers.

(2) To provide prompt, dependable service from local warehouse stocks.

(3) To provide information to the users of chemicals regarding properties, application, and handling of the chemicals in which they are interested. Comprehensive technical back-up is arranged by the distributor and provided by and in cooperation with the technical staffs of the producers they represent.

(4) To assist customers in the management of their chemical raw material inventories by carefully planned buying and arranging for the combining of the many items they regularly require on one order with one delivery. This substantially reduces a customer's paperwork. Lower inventories can be maintained by dependence on the local distributors, thus releasing capital for other purposes. This method of buying greatly simplifies the chemical purchaser's problem of securing the many smaller items on his procurement list, each of which, if ordered singly, can take as much time as a major purchase.

(5) To work cooperatively with manufacturers of chemicals by providing a well trained and strong local selling organization, which provides intensive coverage of all chemical users in the area. The distributor's local selling strength is in effect an extension of the manufacturers' own marketing organization. Through it the chemical producer can reach the users of his products throughout the country that he cannot economically sell and service himself.

Distributor Organizations

There are many types of distributors who serve the chemical industry. Broadly, they may be classified with these groups:

(1) *Area or Territory Served.* (a) LOCAL—This type of distributor sells and delivers in a very limited area, such as one city or town. (b) REGIONAL—An organization that can provide coverage of a large geographic area—*i.e.*, the Western States, by maintaining a network of

local distribution points. (c) NATIONAL—A coast to coast organization of local distribution centers that provides coverage of the entire country. McKesson Chemical is such an organization, coordinating and directing the activities of 63 local "branch" operations and 125 stock points in the United States.

(2) *Specialized Distributors.* There are many distributors who direct their efforts to a specific industry or to a specific group of chemicals. Examples of these would be, the type of distributor in the Southwest who directs his full attention to the servicing of the oil fields; or the distributor who is totally engaged in servicing the rubber industry or the plating industry.

There are specialists who work with product groups, such as the solvents distributors and the compressed gas distributors.

(3) *Broad or Full Line Distributors.* This type of distributor sells, delivers, and provides services on all types of industrial and fine chemicals.

The distributor, because of the very close association with the community and the industries he serves, provides a strong link between the manufacturer and the chemical user. As we have mentioned previously, he is really a part of the marketing organization of each chemical producer for whom he acts as a distributor.

To work most effectively with his suppliers, the distributor in this role must have understanding of the sales policies and goals of the manufacturer. On the other hand, the manufacturer must have an understanding of the needs and goals of his distributor and the market he serves. This is best accomplished by written agreements between the distributor and the manufacturer, supplemented by a continuing interchange at all levels of these organizations.

Good working relationships are most important at the salesmen's and local manager's levels. These must be fostered and cultivated by both the distributor's and manufacturer's management.

The Distributor Salesman

Key to Success. Since the primary mission of the distributor organization is to do a localized and intensive selling job, good salesmen are vital to the success of the distributor.

Just as most professions have grown more sophisticated in our expanding, complex and highly technical society, so has the distributor's salesmen grown. Today, he has a degree—usually in chemistry or in business sciences—undergoes considerable preparatory training with his employer prior to making sales calls. He has a lifetime job of keeping himself informed on new products, new technology in the chemical industry that may change uses or requirements for chemicals, and keeping abreast of local business and market conditions.

The distributor salesman is trained not only by his own highly sales-minded employer, but also by selected suppliers who can contribute to his development.

As a highly trained professional salesman, the distributor salesman makes concrete contributions to the area he serves. He brings new products and new ideas to the attention of local industry, and provides services on them. These benefit the customers and the community in which he is located, as well as the chemical manufacturer and the employer he represents.

The Distributor's Services

With a well-staffed, aggressive sales organization, the distributor needs a strong service group to follow through and to provide the customer with the many benefits available from this kind of organization.

The distributor salesman who provides local and frequent person to person contact with the customer has a partner who is the "inside man" on the telephone at the local branch office. This key man supplements the salesman's contacts by handling orders and requests for information. Technical assistance, in the form of information or field help, can be provided by the local distributor's salesman or by members of the technical staff of the manufacturer to almost any degree that is required.

Local warehouse stocks of fresh chemicals are convenient to the user for fast delivery or for pick-up by his own truck.

Customized services are available to chemical users who may profitably utilize any one or all of the following: combination of products in a single shipment for better inventory management; the coordination of local plants buying practices at the headquarters of a multi-plant company with a regional or national distributor, who has local contacts at all the plant locations; and the tailoring of small bulk systems to replace costly and sometimes unsafe drum handling in the customer's plants.

The Role the Distributor has Played in the Growth of Chemical Sales

As we all know, need or a demand triggers a supply. This has certainly been true in the field of chemical distribution, where, since World War II, there has been a tremendous growth in the number of distributors, as well as growth in the size of established distributors.

The latest figures that are available from the U.S. Department of Commerce "Census of Business" are for 1963. These show that in the five year period between 1958 and 1963, there was a gain of 349 establishments distributing chemicals, to bring the total up to 3,163. Most of these are very small organizations, with the average number of employees

for all of these establishments being eight. Growth in the number of these establishments has continued.

From 1958 to 1963 sales of this group increased 35.5% from $1,497,500,000 to $2,028,806,000.

McKesson Chemical Company's sales in 1958 were $24,000,000 and grew to $116,000,000 by 1967.

During the early years, the distributor had little or no status and was frequently considered a "parasitic middleman" who contributed little to the industry.

The story is much different in 1968. He is now valued as an important member of the chemical manufacturer's selling and servicing efforts and is a real constructive force, filling a necessary economic function.

During this period, the chemical manufacturer and the distributor have learned more about each other's goals and the routes to them, and have been developing a teamwork approach to their achievement.

Today, chemical distributors are being used by more and more of the manufacturers to handle a wider and more sophisticated line of chemicals. This has become possible through the progressive development of the distributor salesman and his organization.

In 1967 it is estimated that 20–25% of industrial chemical sales (organic, inorganic, specialty chemicals, etc.) will be sold by chemical distributors. This approximates 5.1 billion dollars.

The Future of the Distributor in the Chemical Industry

"The Challenge of the Seventies." With the chemical industry looking at growth rates in the Seventies in the range of 8–10% per year, and with the expectation that the distributor will continue to grow at these rates, and perhaps in excess of them, the challenge properly to cover this huge market is great. A survey recently completed by McGraw-Hill's, Department of Economics for the fifteen year period 1967–1982, shows these rates of growth for those segments of the Chemical Process Industry which are served in an important way by the chemical distributor, as follows:

Industrial chemicals	9.7%/yr.
Organic chemicals	10.2
Inorganic chemicals	8.1

Costs of selling, delivery, and related functions will continue to rise, and the chemical distributor can play an increasingly important role in getting products from the manufacturer's plants to the large number of users that constitute the sizeable less carload markets.

The distributor, as a local marketing specialist, who knows the local people well, understands the local problems and has a feel for the trends in his area of service, will continue to feed back information on these

matters to the manufacturer. This information can be the feed stock for future development of improved or new products and better services.

As the chemical distributor becomes more knowledgeable and more highly developed in the fields of industrial selling and in the creation of better services to the chemical user, he will expand his usefulness to the manufacturer and the customer and will share a larger percentage of chemical markets. This has happened in the last decade and the outlook is favorable for this to continue into the Seventies.

RECEIVED May 23, 1968.

12

Market Development of New Industrial Chemicals and Plastics

W. G. KINSINGER

Hercules Incorporated, Wilmington, Delaware

In the 1970's market development will, as always, link the products of industrial chemical research to prospective customers. Producers of polymeric chemicals will increasingly conduct research on the fabrication of their polymers and the manufacture of complex structures from them. This imposes new challenges on chemical market development in assessing profitability factors and his company's marketing capabilities to determine how far to integrate. A mature chemical industry appears near to an ability to synthesize at will a product with reasonable property requirements. Increasing need for detailed knowledge of the technologies of prospective customers is required to guide such research. The author foresees increasing formal relationships on a development basis between chemical producers and selected companies in the consuming industry.

We shall attempt to forecast what new challenges shall face market development people in the 1970's. We are concerned here only with market development of completely new chemicals and plastics. Products new to one's company but well established in the economy will be covered in a later chapter.

What Is Market Development? We should begin by understanding the market development function and its role in our industrial economy. Perhaps it can be defined as the reactive interface between the creators of a new product—usually technical research—and the future customers for that product. Since to many the word "interface" connotes a barrier, let us emphasize here that the objective of market development is quite the opposite—to minimize obstacles and to stimulate, guide, and expedite the flow of information between markets and research.

The Market Development Function in the Chemical Industry. Forecasting is a dangerous business. Many a forecaster has lived to have his predictions haunt him later. Recognition of this has led to the unwritten rule that one should always forecast for a period of one year after his retirement. Since I hope to be actively involved in market development through most of the 1970's, this safeguard is not available to me.

I fall back, therefore, on a simple rule I learned many years ago as a Boy Scout studying for a Merit Badge in Pathfinding. This rule, as I remember it, went somewhat as follows, "If you're lost in the woods and want to see where you're going, climb the highest tree and see where you have been." While I've never been lost in a literal woods, this rule has often helped me get out of a figurative woods. Thus I shall use it here.

The woods in which we seek our way is, of course, the chemical industry. The path we seek is that of market development. As we climb our 1968 tree and look back, we note several things. First we see that the path of market development always follows the outermost borders of the woods of the chemical industry. It is a meandering, almost sinusoidal path, wandering frequently into the woods of other industries.

We note too that the path of market development runs very close to another path—that marked Research. In fact, so close are the two paths at times, that they sometimes seem to be one. At such places the signs read "R & D."

Finally, we note that the woods of the chemical industry appears to be continually expanding, always touching upon and frequently enveloping portions of other woods of other industries in the economic forest.

So much for our allegory, we shall not pursue it further. It has served solely to picture the following base points from which we can project the future course of market development:

1. That market development usually functions at the outer borders or frontiers of the chemical industry.

2. That it is one route by which that industry relates to and explores other industries.

3. That market development of new products must necessarily have close relations to technical research.

4. That, as the chemical industry expands and evolves into new areas of technology, market development must keep pace.

If we are therefore to predict the future of market development, we must first predict the future of the chemical industry and of the research by which it generates its new products.

Trends in the Chemical Industry

Market *vs.* Product Orientation. Despite many attempts to do so, it is becoming increasingly evident that the chemical industry cannot be defined in terms of its products. If there are those who still long to do so, I remind them that two of the largest volume "chemical" products are not ordinarily considered as products of that industry. One of the largest tonnage pure organic chemicals consumed in the U. S. today is crystalline sucrose—more commonly known as sugar. We consume over ten billion pounds per year. Correspondingly, one of the largest volume inorganic chemicals—over two hundred billion pounds per year—is a solution of carbon and other chemical elements in iron, more commonly known as steel. Neither of these come readily to mind when one tries to name the major products of the "chemical industry," yet both require chemical technology in their manufacture.

Most major chemical companies have become aware that their basic business—their *raison d'etre* in our economy—is chemical technology rather than specific chemical products. I am indebted to a 1964 speech by D. Ballman of Dow Chemical for expressing this well. He suggests that Dow (and I would assume he includes other chemical companies) provide "technical service" to their customers. Not technical service in the sense of answering customer complaints on specific chemical products but rather the use of their unique, chemical knowledge and know-how to make products which meet certain customer needs in certain industries. He considers a chemical product as the means for this service to the customer as opposed to the customer's being a user of a previously designed product. Saran Wrap, for example, is but the means by which Dow, using their know-how on ethylene and chlorine chemistry, fills the need of the consumer for household wrapping.

This change in the outlook of chemical industry from a product-oriented approach to a market-oriented approach has become pronounced only in this decade. One is inclined to believe it may be the result of several influences which have been increasingly at work during that period:

(1) The advent of Long Range Planning in the chemical industry. One of the basic principles of Long Range Planning is detailed self analysis—a determination of just what is one's business.

(2) The encroachment into chemical operations of many companies not previously considered part of the chemical industry.

(3) The increasing maturity of the industry. Statements that most of the major chemical products have already been invented or that the chemical industry can synthesize at will a chemical having any required properties lead, if true, to questions regarding how best to use these abilities.

(4) The increasing concern with structures or systems of chemicals and plastics rather than with their chemical nature alone. We shall have more to say on this later.

Effects of Market Orientation. In any case, this new market concept of the chemical industry will undoubtedly continue in the 1970's. It has and will continue to have an increasing affect on the objectives of industrial research and on the new products which result therefrom. Such products will be predesigned to perform a specific service for another industry. They will fill a "market need."

Market development also shall have to change accordingly from a product-oriented group to a service-oriented group. It shall have to learn to deal less in "product characteristics" with potential customers and more in "market needs" with creative research people. It shall be less concerned with finding a market for a product than with finding a product for a market.

The Need to Know Other Technologies

By Acquisition. A chemical industry long devoted to growth through the development of new products quickly learned that it had to be aware of the technologies used by other industries if it were to succeed. While the industry has always been its own largest customer, eventually its products or the action of its products on other materials had to be used in other industries.

One route to such windows in other technologies has been acquisition of small companies employing them. While many of us may feel that this is a new route employed by major companies over the past few years, history will not bear this out. This can be demonstrated by the testimony in November 1949 of Crawford H. Greenewalt, then president of DuPont, before a Special Senate Subcommittee on Study of Monopoly Power. The subject on which Greenewalt was being questioned concerned the reasons for his company's thirty or more acquisitions over the period 1915 to 1944. A few extracts will, I believe, make my point:

These purchases were made because of the need for a broad framework of commercial experience in the chemical field against which to appraise the products of research.

We were seeking diversification and I can assure you—what a painful business it is to synthesize compound after compound, and then you sit back and admire it and you say 'Now what are we going to do with it, now that we have it?' The $64 question in research, sir, is that one: What are you going to do with it now that you have it?

The principal reason for the acquisition of those businesses was to get a diversified field—against which to appraise the results of research.

No doubt the wave of acquisitions by many other chemical companies during the 1960's was motivated in part by similar reasons.

It would seem to this author however, that in our modern complex industrial society this cannot be a sole basis on which to exploit the products of research. I suggest that even DuPont, our largest chemical company, might find themselves sorely pressed financially were they to buy into all possible technologies which might use new chemicals or plastics.

By Market Research. Another route to windows in other technologies was market research. In the mid-1950's chemical companies began to try to guide their research on new products by challenging their research people with "market needs." Such market needs were gathered by surveys of market research people in specified areas.

While admirable in its goal, this approach has, unfortunately, fallen far short of success. The reasons are many, but I can suggest two from my own experience.

In the first place the potential customer usually knows only what he wants—really a solution to his short term problems. Rarely has he himself taken the time to determine what he really needs and then it is more a case of wishful thinking—"Wouldn't it be nice if"—than a practical and achievable goal.

Another barrier lies in the fact that the product innovators in chemical research usually think in terms of chemistry rather than in functional performance. In most cases the need is functional rather than chemical —a purely mechanical solution is frequently equally possible. The translation of a functional need to a synthesis of a chemical having this function appears to be a discipline we shall all have to develop if this method of new product generation is to achieve the success we all expected for it. A large share of this will be with our market research and market development people.

By Joint R & D Contracts. Another route for relating customer's technology to new product development appears to be increasingly popular in the last several years. I suspect we shall find it employed more in the 1970's. This is a joint research and development program, under contract, between a selected company in the consuming industry and the chemical producer.

This method—which might be considered the ultimate of the team approach to development—can be used either after the new product has made its initial appearance or when there is no product at all—merely a mutual desire to explore a new field. The advantages of having a knowledgeable customer as part of the development team are obvious. The disadvantages lie in the price one pays for his participation—exclusivity

or lead time—and in the fact that members of the "team" have different loyalties.

Since the market development man is generally the instigator of such agreements and frequently the implementer of the development program after the contract has been signed, he faces a whole new set of techniques when he engages in this approach. Space will not permit a detailed discussion but a listing of some of the new problems involved should indicate his new worries.

I. Who should the development partner be?

Should it be the largest in the industry so that success would result in the largest volume, or should it be someone smaller and, perhaps, hungrier?

How capable is the proposed partner—in R & D, in marketing, in production facilities, financially?

II. What price must be paid for cooperation?

Is exclusivity demanded? For how long? Under what conditions?

Will the development efforts of the partners be equal?

III. Patents

What determines which partner gets patents resulting from the joint effort? What are the cross licensing arrangements?

IV. Legality

Does the arrangement violate any antitrust laws?

V. Program Generation

Who decides the specific programs to be performed? What is due diligence on either partners part?

VI. Success

Who decides when the program has been completed successfully? When it has been completed unsuccessfully? What responsibilities does each partner have in either case?

VII. The Technical Field

Exactly what is and is not the technical field in which the joint cooperation is to be made?

While there are many other questions equally important, these will indicate that the use of this route to development in the 1970's will require a new breed of market development man—certainly one knowledgeable in business and legal lore. For the right type of technical man this cannot but be an exciting challenge!

The Effects of Polymer Development

Perhaps no single discovery in the chemical industry has had greater effect on that industry than the discovery in the 1930's of commercial methods for making synthetic organic polymers. The basic discoveries

made during that decade by Carothers and other pioneers has led to many of the major products of our industry today.

Synthetic Fibers
Films
Synthetic Rubber
Synthetic Detergents
Plastics
Foams
Polymeric Coatings
Plasticizers

The list could go on. To realize how deep an impact polymer science has made on our industry, one has but to peruse any commercial chemical magazine and note how much of the activity described therein fundamentally deals with polymeric materials.

But it is another effect on our industry I am concerned with here. Polymers are, by their very nature, usually materials of construction. As such, the physical forms in which they are sold and the methods of achieving those forms become as important to the markets as the chemistry of their manufacture.

As a result of this the manufacturers of polymers have found it necessary to exercise leadership in pioneering the methods by which their polymers are formed—sometimes to the extent that the manufacturer has himself often sold the polymer in the fabricated form. Hercules, for example, pioneered in the manufacture and sale of polypropylene resin. We soon realized, however, that the conversion of this resin to fiber and to film and to foam, would have to be done by us because of the complex technologies and large investments involved. Consequently, the resin manufacturer now finds himself selling polypropylene fiber, biaxially-oriented film, and foam—successfully too if I may be allowed to add.

In the same vein many new polymeric products are not simple polymers but complex structures or mixtures of various polymers. DuPont's poromeric material, Corfam, is an excellent example. Another is Uniroyal's expandable ABS sheet. Mixtures or alloys of different polymers are frequently sold—Allied's nylon-polyester fiber, for example.

Thus both the need and the desire to carry polymeric chemicals one or more steps further in the industrial chain has opened new areas for market development activity. I look for even broader horizons in this direction in the 1970's. From dealing with products essentially chemical in nature, market development is now concerned with fabricated products up to and including those sold to the public consumer. Questions of product design and aesthetic appeal now plague the market development son whose father, only a few short years ago, worried only about product reactivity and purity.

Solutions to Social Problems

Finally, I discern one more trend of the chemical industry and of its research programs which shall have important influence on market development in the 1970's. The industry has become increasingly aware that many problems of our modern society not only may be solved by the use of chemical technology, but that there may well be attractive profits in such solutions. As pointed out by H. D. Doan, president of Dow, in a speech before the Commercial Chemical Development Association on October 28, 1966:

We can't afford to be do-gooders for that purpose alone, and we don't have to. We should be able to solve the country's social problems profitably. There is opportunity in this area that none of us have yet seen how to handle, but we should and must.

A few areas should indicate the type of social problem which might be attacked with our abilities:

Water Pollution
Air Pollution
Saline Water Recovery
Synthetic Food
Flammability
Automobile Safety

There are, of course, many others including the broad sweep of pharmaceutical and biological needs.

Most of us have little doubt that, given time, the excellent research machine of the industrial chemical industry will provide solutions to these problems, that these solutions will be chemical products, and that such products will return a profit. But think, if you will of the challenges to market development! In many cases the market must be created—nothing exists today but the problem. Since the first successful product is rarely the ultimate, here is certainly one area where market development and research must maintain that intimate relation so needed for success.

Conclusion

The author has been engaged for over twenty years in market research and development, yet not once in that period has there been a dearth of existing challenges. Looking ahead to the 1970's only shows larger and more stimulating challenges. As the chemical industry loosens its chemical shackles, as it becomes oriented to servicing markets instead of making chemicals, as it joins hands with other industries in de-

signing new products, as it integrates forward in its polymers and plastics and as it tackles the world's ills with its technology, so must the horizons of market development expand.

Should some biologist today discover a process for human regeneration, I would elect this same profession again—happily, avidly. A young chemist with a bent for business can assuredly find no more satisfying career today than to participate in the challenging problems of market development facing us. Our industry, our country, our society depend upon his success.

RECEIVED July 17, 1968.

13

Market Development: Established Products, New to the Company

H. AVERY and J. W. McNEIL

USS Chemicals, Division of United States Steel Corporation, Pittsburgh, Pa.

Chemical marketing will face many challenges in the Seventies. The shape and nature of the chemical industry will continue to change and become increasingly complex with time. Market development, as an activity, will become more and more specialized as a broader range of skills is developed and utilized. Many of today's new products will become established products in the 70's. These products will face ascending competitive pressures and a growing number of complexities. Market development must anticipate and adapt to this new environment. If market development can successfully promote new approaches and develop the advanced skills that are needed, it will make a significant contribution toward meeting the marketing challenges that lie ahead for the chemical industry.

The shape and nature of the dynamic chemical industry will continue to change as we enter the decade of the Seventies. New chemical ventures, undertaken by non-chemical companies, will continue and chemical companies will diversify into non-chemical areas. The identity of the chemical industry will become less recognizable with time. More and more large volume commodity product and market segments will emerge as reflections of the growing economy and population. On the other hand, the flow of new specialty products will continue unabated in an effort to meet the surging market needs.

Government-business relationships will be closer as the problems of urban crises are attacked and solved. Industry will undertake an increasing number of market research and development studies involving the use of various chemicals and plastics in such public–private areas as: health care, environmental pollution, mass transit, education, etc.

New product and market opportunities will abound in space, biological activities, oceanography, composite materials, nuclear energy,

water and waste management, and plastics. Consumer product areas will attract many chemical companies who will seek active market participation. Many whole new fields of opportunity are yet to be identified.

The burgeoning world population and demand for food will accelerate developments in synthetic foods and food processing techniques. As the supply of chemical products mounts to serve the needs of the exploding world population, distribution methods and costs will become increasingly important and significant.

Domestic competition will become even more intense and a new type of global competition will be encountered. The current merger trend abroad is primarily financial and represents a pooling of resources. However, in the 70's many of these mergers will integrate production and marketing. Some of the mergers will result in multi-national companies. The adoption of American management methods, including long range planning, will be stepped up.

The dominant trends would seem to indicate movement toward a more simplified chemical industry in the 70's but, in reality, the industry will become more complex. The new-type global competition, the growing commodity segments, the new market and product opportunities, and the rapid diversification of the industry are some of the key challenges to be met by marketing in the 70's. (*See* opposite.)

Established Products from New Products

Many successful new products eventually become established products. Some established products are newly-established while others are mature products. Some are sold into a single market while others are consumed in many markets. Phenol is an example of an established product which envolved from utilization only as an antiseptic into a commodity product serving many markets. It was first produced commercially by the distillation of coal tar in 1860. In 1867 the first synthesis was worked out by the sulfonation of benzene. However, prior to World War I, most of the phenol manufactured in the United States was derived from coal tar distillation by a relatively few number of producers. During the 1930's and 1940's phenol production was spurred by the growing need for phenolic resin. New uses for phenol derivatives in synthetic fibers, plasticizers, detergents, plastics, herbicides, etc. pushed production still higher through the 1950's and into the 1960's. Other new processes for the production of synthetic phenol were introduced and adopted as new producers entered the field. By the early 1960's less than 5% of total phenol production was supplied by the natural product. At this time, the number of synthetic producers totaled nine. Today the number has grown to eleven and may still grow.

Some Key Market Development Efforts in the 70's

Challenges of the 70's	*Market Development Actions*
INCREASED COMPETITION IN MARKETPLACE	Determine the competitive environment, strategy, and threats—recommend counter strategy.
	Develop pricing history—recommend future price policies needed.
ENLARGED NEW PRODUCT AND MARKET OPPORTUNITIES	Seek out new product and market opportunities in the marketplace—recommend plans for participation.
	Develop new markets and expand present market opportunities.
GROWING IMPORTANCE OF DISTRIBUTION	Examine present distribution costs/methods —recommend action needed to be competitive and stay competitive.
INCREASED GOVERNMENT-BUSINESS RELATIONSHIPS	Analyze present and future government participation in the market—identify possible cooperative business-government efforts.
EXPANDED CONSUMER MARKET AREA INTEREST	Determine any present or future opportunities in consumer market areas—recommend plan for entry and/or participation.
GROWING COMMODITY SEGMENTS	Ferret out the strengths and weaknesses of present and future competitors—develop and recommend required strategy.
	Determine the present product life cycle of the product—tailor market development program to the identified cycle stage.

A recognition of the breadth of differences in established products is important because the market development effort must comprehend and reflect such differences. For example, a percentage of the output of certain established products is used internally by the producers. Phthalic anhydride is an example of such a product. Most of the producers today utilize some internal production. However, this situation did not exist when phthalic was first made commercially available in this country after World War I. An American patent was announced in September 1916 and three or four U.S. producers initiated some production prior to 1920. Prior supplies of the product had been imported from Europe. By the mid-1920's the newly developed production process made possible reductions in price from a level of several dollars/pound to the 20¢/lb. range. Large volume applications developed. During the 1930's the demand came from alkyd resins for the surface

coating industry. World War II introduced a large demand for phthalate esters to plasticize smokeless powder and for use as an insect repellant. After the War, the growth was largely for phthalate esters as plasticizers for the growing PVC plastics area. As phthalic anhydride became an established product, many new producers entered the marketplace. By 1960 there were nine producers—today this total has grown to twelve.

Certain established products, such as phthalic anhydride, require the producer to design a two-pronged market development program. One prong to meet the needs of the selected established product to be produced and marketed and a second prong for the products to be manufactured and marketed from the internal use portion of the selected established product.

The Significance of the Product Life Cycle to Established Products

Products evolve through various product life stages during which most of their proprietary advantages disappear as competitive pressures increase. The product life stages are identified as: introduction, growth, maturity, saturation, and decline. Many chemical products will reach the saturation or decline stages in the 70's in contrast to the myriad of new products that will be introduced.

A customized market development program is required for a product as it progresses through its life cycle stages. When a company decides to launch an established product, new to the company, the initial market and/or business analysis should determine the present life cycle stage of the product. The market development program can then be designed to meet the conditions peculiar to the product's current life cycle stage. At the same time the proposed overall marketing strategy must also be evaluated in relation to the life cycle stage. This task is difficult because the various product life cycle stages tend to merge into each other, and the differences between them are not always sharply discerned.

Each product life cycle stage generates a different marketing and business climate that requires different approaches and strategies. The market development activity must recognize these differences and channel pertinent inputs into the overall marketing strategy plan so that modifications and revisions can be made as required.

As we look ahead, more and more companies will find it desirable to construct marketing models in order to simulate and test, in whole or part, a proposed market development program. Participation by market development people, in constructing such models, will help sharpen and clarify the problems to be solved and the opportunities to be realized.

Established Products in the 70's

Many of today's new products will become established products in the 1970's. Some of the product groups that include such new products are: pharmaceuticals, agricultural chemicals, plastics, adhesives, propellants, synthetic fibers, construction and building materials, and many more. The marketing climate of the 70's will be characterized by a still more rapid rate of technological change, strong consumer demand, cyclical periods of over capacity, and sharper competition both domestically and internationally. Such a climate will demand not only new market development emphases but results that contribute heavily to the success of the total marketing program. Such contributions will have a significant impact on the marketing of established products new to the company.

Market Development Emphases in the 70's

Market development for newly-invented products focuses mainly on the identification and development of markets and product applications. Established products, new to the company, require an emphasis pointed toward the competitive aspects of the business such as determining the environment of the marketplace, the price climate and outlook, the marketing capability required to be successful, etc. As discussed, estab-

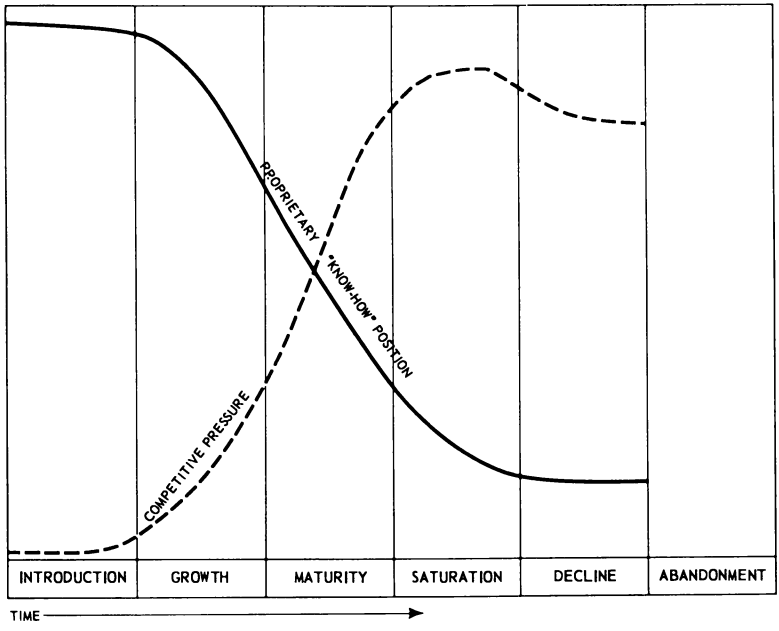


Figure 1. Product life cycle

lished products are normally subject to continuous and ascending competitive pressures over the long range while simultaneously losing proprietary position in the marketplace (*see* Figure 1). This inverse relationship points up the need for market development programs designed to evolve over the span of a product's life cycle.

The marketing challenges, posed in the 70's, will require additional shifts of emphasis (*see* Figure 2). The many established products that will appear will face a swelling number of complexities. Higher quality analyses and evaluations in the early program stages and more effective and intense sales development efforts will be required.

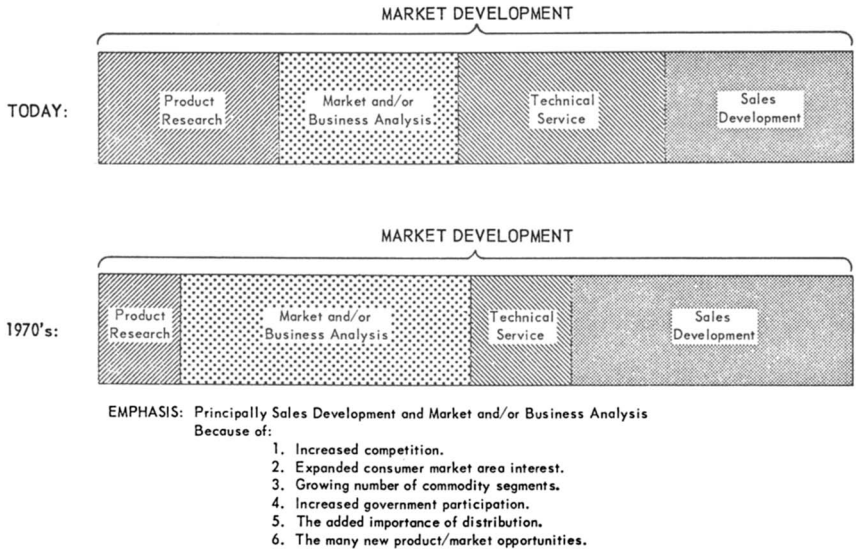


Figure 2. Market development emphases in the Seventies

Organizing and Staffing Market Development in the 70's

There is no established pattern or "one best way" for organizing and implementing market development. Because of this, each market development effort has to be tailored to a mix of factors. Company size and organizational structure, the nature of the markets, type of product—*e.g.*, commodity or specialty, specification-type or performance-type, etc.—and the capability and availability of people are important factors which affect the role of market development.

The growing complexity of the 70's will require market development people to be knowledgeable in the areas of distribution, government activities, operations research, marketing and sales, global markets, product research, marketing research, etc. Companies with product lines requiring high levels of technology may prefer that market develop-

ment be organized within the product research department. Other companies, selling into highly competitive markets, may want to have the function report within the marketing and sales department. However, looking to the future, more and more companies can be expected to organize the market development activity on a project management basis. This approach would make the myriad of skills within various companies more available for specialty use. Thus, the contribution by market development would be keyed to determining the proper mix of skills required for each specific product venture and then effectively utilizing these skills in meeting stated objectives.

Conclusion

To sum up, market development is an important promotional effort in the overall development process that is required to launch an established product, new to the company. It may perform, coordinate, or relate with the functions of product research, technical service, marketing research, advertising, sales development, and regular sales. It may be a near-term program or a continuous program that evolves through the life cycle of a product. The need for market development can be continuous during the life of a product but will vary considerably in content and magnitude from the time a product is introduced into the marketplace until the time it matures. It is distinguished by the fact that there is no pattern or "one best way" for organizing and staffing the activity—every program must be customized! When this customizing need is successfully met, market development becomes one of the real keys to the successful launching of an established product, new to the company.

How does market development meet the marketing challenges of the 70's? First, by anticipating and identifying the new complexities and changing environment and shape of the industry; and secondly, by meeting these changes with the proper quantity and quality of both current and new skills at the right time. If market development, as an activity, can successfully promote the new approaches and develop the advanced skills that are needed, it will make a significant contribution toward meeting the marketing challenges that lie ahead for the chemical industry.

RECEIVED June 6, 1968.

14

Technical Service and Application Research—Industrial Chemicals and Plastics

ARTHUR B. STEELE

Operations Manager, Coatings Intermediates Division, Union Carbide Corporation, 270 Park Avenue, New York, N. Y., 10017

Conscientious but routine technical aid to customers is no longer adequate to maintain suppliers of chemical and plastic materials in a strong competitive position. The competitive picture of the Seventies calls for the furnishing of more elaborate and expensive assistance, ranging from immediate on-the-job help to long-range planning and product development. Such technical assistance to customers costs time and money and gives rise to the question: "How can the technical service and product development functions be organized to fulfill the mission of service to customers without further straining company profits?"

> "The customer will finally be served and the supplier most sensitive to the needs of his customer will eventually be the gainer."—Anon.

The rapidly changing, highly technical period of the Seventies will see a continuation of the marketing revolution in which the salesman must offer more than a good product. He must offer also the technology required to help his customers toward profitable application of the product. Because customers have come to expect a liberal share of technical know-how along with purchased materials, companies in the chemical and plastics industry have established specialized research and development facilities, manned by able, professional experimentalists, to assist customers in the proper and profitable use of standard products and in the development of new applications for existing products and of commercially-acceptable, new products for specific applications. Such assistance to customers defines the mission of technical service and application research.

The Dilemma

During the past decade, the partnership of sales and science has had a remarkable impact on the growth of sales volumes of chemical and plastic materials; top management has been quite willing to invest substantial amounts of money in use-research, product development, and technical service operations. In recent years, however, because of high salaries, costly facilities, expensive equipment, and great expectations, this technical support for sales has become progressively more expensive. At the same time, excess production capacities and competitive initiative among domestic and foreign producers of chemicals and plastic have reduced selling prices and narrowed profit margins to the point where the large expenditures for use-research and technical service must be carefully examined. The focus of the examination must be the finding of practical answers to the question: How can a producer of chemical and plastic products organize the technical service and use-research functions needed to maintain a strong competitive position without, at the same time, straining company profits?

The challenge of the Seventies is clear!

Organizing For Greater Efficiency

Effective use–research and technical service depend, fundamentally, upon the experimental sciences as practiced by chemists and engineers in modern laboratory settings. Within reasonable limits, the capacity of these functions to consider and to solve problems of concern to customers does not relate to the total number of members assigned to these functions nor to the dollar level of the budget. In this setting, the motivation of the individual experimentalist and the leadership skills of his manager count heavily in the productivity.

The mission of effective managers is to see to it that they and their associates learn to do things with greater and greater skill and efficiency and, thus, to achieve out of the development of their people and out of their growing vitality and momentum improved quality of operations, higher levels of individual productivity, proportionally lower costs, and, ultimately, greater profit; these are the real and measurable contributions of effective managers.

Managers concerned with technical service and application research must recognize that individuals are capable of growth in productivity, vigor, flexibility, enthusiasm, readiness to learn, and maturity of judgment and that this growth should result in an annual increase in productivity for the establishment, particularly when individual growth is supplemented with improvements in the tools for experimentation. But such growth in individual productivity will not be realized until managers

improve their practices (particularly face-to-face supervision of members); create a climate where increased individual productivity is not only welcomed, but expected; determine the full range and extent of the abilities of individual associates; apply appropriate motivators that will bring individual performance progressively closer to individual capacity; and organize the experimental program in such ways as to permit the individual experimentalists to make as full a contribution to the total work as he may be capable.

While laboratory management may feel that the problems of staffing and budgets are the most engaging and troublesome in seeking to resolve the dilemma of cost *vs.* demand for technical service and application research, actually a review of the organization structure of the effort may be more rewarding. Perhaps the existing manpower and facilities committed to these functions might achieve significantly higher levels of productivity if weaknesses in organization policy and structure were removed. Some of the most trying situations in which experimentalists find themselves have their roots in poor organization, which may result in roadblocks to communications, excessive superstructure of management levels, over-control of experimental approaches and reporting, hindrances to personnel development; all resulting in a high cost-performance ratio for the function. The Industry Group concept, with its high promise of productivity through effective organization structure, is worthy of careful consideration.

The Industry Group Concept

The Industry Group concept offers a challenging and efficient approach to organizing a laboratory-based technical service and application research function dedicated to generating new technology and solving practical problems. It offers a relatively simple organizational structure; an unusual opportunity for technical responsibility and initiative for the individual scientist; a scheme that encourages the experimentalist to work closely with his associates in sales and marketing in forming a tightly knit, externally oriented, technology-marketing-sales effort which essentially looks outward toward the customer and his industry; a systematic approach to balancing the effort of short-range customer problems with longer range programs designed to find solution to important industry problems that would result in sales of new or established chemical or plastic materials.

Definition of an Industry Group

An Industry Group is a team of experimentalists dedicated, on a continuing basis, to learning, assimilating, integrating, applying, develop-

ing, and expanding pure and applied science associated with the sale of company products to a specific, defined, end-use area.

Evolution of an Industry Group

The normal evolution of an Industry Group proceeds through a number of logical steps, requiring individual initiative and management encouragement and support.

The process begins with the assignment of an adequately trained experimentalist to an area of business and scientific interest that merits serious attention. The man begins his assignment by collection of all available pertinent information, and acquires knowledge and understanding of the state of the art through exhaustive study of scientific and trade literature, reports, patents, and the like. He is encouraged and aided in establishing technical contacts within the specific industry in question. This naturally includes contacts within the company, with customers and potential customers, and with recognized authorities in the field.

After thorough assimilation of all of the possible sources of information on the subject, the scientist will begin to plan an experimental program through which established knowledge is clarified and evaluated. His contacts with technical societies, trade associations, and cooperative industry groups will also be continuously developed and maintained. These highly important contacts with other experienced, industrial scientists are of an entirely different type than the usual customer calls on purchasing agents and business executives carried out by sales and marketing personnel, and generally produce a different type of industrial intelligence based on science and technology divorced from promotion and sales goals. Ultimately, these many activities, encompassing both an active experimental program and the acquisition of firsthand knowledge and understanding of industry problems, should lead to the development of working hypotheses which will generate ideas to serve as a basis for the continuing activity of the Industry Group.

Publication of the results of scientific work, conducted to generate or implement the ideas developed, will normally take place through research reports, technical service reports for specific customers, and appropriate articles in scientific and trade journals. By this means, the individual and his Industry Group become recognized for their contributions and professional accomplishments within the company and the company becomes established as a contributor to the technology of the industries it wishes to cultivate as customers.

The process of establishing an effective Industry Group has proved to be autocatalytic. The more that is learned and the more that is contributed scientifically to solving the problems of a customer and his industry, the more inclined the customers are to bring problems and to

provide a climate for acceptance on which to establish a mutually profitable business. It is necessary first to earn the confidence and respect of customers and potential customers, by positive contributions to their technology and effective demonstration of an understanding of their problems, before the Industry Group can lead a more advanced technology which will be to the supplier's and the customer's benefit.

Inherent in the Industry Group concept is the belief that originality in experimental work and the creation of improvements in technology, based on scientific principles and a realistic appraisal of industry opportunities, will lead to mutual expansion and growth. A properly functioning Industry Group eventually develops that rare commodity called "Industry Sense," through which the Industry Group acquires an almost intuitive appreciation for sound exploitation of business opportunities based on technology.

Thus, the development of a mature Industry Group, that knows and understands the facts and opportunities surrounding an industry, involves a progression from the complex to the simple—through achievement of "understanding" and "contribution" through science. In its initial stage of development, every Industry Group is confronted with a chaos of information that is not well understood. Progress toward discovering and exploiting a possible business opportunity is made by reducing the initial chaos of seemingly contradictory fact and fiction into a sophisticated understanding of true facts, and a matching of attainable results with real needs.

The activities of an Industry Group must continue to be based on experimental science and technology, in order to maintain contact with the newer knowledge and to sustain an ability to generate new ideas, and, thus, contribute to the success of the business. It is important to note that better and more meaningful experimental work generally also leads to a better judgment of the technology of an industry, and of the likelihood of acceptance of new ideas by that industry.

Industry Groups succeed in providing the science and technology required for sound marketing and sales programs, through direct participation in the planning and execution of their own experimental programs, and by playing an active role in the introduction of new products and new ideas to customers. As a result of conducting comprehensive and meaningful customer service and use-research programs over a relatively long period of time, members of a mature Industry Group can hardly fail to develop an unusual combination of scientific competence, technological know-how, and appreciation for valid business opportunities. This fusion of applied science, knowledge of industrial technology and appreciation of business opportunities, which is characteristic of an Industry Group, is a unique asset.

The Value of the Industry Group in Developing a Business Strategy

The development of a business strategy, which involves the coordination of many different functions—sales, marketing, production, distribution, research and development, and other activities—is extremely complex and requires the best efforts of the entire company. Various attempts have been made to bring about better and more effective coordination of these various functions. One resource for the development of a sound business strategy is the Industry Group.

The Industry Group, being a fusion of applied science, knowledge of industrial technology, and appreciation of business opportunities, is well equipped to make major, and often unique, contributions to the following critical factors in the development of a business strategy:

Identification of the products and technology essential to an industry.

Appraisal of the supplier's capabilities to meet industry needs.

Definition of candidate products designed to meet industry requirements.

Estimation of the size of the available market, the degree of penetration that can reasonably be expected, and the impact on existing products and processes.

Evaluation of cost-price-performance characteristics in relation to existing industry practice.

Assessment of the industry's capabilities and willingness to make necessary capital investment, engineering innovations, and new product design and promotion.

Projection of type and level of technical support required to obtain and sustain sales volume.

Determination of the basic position and proprietary interests of customers and potential customers, and of the supplier.

Evaluation of competitive products and processes in specific applications.

It has been shown that an experienced Industry Group can be uniquely helpful to marketing and sales by providing deep insight into a customer's technology, and by participating in reaching realistic appraisals of the opportunities for success of new products and new ideas involving technology. The Industry Groups can also give valuable guidance to other research and development programs, by helping to plan lines of investigation that will result in the development of new products and new ideas will have the best chance for commercial success.

In a very real sense, the Industry Groups which are conducting active and well-supported applied science programs can be a bridge between the more traditional activities of research and development on the one hand, and marketing and sales on the other. By training and experience, the members of an Industry Group are and must continue to be experimental scientists working in a laboratory environment, but they are

also practicing industrial specialists who have an unusual degree of first-hand knowledge of customers and customer's business and the real opportunities for marketing products in a highly competitive and highly technical marketplace.

The "Industry Specialist"—Valuable Customer Contact

A major advantage that accrues through Industry Groups is the continuum of industry acquaintance that the Industry Group achieves and maintains. Over the years, the Industry Group forms strong, working relationships with employees in customer's plants and laboratories. Such friendships based on mutual respect are formed through helping a customer develop a new product or bring on stream a new process, through teaching the proper, efficient, and safe use of company products, through redesign of customer products to make use of new materials that have special advantage, through demonstration and plant trials in proving the utility of new materials, through cooperation in the work of the many industry associations and technical societies, and through publication of the results of applied research work.

Staffing The Industry Group

The Industry Group is grounded in careful recruitment of professionally oriented people with good academic training, and developed by extensive further training of these people for productive careers in industrial research. The training program requires that they serve first as students of an area of technology, gradually becoming practitioners of the technology to an increasingly more responsible degree, and finally becoming teachers to a new generation of aspiring "Industry Specialists." Once the philosophy of the Industry Group concept has been established, it is a relatively easy matter to take people with good scientific training, organize them into Industry Groups, and give them broad responsibility for developing the technology of an industry. Given a framework of effective managerial support through the line organization and strong scientific support through the scientifically oriented members of the organization, the Industry Group and hence the "Industry Specialist" that represents the company can become a highly effective leader in carrying the technology of products to customers.

The Organization Chart

The Industry Group structure may be organized as a division of Research and Development or, optionally, as a part of the Marketing organization. In either case, the administrative pattern would follow the

classic structure of a research organization with typical sequences of titles and levels of responsibilities:

Functional Title

Project Associate
Project Specialist
Project Leader
Group Leader
Research Supervisor or
Department Head
Assistant Director
Director

Levels of responsibility should relate to the types of assignments and the nature and extent of the supervision required. A progression in assignments from problems to projects and to programs and a decrease in the nature and extent of supervision characterize the title progression.

There are inherent advantages in an unsymmetrical organization chart for experimentalists organized within the Industry Group concept. Although the pattern of organization is based on industries, yet there are certain areas in which a departmental organization, each department designed to serve several industries, is tacitly assumed. Secondly, although equal scientific competence might be required for two given industries, or departments, there is a vast difference in the number of workers that can be justified in them. This might create, for example, a man with group leader talents in several industries that need no "groups." Yet this man should report directly to high authority. Similarly, no matter how competent a group leader, there are very often problems, involving highly specialized knowledge in one of the basic areas of chemistry with which the group leader cannot cope professionally. Through adequate organizational procedures, highly specialized knowledge must formally be brought to bear on all applicable problems. When, for instance, technical service involving corrosion problems arises, the best brains on corrosion should be consulted, and given professional responsibility for expert advice and assistance, acting through the Director if necessary, regardless of the industry group in which the problem occurs. The appropriate industry group leader would, of course, report the results to this industry. with due acknowledgement for expert advice and assistance rendered to him by others. A certain formality is required because time must be allotted to the specialists to operate in the manner described, without neglecting their own industry groups. Such specialists must not be judged solely on the sales progress in an industry group to which they are attached for administrative reasons. Solubility, and other phases of classical physical chemistry, analytical methods, stability of products, and physical properties determination are other examples where anyone can

give an answer of a sort, but it might require an extremely high degree of specialization to produce, in consultation with the appropriate group leader, the best answer.

All of these special requirements suggest that the organization be flexible in matters of protocol. Any level should be permitted to report to any higher level, depending upon where vacancies, or the lack of need for intermediate levels, exist. An ideal chart then may not be symmetrical and it may not be inflexible, either vertically or, through high enough authority, laterally.

Integration of Functions

At this point it may be prudent to review the position of use research and technical service in the organization as a whole to keep the major functions in industry in proper perspective. Even in these days of long-established staff functions and elaborate staff organizations, there are still only two essential operating functions; namely, production and sales. Everything else, research in all forms not excepted, exists for the purpose of support for these two line functions. Use research and technical service centered in the Industry Group are only means to an end, not an end in themselves.

Another aspect of organization is the position of the individual experimentalist. Of course, all individuals are important, whether they be operators, salesmen, accountants, lawyers, or members of the research group. However, the worker in the Industry Group has a potential that is extraordinary; a single concept reduced to practice can change the whole course of an industry. To achieve the full benefit of this vast potential, the creative talent of the laboratory needs the active support of developers of processes, specialists in commercial chemical development, designers of facilities and members of production groups A question for management is how to provide a working climate conducive to achievement and personal satisfaction.

In order to attain such a climate, initiative must be encouraged while at the same time maintaining smooth working relationships within groups and among groups. Yet, to a degree, initiation and collaboration are antagonistic. The difficulty is that discovery and invention are highly individual matters, whereas the great mass of technical effort in commercialization is concerned with the elaboration of ideas, and this must be done largely through groups. Great emphasis, therefore, is placed on organization, which even in companies of moderate size tends to be highly specialized and complex. Since an idea is a fragile thing and the enthusiasm of the inventor is vital, organization must be structured to prevent ideas from being victim to the sheer weight of the hierarchy and to

the time—consuming procedure of review by various levels of supervision and business management.

Proper organization to implement an orderly development of a new product or an adequate servicing of an existing product depends to a large extent on the recognition by all groups involved of each other's area of responsibility and of each other's competence to carry out that responsibility rather than on any one form or organization. The structuring of functions within any one company, is, to a marked degree, a reflection of its chief executive and is thus subject to change over the years. The Industry Group concept does not demand a common form of organization yet effective use of the concept needs careful definition of its interrelationships with functional groups having responsibilities for manufacture of product for sale and for moving the product to customers. Figure 1 delineates a useful sorting out of such relationships where the product line yields actual goods for sales and the services line generates and supports the order for these goods. The product line is centered within the company while the services line is directed toward company-customer activities.

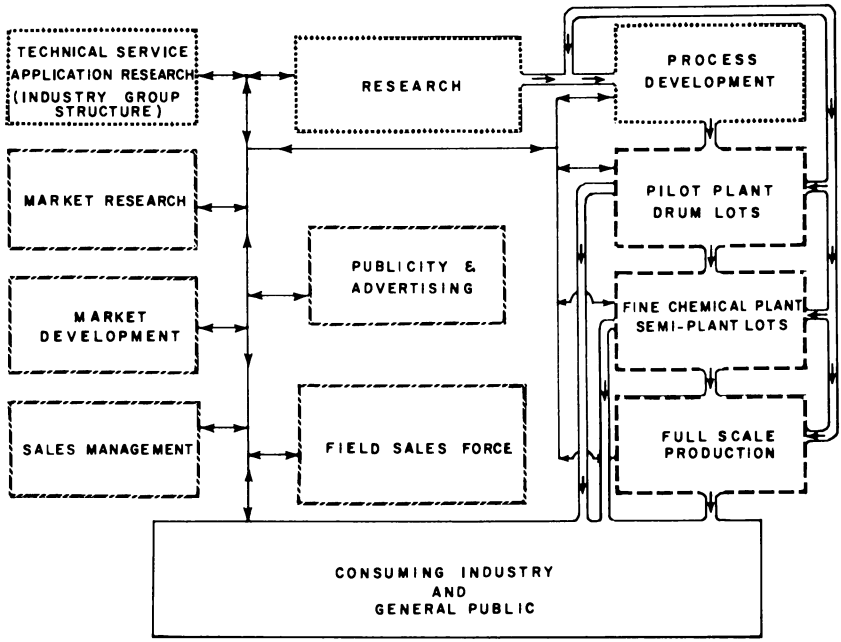


Figure 1. The interrelationships between the Industry Group and the functional groups.

The formula for success in utilizing organization of this structure includes a clear understanding at each level of management to members of

each function of the continuous and interlocking responsibilities that exist: goals that are kept under constant review in the light of ever-changing facts in order that planning at all levels may be based on realities and not on illusions; patience, consistency and common sense among managers and supervisors in integrating the high potential of all functions.

The Effective Use of the Industry Group

Whether projects originate within an Industry Group itself, or are suggested by other scientists or businessmen within the company, or by customers, the Industry Group provides the ability to exercise judgment, based on experience in the planning and execution of meaningful applied research programs.

Sound industry knowledge can prevent a waste of research and development assets on those projects which, although technically feasible, are lacking in the essential requirement of acceptance by customers. Judgment concerning the technological climate in which a new product or a new concept of technology must live or die must be made by a person who combines firsthand scientific knowledge of the performance of such products or the technical usefulness of such ideas, with a broad understanding of the technology and the people of the industry into which the product or idea is to be launched. The background, training, experience, and above all, the general support in depth behind an "Industry Specialist," qualify him together with his colleagues to judge objectively the probabilities of success for experimental programs both from the standpoint of technical feasibility and likelihood of acceptance by the customers.

Summary

In explaining the philosophy and expounding the virtue of Industry Groups to carry out the responsibilities of customer service, use-research and introduction of new product technology to the market place, it is recognized that needs exist for three other distinct functions which are closely associated with the activities of the Industry Group. In the first place, there is a very real and important need for other research and development functions designed to generate the type of scientific understanding in areas of science important to the business interest, and to provide a framework for the generation of new products. Secondly, there is need to devise new and improved methods for the manufacture of products of current and future interest to the company, to scale-up new processes and to support production operations. There is also great need for a strong sales organization to call on customers, to promote the sale of existing products, to help with the introduction of new products and to main-

tain a continuing good relationship between the supplier and the purchasing agent representing the customer. There is need also for a strong marketing function to develop and maintain an understanding of the marketing information about the industries served, to help with the scheduling of production, to arrange for distribution and to handle the pricing and marketing strategy surrounding the sale of goods.

In a framework of good cooperation with these other important functions, there is an important place for experienced "Industry Specialists," who, out of their own working experience and that of their associates, and with the resources behind them of a research and development organization which recognizes and supports their special talent, can be relied upon to organize effective experimental programs designed to meet real industry and customer needs, and to be successful in introducing products and technology to existing and potential customers at minimum costs.

Acknowledgment

The author wishes to acknowledge J. R. Anderson, C. K. Fink, S. M. Livengood, C. P. McClelland, W. H. Millett, and E. R. Weidlein, Jr., for helpful discussions and concepts on which the Industry Group scheme of organization is based.

RECEIVED April 29, 1968.

15

Application Research and Technical Service Trends in the Seventies

H. W. ZUSSMAN

Geigy Industrial Chemicals, Division of Geigy Chemical Corporation, Ardsley, N. Y.

Increased emphasis on applications work may be anticipated in the 70's, perhaps with less accent on technical service. The direction of this activity will be influenced by greater awareness of national objectives and priorities. The quality of the work will be affected by growing consumerism, government regulations and changing concepts of legal responsibility. The scope of this work will be influenced by ecological consideration and attention to safety. On the economic side may be noted the growth of applications—intensive chemical projects and greater involvement of the chemical industry with less sophisticated customers.

Many trends significant for applications research and technical service (AR/TS) already evident in the Sixties may be expected to continue into the Seventies. The forces behind these trends are being generated by sharpening industry competition, by increasingly relevant industry-society interrelations and by the forward advance of science itself. AR/TS will be more necessary, more expensive, more sophisticated, and more responsible. While the same may be said about other areas of activity in the chemical industry, practitioners and managers of AR/TS will recognize a special importance in these trends.

If the goal of technology is making useful things, then the identification and ideation of usefulness is at the core of modern technology. The rapid expansion of chemical technology has been possible in part through the great skill with which fits are made between chemical products and technically defined needs. At the same time, there has been an increasing awareness of the complexity of the fit and the consequence of a misfit: hence, a reexamination of the nature of technological progress by industry and by government. Typically, in situations undergoing reevaluation, opportunities as well as limitations may be anticipated.

Societal Control of Chemicals

The coming decade will witness more societal control of chemicals and how they are used. Recent developments in pharmaceuticals foreshadow what will probably happen with chemicals for growing food crops, food additives, food packaging materials, and toilet goods ingredients. In a possibly more moralistic and less rapacious era, unencumbered by industrial bigness, Freud tested and then predicted "the greatest future" for a medicinal described to physicians by one American producer as:

> . . . a drug which through its stimulant properties can supply the place of food, make the coward brave, the silent eloquent, free the victims of alcohol and opium habit from their bondage.

About the same time in London, that legendary arch foe of crime, Sherlock Holmes, was becoming addicted to the same drug—cocaine (*10*). Both eminent gentlemen eventually mended their ways, apparently with no harm to their reputations. Eighty years later, people engaged in finding or developing uses for chemicals with potential health hazards should seriously contemplate the plight of the scientists implicated in the MER/29 anti-cholesterol agent incident in the United States (*2*), or of those now standing trial in Germany for their involvement in the Thalidomide incident (*7*). In neither case did the shield of corporative responsibility protect the hapless defendants from claims on their personal responsibility.

Regulatory Influences

Regulatory agencies may be expected to be even more zealous than the courts in discharging their statutory obligations. A recent editorial in a medical publication comments on the FDA:

> The view that because some clinical investigators have been sloppy or dishonest and are not to be trusted has led to some rather arbitrary decisions regarding the acceptability of certain investigators. In at least one instance, an investigator was declared inadequate by auditing rather than scientific standards. After a review of the records by a single FDA physician, a hurried hearing was called in Washington and suspension invoked without any consultation with the investigator, without submitting to him a copy of the hearing, without allowing for rebuttal, and without answering a request for appeal. The criminal in the street is treated better than that. It is understood that the regulations are now being revised to make appeal possible.

Generally, lawsuits involving product liability will increase, with manufacturers more vulnerable in cases of negligence in design or lack of reasonable foresight. Warranty disclaimers (the fine print carefully added at the end of properly constructed technical bulletins) and privity of

contract (the concept that an injured plaintiff cannot hold liable a manufacturer with whom there is no direct contractual relationship) will afford the defendant less protection (*3, 4, 14*). In the absence of countertrends, liability insurance may be more costly; faced with greater risks, formulators and fabricators may become litigious against basic ingredient producers.

Legislative and regulatory influences deriving from ecological considerations and consumer interests will also make life more exciting and challenging for AR/TS. The mere mass of chemicals used now makes it essential as never before to consider carefully the ultimate disposition of what is discharged into the air, water, or soil. On his discovery of the insecticidal properties of DDT almost thirty years ago, Müller could hardly have been expected to foresee that DDT would be found in the fat deposits of antarctic penguins some decades later or that an estimated one billion pounds of DDT, an unusually persistent organic compound, would have collected on the earth's surface. On the other hand, Los Angeles' Rule 66, restricting the use of photo-reactive, smog-producing solvents, indicates that the way chemicals break down after they have served their purposes is also important.

Even when government regulation is avoided by responsive industry action, the logistics of adjustment are frequently staggering as in the change to biodegradable surfactants by chemical producers and detergent formulators, or in the present concern with phosphate accumulation in ground water from detergent effluent, human waste, and fertilizer run-off.

The complexity of the problems chemists are frequently called on to deal with is exemplified in accounts of the Torrey Canyon oil spill off the coast of Britain in March 1967, and the Ocean Eagle oil spill off San Juan, Puerto Rico, a year later; the enthusiastic but apparently misdirected use of huge quantities of chemicals, by government agencies as well, compounded rather than ameliorated the original damage. Once the regulatory responsibilities are sorted out—the U.S. Navy, Coast Guard, Corps of Engineers, and Department of the Interior all participated in the San Juan incident—the use of chemicals for treating oil spills will probably be greatly limited.

Consumer interest will be served. While responsible industry must cater to consumer interest for a variety of good reasons, government increasingly concerns itself with protecting the consumer from personal hazard owing to product design—poisoning accidents from household chemicals, automobile safety, cigarette smoking, etc. The consequences of consumerism as a force for change are by no means negative for the chemical industry. Concern over cigarettes, for example, has spawned a new market for filters and adsorbents; safety belts in automobiles repre-

sent a new market for synthetic fiber. The predictable effect on AR/TS of the 1967 amendment to the Flammable Fabrics Act (which will eventually prohibit the sale of dangerously flammable wearing apparel and interior furnishings of all types) will be the encouragement of work on flame-retardant materials and additives, combustion, smoke, noxious fumes. New markets will undoubtedly be opened where prospects were formerly pessimistic. It is highly unlikely that in the absence of regulatory influence the average consumer could be induced to buy flame retardant materials at a higher price and possibly with some loss in esthetic properties, as compared with non-flame retardant materials. In the mid-Fifties, Ford tried unsuccessfully to sell safety features to the public; with the support of regulatory influence, it is not improbable that safety features may become a focus of competitive activity in the automotive industry.

The implications of government control should not, however, be overlooked. Chemists should be familiar with U.S. Code Annotated Volume 18, Section 1001:

Whoever in any matter within the jurisdiction of any department or agency of the United States knowingly or willfully falsifies, conceals or covers up by any trick, scheme or device a material fact, or makes any false, fictitious or fraudulent statements or representations, or makes or uses any false, fictitious or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

The point is that chemists and managers in applications work, no matter how correct and honorable their intentions, will have to be more careful, more circumspect, more deliberate and more prescient. If they are not, others may assume this responsibility, not necessarily with happier results.

Impact of Business Trends

Our industrial ambience will develop pressures on AR/TS not less important than those just described. The acceptance of innovation and change as business style, the need to maintain high levels of production and high rates of growth in industry, the complex and competitive background against which crucial business decisions must be made, all create a frenetic climate in which the work of technologists is increasingly important but rarely finished. Because some companies are willing to take bigger risks than others, the time to move a new product from concept to market is diminishing. One's competitor is right behind if not just ahead. Willingness to match risk against expected advantage will spread; the American talent for tinkering and for applied science is more likely to be challenged by foreign firms ready to adopt or to improve on American business style. As consumers, we can look forward to more private leisure time; professionally as producers, we are going to have

less time to get the right answers to more questions and evidently we will have to devote more time to finding the right questions. Computers and automated equipment will help, but current wisdom suggests that the workload expands to the limits of our capabilities.

It is not improbable that general, non-technical business trends as in advertising and diversification may have an impact on AR/TS. Advertising, the cost of which still greatly exceeds the cost of all industrial research in the private sector, is increasingly under scrutiny; if governmental restraints are put on advertising, it is likely that advertising funds will be diverted to strengthening product identification and purchase motivation on the basis of technical performance characteristics readily recognizable by the consumer. Diversification in corporate activity may be expected to have a cross fertilizing effect on applications research probably more important than might be expected from equivalent growth in an undiversified company. For example, in highly diversified Unilever, technology acquired in the making of ice cream and margarine was used to solve a very difficult formulation problem involving a liquid scouring agent (*15*).

The chemical industry will spend more money on applications research and technical development. Costs will be higher. It has been estimated (*13*) that one dollar in 1965 bought as much research as forty-one cents in 1950. Inflation probably accounted for not more than twenty cents of the increase. The difference presumably represents a change in the quality and style of research work. This trend may be expected to continue.

Proportionately less money may be devoted to technical service. More emphasis will be put on doing the job right the first time (because it's cheaper) with a sort of prophylactic approach to customer problems. More emphasis will be put on the total marketing approach, including ultimate markets. Technical service will be needed more by smaller customers for whom such effort is more difficult to justify and will be needed less by larger, more self-reliant customers. Where the technical gap between seller and buyer increases, the service function will expand but not necessarily in a chemical-technical way. Polymer producers, for example, have been obliged sometimes to go into the equipment business to help fabricator-customers; when the technical gap gets too big, however, the polymer producer may go into fabrication himself to assure a market for the finished product. For similar reasons, producers of agricultural chemicals may be expected to provide more farming management services to their customers.

Applications work is usually concentrated in the early phase of a chemical product's life cycle. As the prominence of newer products in the total chemical product mix increases, applications work will increase.

The introduction of fifty new polymers over the next decade (*1*) as one forecast has suggested, should generate more applications research activity than was needed to develop the plastics industry to its current status.

Applications-intensive products are probably also becoming more numerous. Projects with military or other national priorities usually require more applications effort than might be expected from the value of the chemicals involved. This also applies to sophisticated physics-based technologies such as electronics. Specialty chemical usage is also increasing. The marketing of such products requires more data and applications–expertise per dollar sales than do commodity products. Market segmentation and marketing strategies based on product differentiation will stimulate applications and especially formulation work. Patents covering new compositions and new uses are increasingly recognized as ways to extend protection of new product inventions or to defend market position. It might also be that, unlike other technical functions in industry, applications development work is repetitive and requires replication. For example, an antioxidant for polypropylene will first be tested exhaustively by the producer/marketer; the product will then be tested by the polypropylene producers and finally by the more fastidious end-users.

The Changing Character of AR/TS

The character of AR/TS is changing. Materials, equipment and applications are all increasingly sophisticated. There is more need for expert personnel, yet flexibility and breadth of outlook are required to cope with new situations. How does one predict the weatherability of plastics when twenty years' service is the objective? The organizers of a 1967 symposium on the subject felt obliged to conclude that after a century the problem is still far from a satisfactory solution (*9*). How does one predict with reliability the hazard to a large population of a new food additive or soap bacteriostat over a long period of time? How does one deal with subjective properties of chemicals such as taste and flavor? The synthetic sweeteners in use today have all been discovered accidentally; is this the way to run a chemical business? How are reluctant "old timers" weaned from visual color matching to computers?

The maturation of processes by which technological progress is accomplished contain the seeds of degenerative change. Ways of doing (or thinking about) things that acquire the sanction of authority or the approbation of the influential tend to become legitimized or institutionalized—*i.e.*, they tend to perpetuate themselves even after they have outlived their usefulness. This hardening process is not unknown to technology nor is it limited to the public sector. While the original intent is

usually beneficent, the long-range effect is sometimes detrimental, especially if the mechanism for change is lacking or cumbersome.

Solidly entrenched, antiquated building codes written before the materials explósion have restricted the adoption of plastics by the building trades. Valuable technological assets go unused in the regulated building industries, but are readily employed by the more tractable automobile manufacturers. Standards of identity for food products (these are essentially legal definitions intended to aid law enforcement in the interest of the consumer) have made it difficult for the responsible processor to utilize sound technical advances even when reasonable scientific criteria are satisfied. A case that went to the U.S. Supreme Court in the Forties resulted in a ruling that Farina fortified with Vitamin D shipped in interstate commerce violated the 1938 FD&C Act, since it did not conform either with the identity standard for Farina (plain) or for enriched Farina (at the time, Farina plus Vitamin B_1, niacin, iron, and as optional ingredients: Vitamin D, calcium and wheat germ). The effect of the law has been to restrain minor changes (*6*). Ironically, a consequence of the awkward procedure for modifying identity standards is the encouragement of synthetic and substitute foods which are not protected by identity standards. Such bold, revolutionary changes are hardly compatible with the basically conservative spirit of the regulations. (Affluence, incidentally, has been suggested (*12*) as a precondition for the development of such products. Apparently, the consumer's willingness to experiment with new food products is generally proportional to his disposable income.)

In the course of U.S. Senate sub-committee hearings on drug pricing and equivalence of generics late 1967, it developed that different commercial preparations of chloramphenicol antibiotic, all of which conformed with specifications of the U.S. Pharmacopeia and the regulations of the FDA, were not therapeutically equivalent. One brand showed more rapid absorption and plasma-level build-up, a critical difference. As a sequel, competitive brands were temporarily withdrawn from sale while the FDA and a joint National Formulary-USP panel undertook a review of test procedures.

Standards are by no means the exclusive concern of government agencies. Nor are these comments to be construed as critical of standards or specifications but rather of their abuse. More insidious yet are the set habits of thinking even scientists live by. H. B. Hass has recently related (*8*) that high density polyethylene was discovered by an American oil company; unhappily, market research indicated that the polymer did not meet the specifications for the already available low density polyethylene and, therefore, had no commercial future; someone else made the grade with the product.

One last look at the future. The interactions of social forces and technological trends are the subject of increasing study (*11*). The recent Negro migrations to the urban North have probably been caused at least partly by the increased use of chemical weed control in southern cotton fields. Contraceptive plastic intra-uterine devices may control population growth and industry but what do contraceptive pills do to the sex mores of our own younger generation? Will the impact on society of food production in petrochemical plants be less than the transition from the prehistoric hunter to the sedentary cultivator? The unplanned use of technological capabilities may be more than the complex human society of the future can afford.

Literature Cited

(1) Barr, E. A., *Jordan Editorial Conf.*, July (1966).
(2) *Chem. Eng. News* **42(24),** 26 (1964).
(3) Condon, W. J., *Food, Drug, Cosmetic Law J.* **21,** 154 (1967).
(4) *Ibid.*, **22,** 125 (1966).
(5) Editorial, *J. Clin. Pharmacol.* **8(2),** 71 (1968).
(6) Gilbert, A. M., *J. Am. Oil Chem. Soc.* **26,** 283 (1949).
(7) Gross, L., *Look* **32(11),** 49 (1968).
(8) Hass, H. R., *Chem. Industry* **14,** 434 (1968).
(9) Kamal, M. R., Saxon, R., "Weatherability of Plastics", p. 24, Interscience Pub., New York, N. Y., 1967.
(10) Musto, D. F., *J. Am. Med. Assoc.* **204 (1),** 125 (1968).
(11) National Committee on Technology, Automation, and Economic Progress, "Employment Impact of Technological Change," Appendix Vol. II., Supt. of Documents, Wash., D. C., 1966.
(12) Polopolus, L., *J. Marketing* **31,** 12 (1967).
(13) *President's report,* Carnegie Institution of Washington, p. 5 (1966-67).
(14) Southwick, A. J., *Michigan Business Rev.* **18 (1),** 5 (1966).
(15) Woodrofe, E. G., *Chem. Industry* **24,** 755 (1968).

RECEIVED June 18, 1968. The views expressed are the author's and are not necessarily shared by the Geigy Chemical Corporation.

16

Materials Flow to the Customer — A Total System

O. E. BEUTEL and D. G. GRIFFIN

The Dow Chemical Company, 2030 Abbott Road Center, Midland, Mich.

The changes in chemicals' physical distribution in the 1970's will be characterized by integration, systemization, and acceleration. Today's disparate "batch" materials handling activities will integrate with each other and with the manufacturing activity to achieve a continuous Materials Flow Concept within a company. The United States will move to realization of a transportation technological revolution. Each of the modes is intensively developing its own technical capabilities and its facility to interchange materials expeditiously with other modes. The integration of materials handling and transportation modal capabilities will be accomplished by major reliance on systems—informational, operational control, and cost control. The entire materials flow process will be accelerated, and must meet the command of the 1970's—total cost improvement.

To accomplish the exciting task of prognosticating the evolution of the physical distribution of chemicals in the next decade, we should recognize that the activities which will be implemented in the 1970's are already under development in the 1960's, and were conceived in the 1950's or before. Our task thus becomes one of analyzing the developments already under way and prognosticating the escalation, or the de-escalation, of present trends. We shall also touch on a few concepts which have little hope of serious implementation before the 1980's. We hope that our endeavors are as successful as J. G. Robison's predictions ten years ago—many things he predicted are already under development or are implemented facts.

As we peer into the next decade we come to the conclusion that the changes in physical distribution of chemicals will be characterized by integration, systemization, and acceleration.

Total Materials Flow Concept

First, let's glance back at the industry which we serve. Since its inception, the chemical industry has been concerned with the chemical or physical conversion of process materials to different forms of utility. The evolution of chemical production through the years has gone from batch processes to continuous processes—with ever-increasing automation made possible by improved instrumentation.

Chemical distribution appears to be undergoing an evolution in many respects parallel to the industry which it serves. (For the purposes of this article, the word "distribution", unless otherwise stated, will mean the physical distribution of materials.) Just as chemical manufacturing is concerning itself with the conversion of materials to higher form utility, chemical distribution is concerning itself with a wide spectrum of actvities involved in converting materials to higher place utility. As these two functions are integrated, they become a continuous materials flow from a company's vendors through its various stages of manufacturing and reaching finally to its customers. The following schematic illustrates a conceptualization of the continuous materials flow system, and its relationship to the marketing and purchasing organizations (*See* Figure 1).

Environmental Influence

Social and governmental as well as economic changes will have their impact on the physical distribution of goods. For example, many people in industry will doubtless be working a shorter week within the next decade. Most chemical operations and large production companies, however, are already on a continuous seven-day-a-week, twenty-four-hour-a-day basis. Increased cost of materials handling equipment, warehouses, tank storage, and transportation equipment are creating pressures to devote seven days a week to the distribution function. We will not be able to afford three-day weekends for the tools of distribution.

Nor will all the changes dictated by society be a result of what we think of as economics. The demands of safety, freedom from noise, attractiveness, pollution prevention, and the other needs of society are forcing the replanning and rerouting of transportation facilities such as truck routes, rail lines, air and marine terminals, and underground pipeline facilities. Congestion within large urban areas is making it advisable to move intra-city distribution of goods at night.

We will find increasing activity, both promotional and regulatory, on the part of public agencies such as the Department of Transportation, the Interstate Commerce Commission, state regulatory boards, and others. It will be in our best interest to work and interchange ideas and problems freely with these groups to allow Government, carrier, and producer-

shipper each to effect and exercise its legitimate role in the business of integrated distribution.

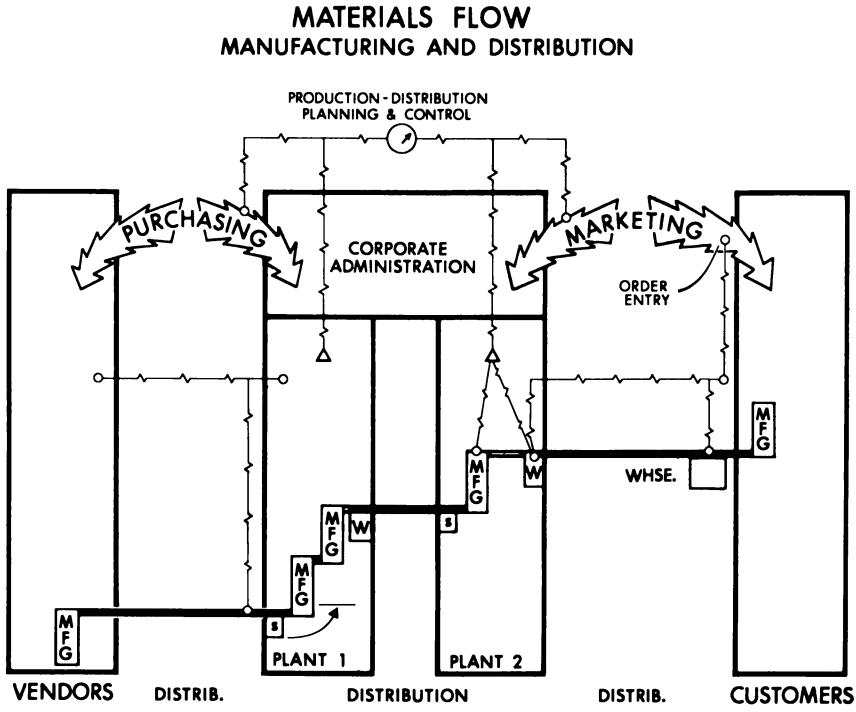


Figure 1. The materials flow achieved by distribution-manufacturing is illustrated above as a continuous process with distribution (change of place) depicted by the horizontal, and manufacturing (change of form) depicted by the vertical. Marketing is shown in its role of exercising the people-to-people, mind-to-mind relationships which spark the flow of goods from a company to its customers. Purchasing is shown in a similar role in relation to its vendors. The company's order systems are illustrated as the operational communication instruments which activate the flow of goods in and out of the company's systems. Production-distribution planning and control is shown as a process regulator which plans and regulates the materials flow process, consistent with the marketing-purchasing sparks, to the dimension of time.

Chemical Industry Distribution Management in the 1970's

Chemical Distribution Management must become the master of two contending forces—creativity and control. Its opportunities to exercise creativity are likely to take place in three major categories: (1) materials handling, (2) transportation modes and (3) systems.

Materials Handling—Packaging, Handling, Storing, and Loading. The distribution manager must participate in a continuous search of the dynamic partnership between the manufacturing processes and the total physical distribution systems of his company in order to optimize both

the material flow and its resultant costs. The skillful utilization of increasingly complex equipment with increasingly capable labor, each more costly than in previous years, should result in delivered products of lower relative cost.

Transportation Modes—Highway, Rail, Ship, Barge, Pipeline, and Air. There will be considerable upward cost pressures on each of these classic modes of transportation. The distribution manager must master an understanding of the capabilities and economics of each of these modes, as well as their relationships to each other and to his company's materials handling processes. The accelerating facility of the modes to exchange materials among themselves, the intermodal revolution, will be a powerful tool in distribution management.

Systems—Information, Operational Control, and Cost Control. The distribution manager must be able to conceive and implement those systems which will integrate and relate his company's material handling activities with the external modes. As he watches cost pressures mount on the disparate parts of these operations, he will find that a recognition and integration of the total process can give his company an improved unit cost of the delivered material.

Total cost improvement will be the challenge and the command of the 1970's. Let us now examine in greater detail these three major areas of opportunity—materials handling, transportation modes, and systems.

Materials Handling

The chemical industry will perceive an increasing need to recognize these activities, batched in many parts of their organization, as parts of a total integrated process. This will require skilled materials handling management in different parts of an organization—management which can simultaneously relate with its local activities and with the total distribution concepts of the corporation.

Some of the managers will be part of the producing plant or works, others will be part of redistribution operations. All will be involved in decisions relating to the packaging or containerization of the product, and with its conveyance through a series of handling procedures—in the company, through various modes, finally into the customers' materials handling operations.

Distribution management's ability to grasp and relate these total materials handling movements will enable it to recommend containers, equipment designs, operational procedures, and other systems which will enhance the total materials flow characteristics of the product. Its tools will be new concepts, new packaging and containerization, new specialized handling equipment, and new information systems.

Transportation Modes

The United States is in the early stages of what could well be called a transportation technological revolution. Government, carriers, and shippers are pouring increasing money into transportation research to fuel this revolution. It is believed that the amount of money spent for transportation research and development by shippers, carriers, and some government agencies has increased approximately fourfold the last eight years, with indications that this trend will continue into the Seventies.

The intermodal concept, which achieved impetus with piggybacking in the 1950's, continues to accelerate its development in the 1960's and should find increasing realization in the 1970's. The highway transportation mode will be the master intermodal link, as it is tied with rail, marine, and air in the interchange of cargo and containers. The other modes will continue and extend their linking process—rail-marine, pipeline-marine, and others.

Containerization developments and standardization will provide one of the key bases for the intermodal revolution of the 1970's. Increasingly sophisticated and automated terminals will also contribute to the intermodal and intramodal exchange of goods at minimum cost.

The pros and cons of intermodal mergers will continue to be debated by all concerned. Mergers will continue at an increasing pace among transportation companies of the same modes. These mergers will facilitate a "continuous flow" operation to, through and beyond our chemical operations. A network of data and communication systems will spring up to support this integrated management and integrated materials flow concept.

As we look at the major modes of transportation used in the U.S. and surmise what their future trends and impacts on the chemical industry may be, we might first glance at their current relative status:

	Inter-City [a]	
Mode	*Frt Cost*	*Ton Miles*
Highway	66%	21%
Rail	27%	38%
Inland Waterway	3%	24%
Pipeline	3%	17%
Air	1%	

[a] *See* Reference 1.

Highway Transportation. The motor carrier in the 1970's should be characterized by outstanding growth, and evolution in equipment and organizational methods. Because of its door-to-door service, it will remain the key link in the intermodal revolution.

EQUIPMENT. Special equipment will include climate control units in all ranges from cryogenic (minus 423°F.) to load temperatures as high as 400°F. Intricate self-loading, self-unloading equipment will be used much more extensively.

Turbine-powered equipment will find increasing development and implementation in the 1970's. The turbine's advantage is its development of greater horsepower at less cost at high, constant speeds, with clean and odorless exhaust. As the technology of the turbines advances and, more important, as the capabilities of the highways progress to allow high, relatively constant cruising speeds, the turbine should contribute significant economies.

Double, triple, and multiple units will be operated on the interstate systems, on toll roads, and on state highways designed to interstate standards. The single van will be used for short-haul deliveries, the multiple van for long line haul movements. Toward the end of the decade, we should see the initiation of remote-control truck caravans (multiple van units) moving over special highways at scheduled hours. The caravans will be controlled through remote control systems operated by a "lead engineer" and "anchor-man unit".

In early development this will involve high-volume/short-haul movements of special cargo, but this method will gain wider acceptance in the 1980's as we learn to operate the sophisticated equipment necessary to achieve economy in unit costs of high-volume movements.

SMALL SHIPMENTS. We will find motor carriers offering a more comprehensive transportation service in the LTL-volume, small-shipment business. Ways must and will be found to reduce the cost of handling small shipments. There will be further consideration of the single agency plan in which all pick-up and delivery service will be performed by a nationwide organization which will employ motor, rail, and airline branch service. Widespread distribution and assembly arrangements will be offered to service off-line points from major cities. Technology advancements in materials handling systems and the automation of strategically-located truck terminals will greatly enhance the truckers' ability to move truckload and LTL shipments more effectively. Automatic equipment, electric sensors, and computers will combine to move LTL quantities into, through, and out of terminals with increasing efficiency and with completed paperwork.

Rail Transportation, U.S. The railroads are currently expanding their traffic through technical development, automation, and new organizational concepts. The next decade should find them investing considerable capital to improve their facilities, to enlarge their plants, and to accelerate the flow of traffic.

Their organizations are evolving apace with the technology change. With more mergers in the next ten years it is conceivable that at least one merger of a strong western system and a strong eastern system could result in the implementation of the "land bridge" frequently discussed. The rail bridge idea will undoubtedly spread to the southwest, north, and midwest.

INTERMODAL. As a result of the evolving rail bridge concept, of improvement in loading-unloading equipment, and of mergers, we shall see TOFC (trailer-on-flat-car) and COFC (container-on-flat-car) riding the rails with increasing frequency. The SCOFC (stacked-containers-on-flat-car) will open the possibility of even more intermodal exchange, with motor and marine.

RAILROAD SERVICE SYSTEMS. Present congestion bottlenecks, many in urban areas, should be removed by opening new traffic lanes bypassing city connections. The construction of these railroad "freeway" systems would yield economies in time and cost to shippers and carriers alike. For example, a car of chemicals can now leave a Gulf Coast terminal and arrive at a Great Lakes terminal, a distance of approximately 1100 miles, in 36 hours. It bypasses metropolitan centers and many towns. There are still a number of towns which impede this flow, but the next decade should see the railroads implementing much further the development of the "interstate freeway" idea.

On long line haul traffic, big, fast trains of high capacity cars will become common. Modernized classification yards should be less congested through the use of small, powerful engines performing local shuttle moves around the clock—achieved through improved scheduling of loads and empties among carriers and shippers. The flow of short-haul traffic should also accelerate.

UNIT TRAINS. Coal in unit trains is already being carried to the chemical industry. In the 1970's other raw material unit train movements may well follow. We expect an increase in unit train movements of chemical products—such as the proposed unit train movement of anhydrous ammonia from the Gulf Coast to the corn belt. These movements will take place from remote raw material sources to plants as well as from plants to distant concentrated markets. Trainloads of semi-finished, in-process chemicals will probably move between a company's plants or to customer plants.

EQUIPMENT—TANK CARS. The trend is for continued development of tank cars of optimum size and cost. Mr. Robison's predicted king-size tank car of 20,000 gallons has become commonplace. In the late 1960's we are beginning to use 30,000-40,000-gallon cars. We are looking forward to 35,000-40,000-gallon-or-larger cars with six-wheel and eight-wheel trucks. Figure 2 shows this pictorially. A capability to move

400,000 pounds of cargo per car is feasible. These super-jumbos will open up new fields of rate negotiations between the shippers and the carriers.

As we probe the future, we find that major car builders are considering and beginning to develop the following:

Type Trucks [a]		*Maximum Truck Load (Lbs)* *Per Car*	*Per Axle*
150-ton	6-axle	394,500	65,750
Span 70-ton	8-axle	440,000	55,000
Span 100-ton	8-axle	526,000	65,750

[a] We anticipate that the 150-ton, six-axle car will be a transition car, and the span bolster, eight-axle car will finally evolve as the standard "Big Car" of the 1970's.

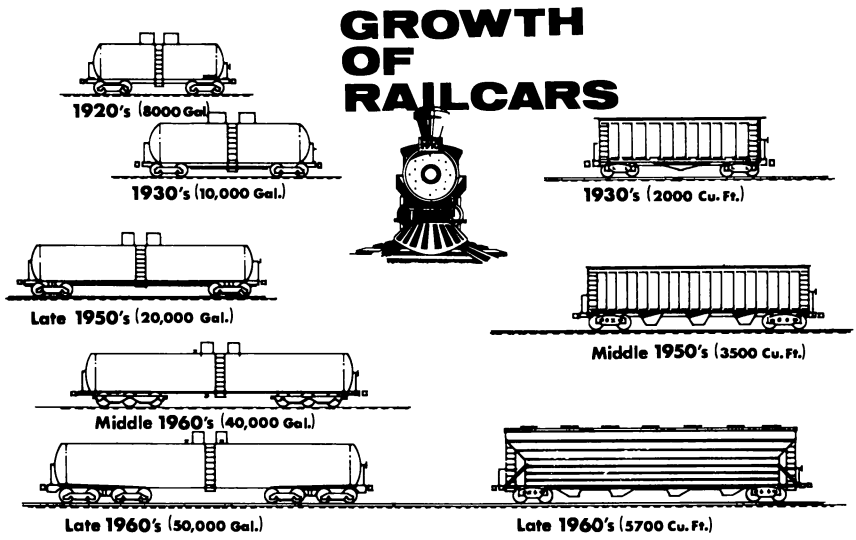


Figure 2. The evolution of tank cars

HOPPER CARS. The chemical industry is now employing hopper cars of 5700 cubic-foot capacity. These cars are equipped with 100-ton trucks and have a net capacity of 191,000 pounds, gross weight of 263,000 pounds. Overall length approximates 65 feet. In the 1970's we anticipate that these cars will be lengthened to the AAR limits of 89 feet four inches and will utilize span truck which could double the present gross weight to 526,000. Considerable design and engineering work will need to be done, however, before this can be fully evaluated.

BOX CARS. The development of rail equipment will not miss the box cars. Although some all-purpose box cars may be constructed in the future, the trend will continue toward cars designed to transport a particular type of lading.

Some problems and considerations which must be met in order to realize the promise of this new equipment becoming standard and universally accepted are as follows:

(1) The roadbeds and rights-of-way must be constantly modernized and de-bottlenecked. Many railroads now in a position to handle the proposed larger cars on main line service must commit to accept them for interchange movements.

(2) Rail and loading facilities at both shippers and customers plants must be made adequate to handle cars of increasing size and weight.

(3) Builders must fabricate cars to meet design and engineering criteria specified by the AAR and must provide assurance that cars will operate and interchange with a minimum of maintenance.

SYSTEMS. Large expensive cars, tying up increasing quantities of inventories, will require the use of automated systems to help them roll and turn faster in order to realize their savings potential. Systems analysis and development, aided by computers, will result in substantial improvement in the utilization of cars, locomotives, and other equipment—with increasing reductions in transit and turn-around times.

Among systems which will contribute to the acceleration of traffic flow and the reduction of yard equipment is the Automatic Car Identification System getting under way in the late 1960's—*i.e.*, the recently-approved KAR TREK system, which instantly locates any freight car in the country, should be tied in with TRAIN (Tele Rail Automated Information Network) by 1970. TRAIN, a communications network, will be centered in Washington, D.C., and operated under the auspices of the Association of American Railroads. It is expected that these systems may effect a 10% reduction in the size of the U.S. freight car fleet (approaching two million in the early 1970's). Increased automated terminals will speed the movement of bulk, packaged, and LCL freight through their centers. Payment of freight and division of revenue between carriers in this intermodal-coordinated transport system will be highly automated, thereby permitting maximum emphasis on operational improvements and service.

Water Transportation. Because of the chemical industry's requirements for high volume, low cost transportation, water plays a significant role in the chemical distribution systems both in the United States and internationally. This role should continue and expand in the 1970's as U.S.-based chemical companies burgeon to global organizations. The chemical giants of the 1970's will place a heavy reliance on water transportation to effect their worldwide raw material gathering and product distribution networks.

Ocean Shipping. *Bulk Products.* Japan, a "have-not" raw material nation, has shown the world how chemical raw materials can be "pro-

duced" economically at any seacoast on earth through the medium of advancing marine technology. Figure 3 shows the evolution of chemical tankers—both raw material and finished product. Today we are seeing increasing volumes of chemical raw materials and basic chemicals moving in chemical tankers. Basic raw materials include LPG's, unsaturated hydrocarbons, benzenes, naphthas, sulfur, lime, and salt, to name a few. Some of the finished products transported by this mode are caustic soda and soda ash, sulfuric and hydrochloric acid, chemical solvents and alcohols, glycols and oxides, and styrene.

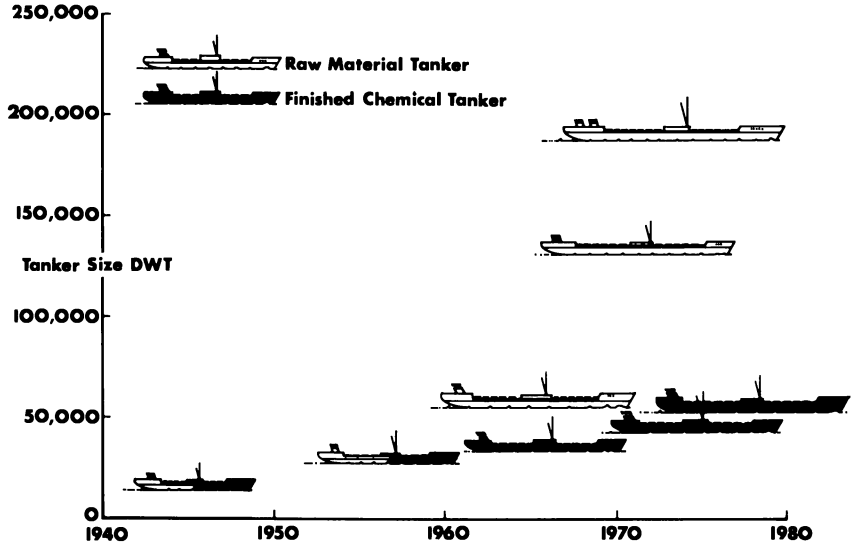


Figure 3. The growth of chemical tankers

Ships. Figure 3 shows the evolution of the chemical tankers from 12,000 tons in the 1940's to today's 23,000-tonners. The 1970's should see chemical tankers of 38,000 tons with 50,000-tonners on the horizon beyond. More important than size will be the complexity and sophistication of the ship's carrying capabilities. They will be designed to handle a number of cargoes simultaneously and will be adaptable to a completely different loading pattern on successive voyages. Cryogenics, high temperatures, special linings, purges, high speed loading-unloading, and the like, will contribute to this capability. This flexibility will enhance the chemical tankers' ability to provide for global markets of many products.

The development of low temperature equipment should increase significantly for a number of reasons. First, this equipment decreases the need for more expensive pressure equipment; second, it enables the containment of a greater mass per unit volume; third and very important to

the chemical industry, it significantly reduces the fire, reactive, or toxic hazards present in most of the chemicals needing transportation.

On the other end of the temperature scale, we shall see an expansion of the program of transporting normally solid products in the form of high-temperature liquids. This improves the handling costs on both ends and moves us closer to the "continuous process" concept.

Barges. Today's ocean-going barges, commonly 8,000-10,000 tons, will probably double in size within a decade—with greater complexity of design which should enable them to carry many products simultaneously.

An important recent innovation, the barge-carrying ship, promises to find major application in the 1970's as we proceed to industrialize the planet. These ships carry barges, preloaded with bulk liquid, solids, or packaged cargo, for dispersal into shallow ports or inland waterways. This intermodal device vastly extends the number of ports available to an ocean ship. Its ability to distribute barges with different products to different destinations speeds the flow of materials and cuts down inventory time. This mode is especially interesting to the chemical industry, which needs to ship bulk finished products in barge size rather than full tanker size volumes.

Containers. Water-borne transportation will be revolutionized by containers. Some people estimate that 75% of the cargo now moving through ports can be containerized by the end of the 1970's. By the early Seventies there will be 45 new U.S. container ships in commercial service and an equal number of special container ship berths in U.S. ports, on both the Atlantic and the Pacific. Current disagreements should gradually give way to acceptance of more standardized container sizes with resulting increase in utilization by the various modes. By 1970 special roll-on, roll-off ships ("marine piggyback"), designed to carry cargo in highway trailers, will be plying the oceans. The present sealand concept of transporting van size containers to which wheels can be attached at the destination should find wider application.

U.S. Inland Waterways. The present system of more than 25,000 miles of inland waterways (excluding the Great Lakes) is being plied by approximately 4,000 tugs and tow boats, 2,600 tank barges, and 14,000 dry cargo barges. The consistent depth of 40% of these waterways is under nine feet, 25% are nine to twelve feet, and 35% are over twelve feet.

Improving technology on tow boats and barges has enabled us to use larger barges, and more barges in each tow. This technology includes more powerful multiple-screw tow boats with improved steering, navigation, and communications systems. We expect to see the technology and the size of the tows continue to improve as new means are

found to decrease water resistance, to integrate and disintegrate the tows as appropriate, and the like. Increasing sophistication will make the double skin barge more common. Many more barges will be designed to carry products at cryogenic temperatures as well as at very high temperatures. Figure 4 shows the evolution of typical barge sizes from 1,200 tons in the 1950's, to 2,000 tons in the 1960's, to 3,000 tons by the late 1970's.

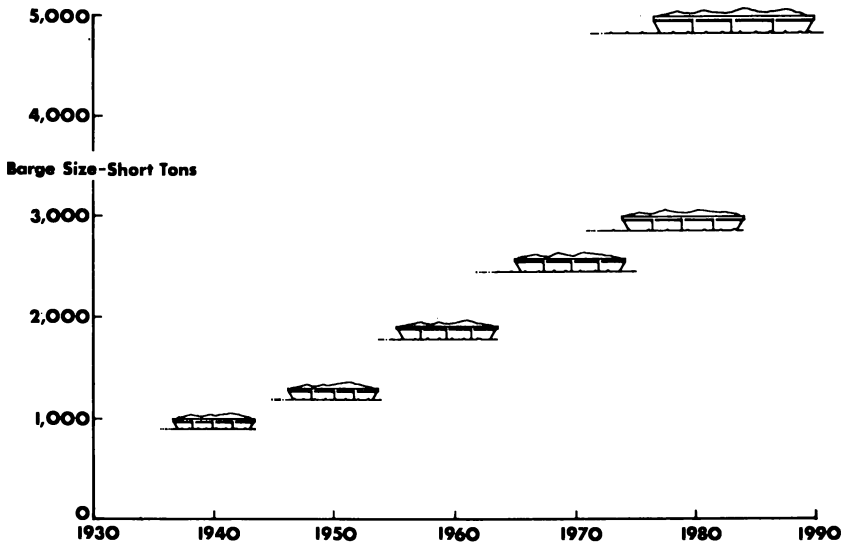


Figure 4. The growth of chemical barges (U. S. inland waters)

The key to significant improvements in the barge systems of the 1970's lies in the improvement of their "highways". Based on present plans, the Seventies should find the United States increasing its waterway systems to approximately 27,000 miles. Continuous work by the Corps of Engineers will progressively make more river ports accessible to barges 12 feet and deeper. The network of small locks on these rivers will be gradually replaced with fewer, larger locks, which will speed the flow of increasing volumes of river commerce. A major key to the improvement of the barge mode will clearly be the improvement of its "highways". It is reasonable to assume that the Government will undertake this work.

Pipeline Transportation. Unseen and silent, pipeline transportation in the last decade has grown rapidly. The vast network of pipelines in the United States (perhaps a quarter of a million miles) continues to be principally used to transport petroleum products. Most of these pipelines are operated by petroleum companies as private facilities. The

Interstate Commerce Commission considers pipelines as common carrier agencies when they are engaged on a for hire basis. With approximately 16% of the nation's total intercity freight in ton miles being moved by pipeline, the cost amounts to less than 3% of the nation's total inter-city freight bill.

The prerequisite for the use of pipeline transportation is large and continuous volume, usually one way, from a fixed source to a fixed destination. The physical characteristics of the fluid determine the sophistication and cost of equipment needed to pump the product. When these prerequisites are met, pipelines provide one of the lowest cost forms of transportation.

Chemicals Use of Pipelines. The transportation of certain chemical building blocks—LPG's and unsaturated hydrocarbons—is already common. Recently a major chemical company made a large volume movement of ethylbenzene through common carrier lines from the Gulf Coast to the Great Lakes area. A pipeline moving anhydrous ammonia from the Gulf Coast to the nitrogen-short corn belt may well be in operation by 1970. The movement of chemical gases, liquids, and slurries from producing plants to nearby customer plants is already established. The 1970's should see an extension of this practice from source to more distant destinations, crossing state lines.

New technology, conceived and under development, could lead to a significant increase in the applicability of pipeline transportation for chemicals. Two instances under development and implementation are discussed here.

(1) The movement of insoluble solids in a liquid slurry. This is now being done with gilsonite, limestone, sulfur, and coal. The prerequisite is for goods which can be finely crushed and mixed with a liquid without contamination.

(2) Capsule pipelines in which capsules, canisters, soft plastic bags, or paste slugs, are moved along in a liquid propellant. This is especially applicable when the liquid propellant is itself being transported for place utility, such as in an oil line. Solids or liquids can be transported by this method.

As the chemical industry grows in size, it will find it is able to meet increasingly the volume criteria for pipeline transportation, and it will be utilizing this low cost mode in increasing instances for raw materials, intermediates, and finished products.

Air Cargo Transportation. Air cargo transportation, established and growing in the 1960's, remains a specialty mode for physical distribution, accounting for less than 0.01% of U.S. inter-city ton miles and perhaps 1% of the national freight bill. The chemical industry's use of this mode is doubtless smaller than even the above percentages show.

Although there will probably be significant relative growth in air cargo transportation in the 1970's, it is likely to remain a small part of the chemical distribution mix—yet one which cannot be ignored.

A number of conditions need to prevail in the 1970's for air cargo transportation to develop as even a selective mode for industry. From the airlines point of view: all-cargo lines will compete with combination passenger-cargo carriers. A resolution of the most economically effective type of carrier will have to be made. Government action—subsidies and the like—will play a major role in this determination.

New equipment is being designed. Boeing's 747 will be available in the 1970's to haul 100 tons, in 14 standard 20-foot containers, at speeds in excess of 600 miles per hour. Lockheed's proposed L-500, the commercial version of the C5A, will carry 140 tons of cargo. Containerization developments will aid and abet the use of air freight. Containerization from the producing plant to the truck, to on-and-off the airplane, and so on to the customer, can reduce high materials handling costs that exist at present. The solution of such materials handling techniques will furnish the key to whatever success the chemical industry achieves in the increased use of air freight.

With all this—new equipment, Government subsidies, intermodal containerization, and intramodal passenger-cargo support—air cargo costs are expected to come down. As the chemical industry produces materials with higher value per-unit-weight (the rarer metals, silicon chemicals, fabricated chemical products), it has a chance increasingly to use the air cargo mode. As global distribution networks increase inventory investments in major proportions, we will find ourselves able to make significant reductions in otherwise high inventories by our willingness to cover critical stock-outs with air cargo.

In summary, in a world made smaller by improving communications, the skillful but selective use of air transportation will provide a small but critical mode in the chemical distribution mix.

Systems

Just as the equipment to carry the chemical industry's goods will get bigger and better in the 1970's, so will our ability to know where our products are and what it costs us to create form and place utility. To take the actions needed to smooth spasmodic batches into more continuous flows, we must know where each batching occurs and how much it costs to blend it smoothly into its preceding and succeeding activity.

We will have better knowledge. Systems, such as the Automated Car Identification system of the American Association of Railroads (previously described in the *Rail Transportation* section), have a good chance of being extended to the trucking industry through the efforts

of the American Trucking Association, the Equipment Interchange Association, and their members. Inventory and control of the type pioneered by hard goods manufacturers and the airlines will find progressively broader application in the chemical transportation industry.

The information systems of the leading chemical and transportation companies should get through current developmental struggles by the early 1970's and be in a position to implement extensive practical on-line information control systems. Continuing to shake the lethargy of "what happened last year", data communications systems should progress toward "real time" information for distribution management—in increasing applications, but not universal.

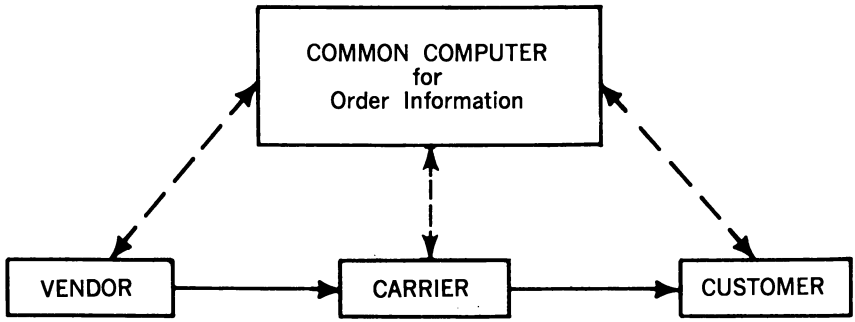
Computers, the "manufacturing plants" of information, will combine with information's distribution systems—wireless and wire communications—to form an integrated set of tools to control and optimize costs in the overall physical goods logistics systems. As the information-gathering explosion of the 1960's evolves into the "knowledgeability" explosion of the 1970's, management can expect to receive only information pertinent to managerial decisions.

Like the man whose thermometers average a "comfortable" 70° because his head is in the oven and his feet are in the deepfreeze, we need systems to point out specific areas of discomfort in the distribution process to replace present measuring devices which seem to assure us that, overall, things are well. Thus, our analytical systems will veer from the averages to the specifics and from the gut-hunches to the difficult and painstaking job of considering more of the pertinent aspects of the whole job of moving chemicals from the hole in the ground through the chemical plant and into the plant of the user or consumer.

Operations Research. The 1970's will see the emergence of a human brain trust of competent professionals to tackle the flood of pertinent data. The new tools of the chemical engineer, the marketer, and the logistics expert—to name a few of the users of what has become known as "operations research"—will find wider applicability in distribution endeavor. The words simulation, optimization, linear programming, network analysis, value analysis, heuristics, statistical decision making, gaming, and Monte Carlo will approach in familiarity the vocabulary developments of the 1960's—words such as piggyback, seatrain, and containerization. Of course, there may be some mistakes in the Seventies when the need for human analytical capacity is temporarily overlooked in the rush to automate our data collection and communication systems.

Action systems will tighten up as time compresses. Project management systems such as the Critical Path Method and the Program Evaluation and Review Technique, so successfully used in the Sixties, will find wider application.

Order Systems. We expect to see dramatic innovations in order handling, both in documentation and in concepts. It is conceivable that customers, vendors, and carriers will be tied through communication devices into a common computer for the continuous exchange of pertinent information—as well as for the payment of funds.



Order information for a customer or vendor or carrier will be available instantaneously through computer tie-ins.

Redefinitions of today's functional alignments may be developed to implement the materials flow system concept. Since both salesmen and purchasing agents need more time for negotiation, the logistics of distribution may be turned over to the materials flow engineers—permitting experts to determine availability of product, its physical movement, its shipping and receiving characteristics, and the required documentation.

The people, time, and profit squeeze should force the present duplication of effort by vendor-carrier-customer to be minimized. As people work together in problem-solving, aided by the impartiality of computer systems, the end result should provide mutual advantages.

Transportation Pricing. A few words should be said on this subject which could cover a book in itself.

Despite many reactive forces, the development of improved concepts, logic, systems, and automation should combine to give us logical transportation pricing systems based on the realities of generated costs. In addition to carrier mergers, we expect an amalgamation of major and minor rate bureaus, both of which should result in rate streamlining. Many present inconsistencies in rate applications will give way to the logic of cost analysis and systems. Rates constructed specifically to define segments of the service could allow a shipper to buy the "whole package" or the components appropriate to his needs—a requirement of the intermodal revolution.

The efforts of governmental agencies such as the Department of Transportation, the General Accounting Office, and the Military Traffic

Management and Technical Service Command should contribute to the areas of the tariff simplication and automation, as well as in automated rate search and retrieval. Computers will not replace traffic analysts and negotiators, but will enhance their operation. The art and practice of rate negotiation will continue present trends of being based somewhat more on meaningful cost-experience data, compiled by both sides through the aid of automation. Thus will the "me too" era gradually yield toward one in which rate increases and reductions are earned.

But people will not let the computer in on all the games they play, so negotiation and distribution management should still be fun.

Conclusion

Global Distribution. The social revolution now sweeping the planet is resulting in many developments—the industrialization of the world community, universal improvements of living standards, and a vast proliferation of communications in many forms. These developments interdict national boundaries.

Physical Distribution is to the goods produced by man's hands as Communication is to the thoughts manufactured by man's mind. The global communication explosion will carry in parallel an intensification of global distribution in the years ahead. Globally-minded and -operating companies will have less and less use for the words "export" and "import"—they will be concerned with global intermodal distribution linking together their raw material sources, far-flung plants, and markets—all into a continuous network of materials flow. National boundaries, although interdicted, will by no means disappear—tariffs and a multitude of distribution taxes will continue to affect distribution patterns.

Global distribution will consume a great amount of the cost and, therefore, the attention of the world manufacturing-distribution complex. The land bridge idea is not confined to the United States. The Canadian land bridge as well as the European-Russian-Japanese rail land bridge are examples of the development of world concepts.

Government Regulations. We will continue to find many Governments and their agencies increasingly involved in regulations, rules, and restrictions—designed among other things to affect the safety and economics of world transportation. The United Nations may increase its present involvement with the development of trade.

Summary

The United States is in the early stages of a transportation technology revolution. The 1970's will see us move many current developments into the implementation stages. Present concepts will begin their development and new concepts will appear.

The Distribution Manager, driving the four horses of Creativity and Control, Business, and Technology, must become the master of them all. He must integrate their efforts into the total materials flow concept —a concept whereby he sees his company as a part of a continuous flow system from its vendors to its customers. As part of the continuous process, automation-instrumentation conscious chemical industry, he starts with important traditions and assets. He will be concerned with integration, systemization, and acceleration.

INTEGRATION. In the 1970's we shall see distribution progressively integrating with the chemical manufacturing processes and in their marriage often determining the form in which material will be manufactured or packaged to enhance its distribution characteristics. The many modes of distribution on land, sea, and air will increasingly integrate to achieve a more smoothly flowing exchange of the product to accomplish the most economic flow from beginning to end of the total process. We have referred to this as the intermodal revolution.

SYSTEMIZATION. The Distribution Manager must relate the creative, kaleidoscopic activities of chemicals physical distribution with information concepts, systems, and hardware to achieve appropriate control. The Distribution Manager who masters this very complex simultaneous equation will achieve for his company a continuous flow network with the end costs of the delivered material progressively improving. The most complex and challenging system which the Distribution Manager will need to develop will be himself and his people organization.

ACCELERATION. As new concepts and developments appear, in and out of the distribution function, events will bear faster on the Distribution Manager. He must accelerate his own managerial processes as well as the physical distribution flow of which he is the steward.

The 1970's appear to be an exciting era for those who have elected to make their contribution to industry and society in the pursuit of Physical Distribution.

Acknowledgment

The following members of the Dow Distribution and Traffic Department rendered special assistance in the preparation of this paper: Gordon R. Anderson, Alfred N. Baldassarri, Dorothy R. Bell, Robert K. Gregg, J. Richard Hopkins, Henry G. Kavanagh, and Jim D. Savvas.

Literature Cited

(1) Transportation Association of America, "Transport Technological Trends", p. 3 Washington, D. C., 1968.

RECEIVED June 7, 1968.

17

Marketing Research as a Guide to the Marketing Department

RUSSELL C. KIDDER

Stauffer Chemical Company, New York, N. Y.

Marketing Research Departments in the chemical industry have been increasing in effectiveness and have made significant contributions to corporate profits during the decade of the Sixties. Improvements have been made from past challenges which include improving accuracy of published and printed statistical information, improving product and market forecasting and following through on recommendations in marketing research projects. However, further improvement is needed on past challenges as well as on those of the future. The marketing research activities especially needed during the decade of the Seventies are improved rapport with divisional managment personnel; improved creativity; improved efficiency in use of time; initial and improved specific customer assistance; improved understanding in the use of the computer; and improved use of manpower.

Marketing Research Departments in the chemical industry have been increasing in effectiveness and have made significant contributions to corporate profits. However, it does no good to bask in past glories, and I do not intend to spend time extolling the virtues of present day marketing research. Rather, I intend to discuss the challenges for the Marketing Research Departments that come from the marketing, corporate, and environmental challenges of the next decade.

There have been many attempts over the years to define marketing research. These definitions although helpful, have differed quite a bit. Therefore, I will not attempt to define marketing research. However, I will in a general sense give a description of the different areas that marketing research can encompass. Marketing research does include the gathering, analyzing, and presentation of marketing type information which is necessary for key management

decisions. Marketing information can include market data, plant capacities and locations, technical aspects of specific products or markets, marketing distribution problems and aspects, selling problems and approaches, and various price data. Marketing information should also include a forecast as well as a present day capsule. Marketing research also includes the making of recommendations concerning marketing and corporate actions and the needed follow-up on these actions. This description is not meant to limit the scope of marketing research but to indicate that the scope is broad and in some cases can be considered unlimited.

Marketing Research Organizational Alternatives

Marketing research servicing a Marketing Department can have several organizational alternatives within a company. The location of the Marketing Research Department in the organizational structure does affect some problems and the ways in which it can guide the Marketing Department.

Corporate. The first alternative is in a multi-divisional company when the Marketing Research Department is in the corporate structure servicing all of the operating divisions. Although this type of organizational structure is probably not the one found in most companies today, it is the one that might evolve in the future as companies become larger and more complex because of acquisitions, joint ventures, mergers, etc.

Divisional. A second alternative is when the Marketing Research Department is within an operating division of a multi-divisional company. In this operation the multi-divisional company has many Marketing Research Departments in contrast to the corporate Marketing Research Department whereby the company has only one. An offshoot of these two would be when the company has both a corporate group and divisional groups. However, this possibility will not be considered for this discussion because the specific responsibility areas could be split in many ways.

Corporate and Divisional. A third alternative is when a company has only one division and the Marketing Research Department is both corporate and divisional in nature. The problems here can differ somewhat from either of the other two alternatives.

I will not try to weigh the advantages and disadvantages of these three types of organizational alternatives. There will be problems and advantages of one over the other. The specific company definition of marketing research will probably govern the organizational setup. However, the challenges of the 1970's will affect the Marketing Research

Departments no matter where in the organization they are located. They all will have the same problems and will have to meet them basically in the same ways.

Marketing Research Challenges Met in the 1960's

Marketing research challenges for the 1960's were very aptly put forth on a similar forum back in 1959 by W. G. Kinsinger of Hercules Company. How many of these challenges were actually met in the past decade? I believe that progress was made on all of them. However, I question whether they were completely met the way it was thought they should be. I plan to review briefly several of them.

It was commented that the statistical information furnished to industry should be refined by marketing research personnel and that they should take the responsibility of making sure that information supplied by them and their company is accurate. The Marketing Research Department should take responsibility for disseminating non-confidential marketing information so that others could benefit and increase the accuracy of their own facts and figures.

I believe progress has been made on this challenge; however, government statistics still are not refined to the point of accuracy that they should be. Companies still are reporting incomplete or improper figures to the government. This is because of careless and improper procedures and certainly is not deliberate. How many Marketing Research Departments take it upon themselves to see that the government obtains accurate information from their own company so that resultant industry compilations will be accurate? How accurate is the information that is passed on at various conventions and association meetings? How accurate is the information that is passed on to the trade press, and how accurately does the trade press check out the information that is published in their various publications? I believe we still have a long way to go in refining our statistical information.

Forecasting Products and Markets. The second challenge was the improvement in forecasting products and markets. It was noted that by 1959 marketing research had made substantial progress in forecasting, but that they needed to improve their skills even further to improve upon the product and market decisions that were to be made in the 1960's.

I believe that a tremendous amount of improvement has taken place in the forecasting by the market researchers in the past decade. Most of this improvement has come about because of experience and the refining of the various forecasting techniques. The question I pose today is have these improved techniques been passed on as they should have to newer people within the Marketing Research Departments? I have my doubts as to whether this has been done in the way that it should have been

done. There have been various seminars and papers on forecasting, some before the Division of Chemical Marketing and Economics of the American Chemical Society. This is one way, but it is not sufficient. Forecasting technique has to be passed on and accepted from one marketing research generation to the next.

Action and Responsibility of Marketing Research Department. A third challenge relates to the action that is taken by the Marketing Research Department after they have completed a project and issued a report. The challenge was put forth that the Marketing Research Department should do more recommending and more following through on their studies. The action and responsibility should not stop as far as the Marketing Research Department is concerned upon the issuance of a report. Gaining the confidence of marketing management in the recommendation and decisions of Marketing Research Departments is necessary in having them accepted and acted upon. I believe that during the decade of the 1960's the Marketing Research Departments in the various chemical companies have gained the confidence of management and are in a better position to follow through on their reports.

Although we are continuing to improve, this area needs almost constant effort because of changing managements, changing times and changing marketing problems. The fact that some marketing research personnel have gone on to top management positions is an example that we are making progress here, and I would say that this challenge has been met to a great degree.

There were other challenges in the decade of the 1960's, and these have been met with various degrees of success. However, I believe from here I would like to pass on to the challenges of the 1970's and how we must meet these.

Challenges of the 1970's

There will be many challenges in the 1970's. Some of these and how they will affect marketing research are discussed.

There will be larger economic size plants for various products coming on in the 1970's. We have already seen this starting to take place in the 1960's. This will put more pressure on total capacity, and the Marketing Research Departments should be aware of this in their planning for future operations.

There very well could be a change in end use pattern owing to pressures of overcapacities in the 1970's. Certain products which reach overcapacity might lower in price to meet end uses which might have been unreachable at original prices. Therefore, it is going to be necessary for the Marketing Research Department to anticipate overcapacity problems and what other products this overcapacity might affect.

Ethylene and ammonia are examples of products where the minimum economic size of plants has increased greatly in the past five years causing marketing problems and price decreases. Similar type marketing problems could easily occur in the 1970's with other products.

There will be larger more complex companies because of mergers and acquisitions as well as the normal growth patterns. This will require more flexibility on the part of the marketing research staff. A marketing researcher will have to take on more and varied assignments.

There has already been a trend towards lower profit margins because of increased costs. These potentially lower profits will put more pressure on marketing research staffs to help forecast and predict when markets and products will become unprofitable or below profit standards set by the company.

There will be increased competition from companies in foreign countries and for international operations as a whole based in the United States and overseas. This will bring about a demand for additional and more accurate foreign marketing research by the chemical industry. There is some marketing research done today on an international basis, but this effort is probably not sufficient for the needs of the 1970's.

There will be a stronger influence for long range planning based on the challenges of the 1970's. Long range planning departments have emerged in most chemical companies during the decade of the 1960's and have been gaining experience. Marketing Research Departments have a responsibility here to help coordinate the various activities and the forecasts that are needed. They will need to forecast rapidly and accurately to keep up with proper long range planning.

These are some of the challenges of the 1970's that will affect the actions of Marketing Research Departments. The actions that are needed to meet these are given next.

Actions to Meet the Challenges of the 1970's

What will the chemical marketing researcher have to do in the 1970's to meet the challenges of the decade. First, he must not consider the challenges of the 1960's as having been met as completely as they might have been. The challenges of the 1970's will bring added responsibilities and not just new and different or replacement challenges to those of the 1960's.

Rapport with Divisional Management. The chemical Marketing Research Department will have to have excellent rapport with the operating divisional management personnel. This is important to understand properly the problems and activities of the operating division. Proper rap-

port and understanding is one of the more important aspects of progressive marketing research.

When the Marketing Research Department is organizationally within a division, the opportunity to have rapport with division management is more easily attained than it is when the marketing research staff is on a corporate organizational level. This is not a reason alone for placing the Marketing Research Department within a division of a multi-divisional company. However, it will be necessary to work harder on rapport when the Marketing Research Department does not have the natural contact of being within the divisions.

The marketing researcher should take the initiative to have discussions with the key sales and marketing personnel of the operating divisions. He should discuss the capabilities and service available from the Marketing Research Department and the marketing problems and needs of the operating divisions. These discussions should be held often so that needed information can be kept up to date.

Having established rapport, the Marketing Research Department should be able to spot lower profit margin products and be able to help the division consider products that are of a higher profit nature. They will be able to know better the product and market needs of the industry served by the operating divisions and will be able to exert a stronger influence on long range planning owing to more accurate and rapid forecasting.

Improved Creativity. The third need for the decade of the 1970's will be an improved creativity in the Marketing Research Department. Creativity here means coming up with new ideas concerning existing products and markets rather than creating completely new products. The creativity for new products will be handled also by the Marketing Research Department but under marketing research for new product ventures which is discussed in the next chapter.

The Marketing Department will need improved creativity from wherever they can find it. The Marketing Research Department which is within the operating division has a direct responsibility for this creativity as part of this division. The Marketing Research Department which is a corporate function has an opportunity for creativity due to complete objectivity. They are not bogged down with day to day divisional activities and can come up with ideas for improved marketing activities. However, it will be necessary to have handled the challenge of establishing the rapport in the division to have the background to come forth with creative marketing possibilities.

The Marketing Research Department should try to anticipate marketing problems so that they can be prevented. If they feel that a specific product could have declining sales or profits in a certain market, it

should be checked out and reported to the operating division. The Marketing Research Department should consider suggesting different plans when studies indicate that negative actions be taken on the specific plan, product or market under study. They should go beyond the initial request of the study. Although a study which takes funds away from unprofitable areas is profitable for the company, this is mainly freeing funds for other projects. Therefore, if projects of a positive and profitable nature can come out of the study, such a possibility should be reported.

Use of Marketing Research Time. A fourth action that will aid in meeting marketing research challenges of the 1970's is an improved efficiency in the use of marketing research time. Experienced marketing research personnel know that they do not have to study or contact close to 100% of a market on a particular project. However, I think that in some studies not enough of the market was covered or too much of the market was covered. I feel that by establishing the proper rapport with the division and the personnel requesting the study, the Marketing Research Department can learn the degree of accuracy needed and the completeness of industry coverage desired. In certain projects it will not be known at the beginning just how much field effort will be needed to obtain sufficient information. In this situation the decision as to when to terminate field work will be made while the study is in progress. The Marketing Research Department and the person working on the study are in the best position to determine when enough coverage has taken place, field calls should be stopped, and the information analyzed and reported. In cases where insufficient information is obtained, it is necessary to go back into the field and obtain more information at a later date. When too much information is obtained, it is obvious that more time is taken than is needed to give an answer to the problem.

The marketing researcher should include questions during field calls that will give him as complete an overall picture of the product or market as quickly as possible. He should ask questions concerning share of market, competitors share and position in market, industry and product trends, and other questions which will allow him to evaluate the validity of information that has been collected and how representative it is. The marketing researcher who goes out and makes a lot of calls just so he will be able to throw away the bad ones is wasting time.

Timing concerning decision deadlines is also important for market research projects. Marketing information that is presented after a decision has been make is no good at all no matter how accurate and detailed it is. Marketing researchers should be well aware of the timing needs of the Marketing Department.

By improving the efficiency in the use of time, the market researcher will be able to do more studies. He will be able to establish the rapport

with the division because he will have more time, and he will be able to do more creative work. Therefore, by taking care of the fourth challenge he will be able to work more on other challenges.

Customer Assistance. The fifth action needed to meet the challenges of the 1970's will be for the Marketing Research Department to initiate or improve customer assistance for the Marketing Department. Usually when a marketing research project is completed, the information that is gathered has no further immediate use. The market information gathered can be of great assistance to the sales function of the Marketing Department. This information in some cases can be used for increasing sales and for assisting the marketing research staff of customers or potential customers.

Marketing information can aid the Sales Department if it is placed in a format that could be shown to customers or potential customers to aid them in understanding their own industry better. It also could point out new uses or new applications or indicate to them the trends involved in new industries. In some cases these companies will not have the funds to have their own separate Marketing Research Departments and in other areas maybe they have not studied a particular market as recently as you have. In any case by presenting information to customers you are allowing them to make better decisions to increase their sales and hopefully increase sales of your products to them.

It is possible that potential customer lists can be developed for your customers from end use market studies. This information would be helpful to them especially when accompanying market data. Your customers would then have information on how much effort they should expend and in that direction to do them the most good.

The fluorocarbon producers disseminate information on end use markets for aerosol products to their customers who use fluorocarbon propellants in aerosols. The fluorocarbon producers hope to provide their customers with helpful marketing information so that they can serve their markets better and use more fluorocarbons.

Marketing information is being disseminated to customers quite a bit by some chemical companies and very little by others. I think that as a sales tool and also a marketing research tool it should be done more. This can aid in taking care of areas where plant capacities are unknown, where size of industries is getting to the point where it is difficult to come on-stream with new plants. This will also allow for a flow-back of information from your customers and give you a better feel for your industry as well. By cooperating in this way you should have a better understanding of the long range picture of the industries, markets and products that your Marketing Department is serving. In the 1970's this type of information will be very helpful in making decisions. It also

would have been helpful in the decade of the 1960's but in the 1970's the importance of this will be felt even more.

Understanding and Use of the Computer. The sixth action needed in order to meet the marketing challenges of the 1970's will be an improved understanding and use of the computer. Marketing Research Departments should make efficient use of the computer. The value of the computer has been overstated for some uses while for other uses it has been understated. When a Marketing Research Department is working on new projects, the use of the computer or model or system built specifically for it will have little value unless it can be used in the future. However, information obtained on a market or product basic to the company can be placed into a model for future use and be more than just an information retrieval system. This information can be set up so that it can be updated from year to year and will cut down on time spent on future projects. The Marketing Research Department with computer help should be able to assist the Marketing Department to spot opportunities that would not ordinarily have been observed. Various cross checks can be set up and built into the model, making it possible to come up with more variables than would have been possible to do by hand. Therefore, every market research study that is done should be examined to see how and if it can fit into a computer program and what value it would be in the future in this form. Marketing research personnel should have an understanding for what the computer can do and should have a rapport with the management science personnel of their company.

There has been a lot said about the use of input/output tables. It is questionable whether the cost of setting up and maintaining an input/output operation is worth the values obtained. The maintenance to keep the information current is very time consuming and costly. If the information on input/output were available and accurate, there is no doubt that it could save a lot of time in marketing research and in long range planning. However, before establishing an input/output program, the amount of time and effort needed not only to set up such a system but to maintain it in order to have it be useful should be understood.

There are various ways that one can use the computer for marketing information retrieval. However, this should probably be done by outside reference companies and not by the Marketing Research Departments themselves. The need and type of information retrieval best suited for your marketing research need and the Marketing Departments needs should be determined before committing to use of an outside company.

Manpower Requirements. The seventh need for the challenges of the 1970's covers manpower requirements. Through all of the discussion

we have assumed a marketing research staff to handle the different assignments. One of the more important aspects and challenges of the 1970's will be the improved use of manpower in marketing research. Inherent in this is the improvement of the marketing researcher himself. It will be necessary to obtain and train the type of man who can do the marketing research that will be needed to meet the challenges of the 1970's. If you have the right man for the job, you can train him in a fairly short time to handle the challenges of the 1970's. Experience is helpful but not necessary in becoming a good marketing researcher.

There are a lot of people who have not been suitable for other jobs who have ended up in marketing research. I think every director or manager for a Marketing Research Department could reflect on times when he could have made better manpower decisions. The need for marketing research personnel at various times has been so great that we have hired people a little below our normal standards. I believe that it would be better to have a staff that is undermanned than to have a staff of market researchers that are not really up to the challenges of the 1970's. Since the challenges of the 1970's will be greater than the challenges of the 1950's and the 1960's, I think we have to be more careful in selecting our marketing research personnel.

One way to help overcome this problem is to instill in the Personnel Department, in the Marketing Departments, and in operating divisions of your company an awareness of the requirements for the marketing research function. If these divisions understand your needs and realize the importance of creative, intelligent market researchers they will assist in finding suitable people for the Marketing Research Department. I believe that the best way to staff a Marketing Research Department is from within your own company where you will better know the potential manpower.

Marketing research has good, creative men, but I think that the percentage of creative men must increase. If you have the proper personnel doing marketing research, you will be in a better position to meet the marketing challenges of the 1970's. The quality of marketing research personnel has not necessarily been below that of other staff departments. However, I believe the challenges for marketing research are as great if not greater than those for most other staff functions. Therefore, Marketing Research Departments must have the best personnel available. This is a challenge to the managers of market research rather than to the department as a whole.

Challenges unknown and unthought of today will appear in the 1970's. However, if the actions discussed above are successfully handled, marketing research will go a long way towards reaching the goals that we have set.

Conclusion

Each of the challenges and actions mentioned here concerning the decade of the 1970's is actually a summary in itself. Therefore, in summarizing as a whole these challenges and needed actions, I will comment on only a few.

(1) It is necessary to work on the challenges of the 1960's—the challenges as mentioned by W. G. Kinsinger in his presentation nine years ago and reviewed in the beginning of this chapter. These challenges are still present and if they are forgotten, we will not have the base to step forward in the decade of the 1970's.

(2) The market researcher should concentrate on understanding operating divisional activities and problems. This will be more critical if chemical companies have corporate Marketing Research Departments, and it is quite possible that this corporate organization will be used more in the future.

(3) Marketing Research Departments must be creative. They must suggest projects and not just wait for assignments. This will improve the chances of increasing the profits of the company.

(4) Marketing Research Departments must be flexible right down to the last man. They must be aware of the changing patterns that are taking place in the 1970's.

It is not possible to come up with everything that will occur in the 1970's; therefore, the Marketing Research Department, as the arm of the company that is out in the field, should be feeling the pulse of the economy and the industries that are served. They must be able to determine just what these changing patterns are and be flexible enough to meet them.

RECEIVED June 16, 1968.

18

Marketing Research for Planning Development and New Product Ventures

N. H. GIRAGOSIAN

GAF, New York, N. Y.

Commercial development is changing from the same forces that are changing chemical industry. These forces include blurring the lines of distinction between the chemical industry and the industries it serves; the impact of changing process technology; increased emphasis on international operation; the trend toward vertical integration; the trend toward mergers and acquisitions; the difficulty of generating sales per dollar of research and development expenditures. Among the challenges of the Seventies is the need for more effective work in the area of distribution costs which amount to 40–50% of the sales price of a chemical as against 15% for processing costs. With the proliferation of new products, competition with older products will become even keener. There will be greater need for more accurate and sophisticated price forecasting for new products. As more efficient and low-cost methods of transporting chemicals become available, the regional character of many markets will disappear.

Before discussing the contributions of marketing research for planning development and new product ventures, we should first discuss the changing nature of commercial development and how it is affected by the forces changing the chemical industry. These forces that are changing the industry include:

1. Entry into the industry by non-chemical companies.
2. Declining profits on both product and corporate levels.
3. Federal and state government action concerning patents, taxation, tariffs, anti-trust, profit margins, resource pollution, and public health.
4. Rising obsolescence rate of products.
5. Rising operating costs for labor, materials and plant.

6. Increasing excess plant capacity.
7. Increasing cost of research and development.
8. Accelerating rate of technological change.

Changing Nature of Commercial Development

In response to the changing forces affecting the chemical industry, commercial development has changed not only in character, but also in the nature in which it carries out its traditional functions. Some of the forces affecting the chemical industry, and in turn commercial development are:

(a) The changing nature of the chemical industry itself—*i.e.*, the blurring of lines of distinction between the chemical industry and the industries it serves.

(b) The impact of changing process technology.

(c) The increased emphasis on international operations.

(d) The trend of chemical companies toward vertical integration.

(e) Increasing trend toward mergers and acquisitions.

(f) Increasing difficulty of generating sales per dollar of research and development expenditures.

To say that the chemical industry has been grounded in research is a truism. Beginning in the 1930's, the U. S. chemical industry began to change from a research oriented group to a production oriented group, and still later to a marketing oriented industry. As the boundaries of the industry have become more diverse, the importance of finding markets for the many new products conceived by the industry became more improtant. Inevitably, with the proliferation of new products and the maturing of older products, process technology has had more impact on chemical markets. Since the 1950's, the chemical industry has become a truly worldwide industry. Not only have U. S. exports been increasing each year, but also U. S. companies have invested heavily in plants abroad. This has occurred partly as a stimulus by the Common Market, which has raised tariffs to companies not having plants within the Common Market, but also because U. S. companies have found it an advantageous method of reinvesting money earned in foreign countries. The total commitment of U. S. companies in foreign countries in 1965 amounted to four billion dollars and foreign earnings of U. S. companies are extremely large.

As a result of this increased investment abroad, and of the growing importance of foreign earnings, it is becoming increasingly important for companies to orient their commercial development activities accordingly. Knowledge of foreign competitors and their marketing capabilities is also important. At the same time the impact of foreign pro-

ducers of U. S. domestic markets has made it imperative for U. S. companies to learn more about the capabilities of their foreign competitors from the viewpoint of their ability to compete successfully in U. S. markets.

One of the more prominent and publicized marketing trends of the late 1950's and 1960's has been the forward integration of chemical companies toward the consumer. By forward integration is meant the sale by chemical companies of consumer "shelf" products, such as hair sprays, cosmetics, and automotive chemicals. There are, of course, degrees of forward integration and a basic raw materials producer may feel that he has integrated forward if he simply upgrades the raw materials into intermediates and makes some progress down the line of distribution of materials to the ultimate consumer.

While it is difficult to estimate the total dollar volume of consumer chemicals, it is felt that this market today is in the area of 10 to 15 billion dollars annually. This market comprises all the small package, disposable chemical products sold for use by the individual consumer, and is growing rapidly in volume with each passing year.

As companies move forward to the consumer, further challenges will face the commercial chemical development practitioner, who up to now has been primarily industrially oriented.

Companies have increasingly been attempting to maintain growth in sales and profits by acquiring other companies in related, as well as non-related fields. During the period 1960–1967, 692 chemical industry mergers and/or acquisitions were consummated. Commercial development has become the spearhead for this type of growth.

The time allotted for commercialization of new products in the chemical industry has been decreasing significantly. Competitors are moving in more rapidly than in the past and commercial timing is more important to achieve economic success.

For each dollar of research and development expended, the sales dollars that have been generated from these developments have been decreasing.

All these changes in the chemical industry have forced changes in the emphasis within the commercial development function away from the market development aspects of internally generated research products, as was the case in former years, to a broader concept of the commercial development function and a recognition of the critical nature of the timing of commercial development.

Already during the 1960's we have seen the increase of the need for a more considered approach for planning of development and new product ventures. Let us now turn to the 1970's to see what are the

challenges facing the chemical industry in the planning of development and new product ventures and also facing marketing research.

Challenges of the 1970's

Increasing Rate of Technological Change. The rate of technological change will continue to accelerate, which will create more pressure on companies to keep abreast of technological developments.

Increasingly, the marketing research groups have been doing an excellent job of carrying out sophisticated marketing research studies on problems involving current product lines and/or products, while new to the company or at least current in the market place, and/or have substitutes that are currently recognizable. Looking forward to the 1970's, however, it is easy to see that with the increasing number of technological breakthroughs, marketing research groups must be able to do imaginative new product research. Manufacturers of industrial products today are looking for new ways to minimize the risks inherent in the development in marketing of new products. They are emphasizing more and more advance research in pretesting new product ideas.

Increasing Economies of Scale. This means the acceleration of the current trend toward much larger chemical plants. We will see that many companies are turning increasingly in the direction of building huge plants regardless of the ability of the market place to absorb the possible production from these new complexes. If companies find that their unit cost for a certain product will be substantially reduced by a much larger facility, they appear to be increasingly willing to build the larger complex and operate the plant at a lower percentage of capacity, hoping that demand will eventually catch up with capacity.

Increasing Cost of Research and Development. Sales per dollar of research expenditures in the chemical industry have been declining steadily, as can be seen in Figure 1. This trend is expected to continue with even greater force during the next decade because of several factors:

(1) The rising cost of research *per se*, and (2) the growing difficulty of developing new products superior to those already in the market place. By 1980, it is expected that sales per dollar of R&D expenditures will decline to about 18.5. This will put more emphasis on new product research to aid in research guidance. This has already begun in a rather small way during this current decade, but will grow in importance as part of the responsibilities of marketing research departments.

Growth by Merger and Acquisition. During the 1960's the chemical industry, in addition to relying upon internal growth *via* the research

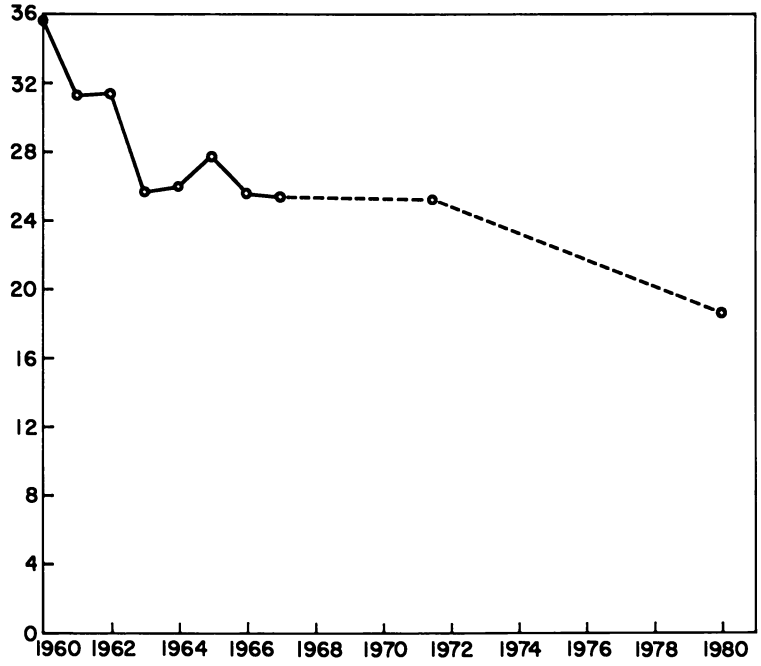


Figure 1. Chemical industry–dollar sales per dollar spent for research and development

route, has increasingly chosen to grow by acquisition and merger. With the growing absolute and relative cost of developing new products by internal research, mentioned above, I expect companies to continue to look for growth opportunities *via* acquisitions. Responding to this, the nature of commercial development will change.

During the 1950's it was essentially a market development-oriented function, in which products discovered in the laboratory were then developed commercially by the market development or product development group. During the 1970's I expect to see implemented a broadened concept of commercial development. The commercial development function will probably consist of several different groups, all designed to achieve the same end, namely successful commercial development of new products and planning for company growth by whatever route seems most feasible.

Lower Profit Margins. We are all familiar with the declining profit margins experienced in the chemical industry during the 1960's. This has occurred in part because of the aforementioned forces and in part because of increasing international competition. Few people realize, however, that the chemical industry is in danger of losing its traditional

image of being a growth industry. As a matter of fact, it is behaving more and more like a cyclical one.

Figure 2 shows profit margins as a percent of sales for the chemical industry compared with all manufacturing. During the early 1950's,

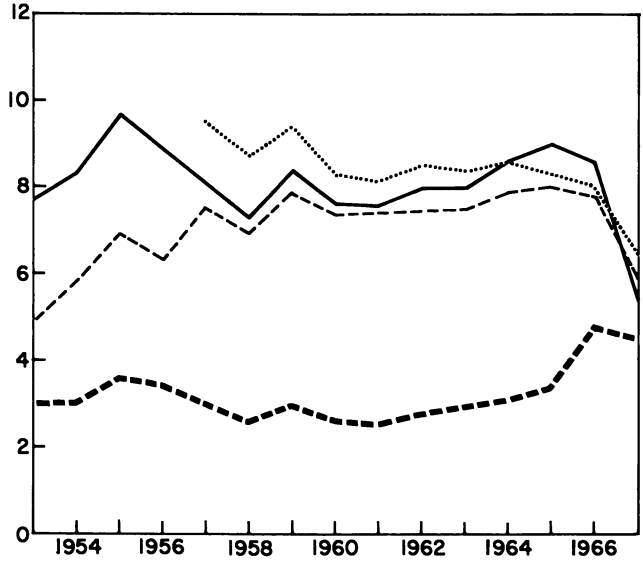


Figure 2. Profit margins after taxes expressed as percent of sales by industry 1953–1967

——— *All manufacturing*
- - - - *Industrial chemicals*
— — — *Chemicals and allied products*
■ ■ ■ *All industries*

profit margins for chemical and allied products grew steadily in comparison with all manufacturing, but since the late 1950's have declined and since then have been lower than profit margins for all manufacturing. Similarly, profit margins as a percent of gross plant for the chemical industry have been declining as compared with all manufacturing, as can be seen from Figure 3.

It has also become more difficult to generate sales for a given dollar of plant expenditure, as seen from Figure 4. This is a problem shared with other industries. From 1963 to 1966 sales per dollar of new plant expenditures declined from $19 to $13. It is too early to tell whether the upswing in 1967 is temporary.

This is not to say that there are no profit opportunities left in the chemical industry. We all know that certain portions of the chemical industry are growing faster than others and it is really more useful to

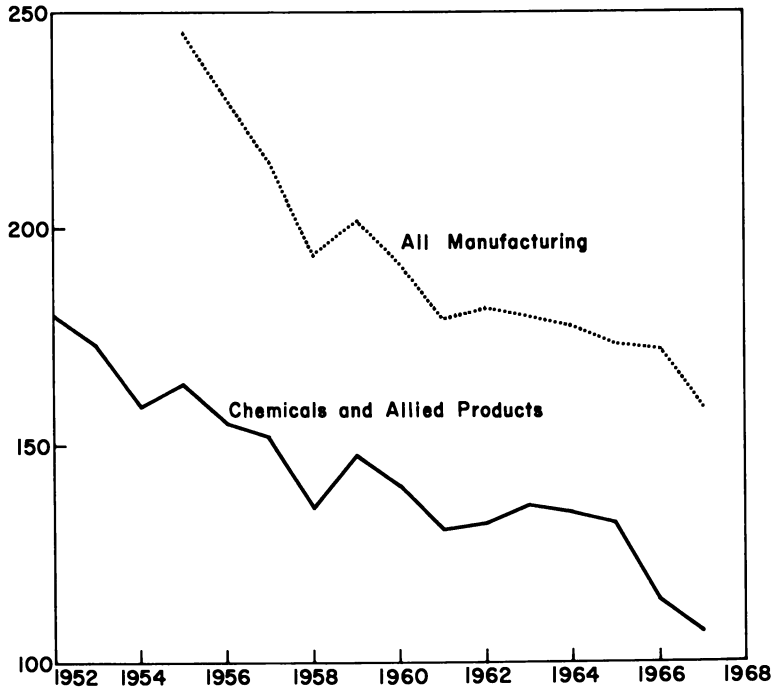


Figure 3. Sales per dollar of gross plant 1952-1967

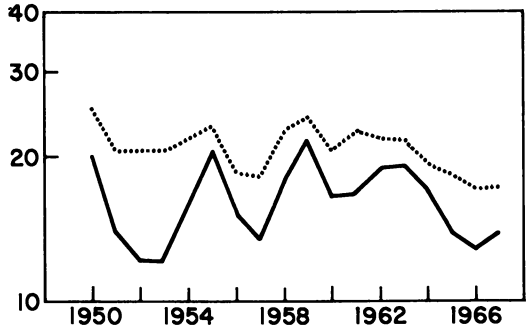


Figure 4. Sales per dollar of new plant and equipment expenditures, chemical industry vs. all industries, 1950–1967 (billions of dollars)

- - - - *All industries*
——— *Chemical industry*

talk about the chemical industry as consisting of perhaps 35–40 separate businesses than a homogeneous industry. There are a number of growth areas remaining to be explored, and the race in the coming decade will

be won by those companies capable of identifying profitable growth areas. It will be an opportunity for a sophisticated, strong, and imaginative marketing research group to contribute to the growth of its company.

Increasing International Competition. The last decade has been characterized by rapidly increasing international competition. Between 1950 and 1960 the relative size of the U. S. chemical industry declined from 50 to 36% of world chemical sales, reflecting the markedly faster growth of the world chemical industry outside the United States. However, between 1960 and 1965 growth of the U. S. chemical industry accelerated at a faster rate, averaging 8.7% for the five-year period, compared with a growth rate of only 3.6% for the rest of the world during the same period; U. S. chemical sales accounted for 42% of world chemical sales in the latter year. By 1982 world-wide chemical sales may reach 245 billion dollars, with U. S. sales in that year of about 130 billion dollars, or 54% of world sales, as can be seen in Figure 5.

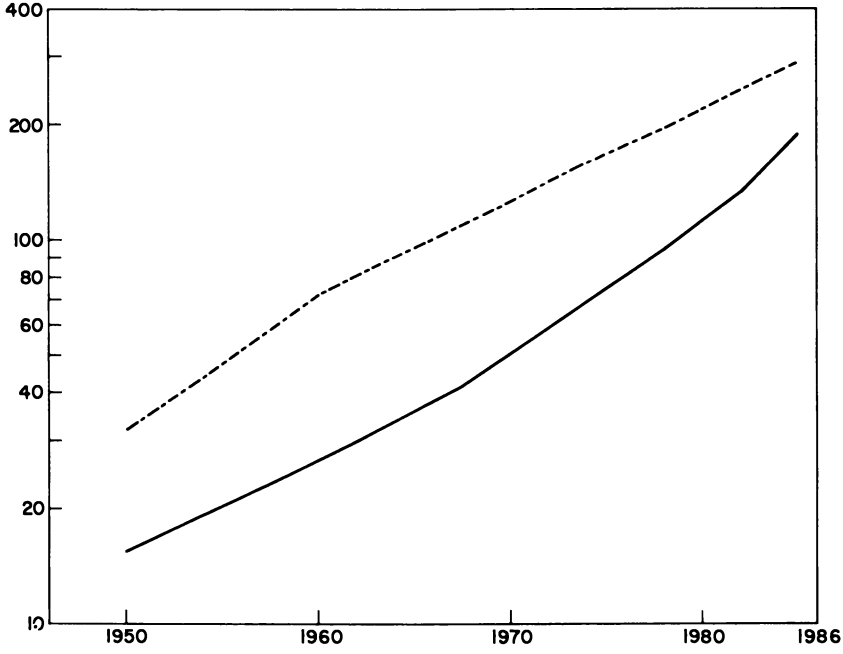


Figure 5. U. S. chemical industry sales vs. *total world chemical sales, 1950–1982 (billions of dollars)*

– – – –*U. S.*
————*Total world*

Source: Survey of current business McGraw Hill economics dept., marketing research estimates.

Competition among European, American, and Japanese chemical producers is becoming increasingly strong and will continue to be so during the next decade. European chemical producers are offering competition not only on the continent, but also in South America and in domestic U. S. markets.

For example, chemical imports into South America from Europe have increased over the past decade. Production of chemicals in Europe has been growing at an average annual rate of almost 16% since 1953; this has made possible increasing exports by European producers despite rising demand at home.

With total labor costs abroad approximately 50 to 75% of U. S. costs, including adjustments for productivity and labor benefits, and with overseas productivity increasing at a rapid rate as newer plant facilities are installed, the competitive position of foreign chemical producers is becoming increasingly strengthened.

To maintain their competitive position, U. S. companies have built plants abroad both jointly with foreign interests and through subsidiaries. The creation of the European Common Market has helped this trend, since special advantages are offered products manufactured inside the Common Market.

The annual expenditures for plants and equipment by foreign affiliates and subsidiaries of American Companies have been increasing steadily and rapidly since 1959. From 216 million dollars in that year, expenditures are estimated to have reached over one billion dollars last year.

At the same time that U. S. chemical companies have been investing abroad, foreign chemical companies have been investing considerable sums in plants in the U. S. and have also participated in many joint ventures here.

During the next decade U. S. investment abroad is expected to continue to increase, perhaps more rapidly than investments by foreign companies in the U. S. All this points to heightened competition throughout the world during the 1970's.

Continuing Proliferation of New Products. These new products will be competing among themselves for the same end-use markets. For example, in the early 1950's inter-product competition was fairly rare. At that time there was one synthetic fiber competing against natural products such as cotton. Now there are a number of synthetic fibers competing among themselves for the same end-use markets. In the polymers area we have seen a vast increase in the number of products competing for the same end-uses; polyethylene, polypropylene, and polycarbonate are just a few of the new polymers that have been intro-

duced during the past few years. The substitution of synthetic materials to supplant natural sources or naturally derived materials is expected to continue, although the list of possible areas to invade is gradually diminishing.

Competition with Older Products. With the proliferation of new products, competition with older products will become even more keen than in the past. This will place an increasing premium on sophisticated marketing research in helping to determine what share of a market a new product can hope to capture.

More Work in the Area of Distribution Costs. There will be a need for more effective work in the area of distribution costs. Much work has been done by the chemical industry in reducing processing costs. It should be remembered, however, that processing costs account for only about 15% of the total sales price of a chemical, while distribution costs have been variously estimated to amount to 4–50%.

Price Forecasting for New Products. There will be an increasing need for more accurate and sophisticated price forecasting for new products. Too many companies are prone to be overly optimistic about the price that a new product will command in the market place. Also, after the new product has been in the market place for a while, there is a common tendency among chemical companies to develop glowing forecasts of the volume their product could achieve if it were reduced in price, so that it would be able to compete with products in end-use areas not currently served by their product. Too often they find that the market for their product is inelastic, or that competitors merely lower the price of the now competitive products to maintain the price differentials. In either event, sales revenue is lost needlessly.

Methods of Transporting Chemicals. There is a great deal of ferment with respect to new and more efficient methods of transporting chemicals. Recently this subject was covered in depth at a meeting of the Chemical Marketing Research Association in Dallas, Texas (*2*), so I will not go into any detail here. Suffice it to say that the regional character of many markets is disappearing. This also will create additional burdens on marketing research when it plans new product ventures. For instance, companies that may have enjoyed a regional advantage in freight costs did not have to worry about competition from other producers outside the protected area. Marketing research practitioners must become more sophisticated in their ability to forecast trends in regional consumption patterns. They must learn more about distribution costs and changes in transportation methods that will affect transportation costs.

So much for the challenges of the 1970's. Let us now see how marketing research is responding or should respond to these challenges.

During the past decade marketing research has increasingly attempted to get away from the so-called "numbers" game. In the early 1950's about all that was requested was a supply-demand analysis of a given product, with perhaps a brief and unsophisticated price forecast. Industry-oriented studies were quite rare, and little more than lip service was given to the impact of competitive products. Actually, whether or not the forecasts were correct did not really matter too much, since eventually demand caught up with supply. As a matter of fact, it was relatively difficult not to make a profit in new ventures in those halcyon days. Now, however, marketing research studies have become quite sophisticated in response to the changing environment of the 1960's. Looking ahead to the 1970's, there are several tools that marketing research has available which must be seriously considered using to a greater advantage. It is not my intention here to discuss them in great detail. I should briefly mention them, however, with respect to the possibilities of marketing research using these tools. These are technological forecasting, the computer, and input-output analysis.

Much has been written on the subject of technological forecasting and it is not my purpose here to discuss this subject in detail. An excellent symposium on technological forecasting was presented recently by the Chemical Marketing and Economics Division. Suffice it to say that technological change is growing more and more pronounced, and we must develop a means of attempting to forecast, not necessarily specific technological breakthroughs, but certainly the general areas in which they will occur.

The computer has as yet made little impact on marketing research practice, but there is growing evidence that major breakthroughs are at hand. Areas in which marketing research already finds computer concepts useful are in territory analysis or analysis of market shares. This used to be one of the first tasks a marketing research group was called upon to undertake, and evaluation of growth of shares of markets for established products was an important part of a market research department's assignment ten years ago. The use of the computer has alleviated a great deal of the laborious aspects of this task.

Similarly, the use of the computer for time series projections, which used to be extremely tedious, has made this area one which can be done almost automatically, leaving the marketing research practitioner free to concentrate on the judgmental aspects of his work.

Future developments lie in the field of decision theory. By constructing models to assist general management in making decisions,

based on varying inputs to these models, marketing research can be of great help.

All this means that the marketing research practitioner must learn to understand the new computer programs which are being developed so that he may take advantage of expanding computer technology. This is not to imply that the marketing research practitioner must become an expert on computers. He should, however, at least be familiar with what the computer can do for him and be able to discuss intelligently with program analysts how to formulate programs to solve marketing research problems.

The challenge facing marketing researchers in the future is extremely interesting, since the marketing researcher possesses the unique blend of technical background, business acumen and training necessary to solve tomorrow's problems. There is a tremendous opportunity for marketing researchers to grasp the complicated forces affecting the chemical industry today and tomorrow, and participate more actively in the future activities of their company. To do this, however, a change in outlook is necessary.

Marketing researchers must become profit-oriented—*i.e.*, they should concentrate more and more on profit-making opportunities. We have already seen earlier how fiercer competition forthcoming in the 1970's from new and old products, international orientation of the worldwide chemical industry, and continuing diffusion of the boundaries of the industry itself, are creating new problems of conceptualization and profitability. In other words, how does one make a profit in tomorrow's extremely competitive and amorphous world?

The marketing researcher must assume an active rather than passive role in his company. Recommendations should be stressed in addition to fact finding. At one time it was felt that the marketing researcher should not be a partisan or protagonist for a project; he should look for truth and facts, and should remain aloof from the final decision. This situation has not changed.

It is also very important for marketing research to take a much more active role in new product planning. Because of the orientation of marketing researchers toward new developments, they can be active in the generation of new product ideas. Emphasis should be placed on determining consumer needs and translating these needs into practical definitions of products and markets to guide research. The saving of time, money, and manpower by such an approach can be enormous.

Another valuable contribution can be made in the area of screening new product ideas that emanate from other sources. By conducting exploratory surveys, marketing research can again contribute effectively to saving much valuable time. Table I shows sources of new product

ideas and shows how marketing research can be especially valuable in contributing to new product ideas through field calls to determine consumer needs. Table II shows the factors to be considered in evaluating new product ideas. Here marketing research plays a very important role with the market development department, manufacturing and engineering departments, and the economic evaluation department. Finally, Table III shows the development of a new product, beginning with the idea and culminating in the research plant.

Table I. Sources of New Product Ideas

Point at Which Idea Originates or Enters the Organization	*Source of Idea*
Sales Force	Knowledge of customer needs and applications Inquiries from customers and prospects Familiarity with competitive, allied and substitute products
Marketing Research	Field calls to determine consumer needs through discussions with: Research directors Marketing managers Purchasing agents Technical service personnel
Research or Engineering	Modification of existing products Application of basic research findings Experimental work with suppliers' new products By-product of work on other ideas Original thinking of recognized problem
Other Company Personnel	Suggestion Systems Analysis of production processes and costs Analysis of maintenance and operating costs for existing products Analysis of markets for existing products and possible new products
Outside Sources	Inventors and industrial designers Stockholders Management engineers: marketing research consultants: advertising agencies, etc. Purchase of an operating company Import or manufacture of products being exploited successfully in foreign countries Trade associations and government agencies

Table II. Factors to be Considered in Evaluating Product Ideas by Department Responsible

Marketing Research Department

1. What purpose will the product serve? Will it improve our quality, lower our costs, etc.?
2. Would the product fit logically into our existing line of products?
3. What is the anticipated market demand? Are the potential applications for the product broad or restricted? Will the product be a large volume item or a minor item in the line?
4. Will it be possible to sell the product through our sales force and channels of distribution? If not, what will be the cost of promoting and establishing new channels?
5. Can the product be sold, in general, to the same consumers or class of trade as our existing products?
6. How long would it take competition to copy or imitate the new product?
7. Is the product technically practicable?
8. Can the item be patented?
9. Can the product be packaged in containers that are generally used in the business?
10. Does the company have the manpower available or reasonably obtainable to develop, manufacture, and introduce the product?
11. What are the prospects for the product on a long-range basis?
12. What is the probability of successful development and introduction of the product?

Market Development Department

1. How long would it take to develop the product for market?
2. What would the development cost be?
3. Could these development costs be absorbed over a reasonable period of time?

Manufacturing and Engineering Departments

1. Can the product be manufactured and sold competitively?
2. Could the product be manufactured by utilizing our existing plant facilities or to what extent would those facilities have to be expanded?
3. Can the product be manufactured from easily obtainable materials? Are these materials in common use by the company?
4. What sizes and types would be required?
5. What effect will the introduction of the product have on engineering schedules?

Economic Evaluation Department

1. What is the estimated return on the investment?
2. Is the item a long-profit or short-profit item?
3. How much profit should the company be able to make and how soon?
4. What effect will the product have on our "break-even" point?
5. Are we financially able to develop and introduce the product?

Table III. Development of a New Product

Step	*Department in charge*	*Department assisting*
1. Idea	(submitted by and division or employee or by outsiders)	
2. Preliminary appraisal and assignment of priority	Research & development	All departments provide data as requested
3. Literature search	Technical laboratory: patent	
4. Project authorization	Company management: Research & development	
5. Laboratory research	Research & development	Marketing research
6. Product formulation	Technical laboratory	Sales: marketing research
7. Technical and economic survey	Marketing research	
8. Appraisal & recommendations	Marketing research	
9. Pilot plant authorization	Research & development: company management	
10. Pilot plant design	Research & development	
11. Pilot plant construction	Research & development	Manufacturing outside construction
12. Pilot plant operation	Research & development	Manufacturing
13. Product evaluation (Field trials)	Research & development	Sales: marketing research
14. Tentative commercial plant design and cost estimates	Research & development	Manufacturing: sales: patent division (final patent review)
15. Final technical and economic survey	Marketing research	All other departments as requested
16. Appraisal & recommendations	Marketing research	Manufacturing: sales: company management
17. Commercial plant authorization	Company management	All departments (recommendations)
18. Commercial plant design & cost estimates	Manufacturing	Research & development

Table III (Continued)

19.	Commercial plant construction	Manufacturing	Outside construction company: (sales department starts to plan sales
20.	Commercial manufacture—initiation	Manufacturing	Research & development
21.	Sales introduction	Sales	Marketing research: patent division (trademark protection): research & development
22.	Commercial sale	Sales	Marketing research: research & development: (sales service)
23.	Commercial plant—process study	Manufacturing	

The foregoing discussion of new areas of opportunity for marketing research practitioners implies, and rightfully so, the necessity for marketing researchers to broaden their skills. This is not an easy task, but it is highly necessary in today's competitive world. Marketing research has always been a reflection of management's attitudes and desires. During the 1950's, when the pace of competitive activity was not quite as hectic as it is today, management had the time and inclination to peruse background reports prepared by marketing research for the education of senior management personnel. Today, however, top management has little or no time to be educated. It needs and insists upon complete studies which offer definite recommendations that can be approved or disapproved by the decision maker. In fact, marketing research will be increasingly a part of the management team that makes the decision.

As a result of the new marketing orientation of chemical companies since the middle 1950's, guidance of the chemical companies' future will come increasingly from the marketplace. Marketing research will have the opportunity to create new concepts of marketing instead of being used on a routine fashion to evaluate the innovations of others.

In closing, Figures 6–9 show how marketing research has functioned in the past and how it should function in the future.

Figure 6 depicts the normal progress of the development of a new chemical product. In this, samples are generally sent to customers in different industries only at the market development stage.

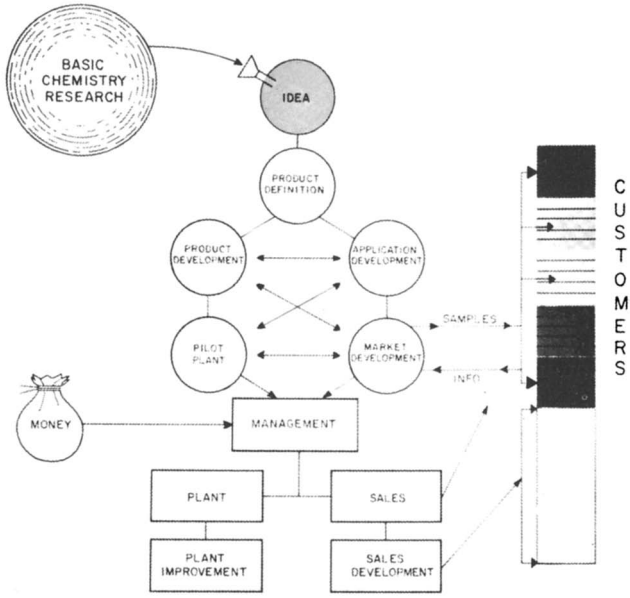


Figure 6. Progress of the development of a new chemical product

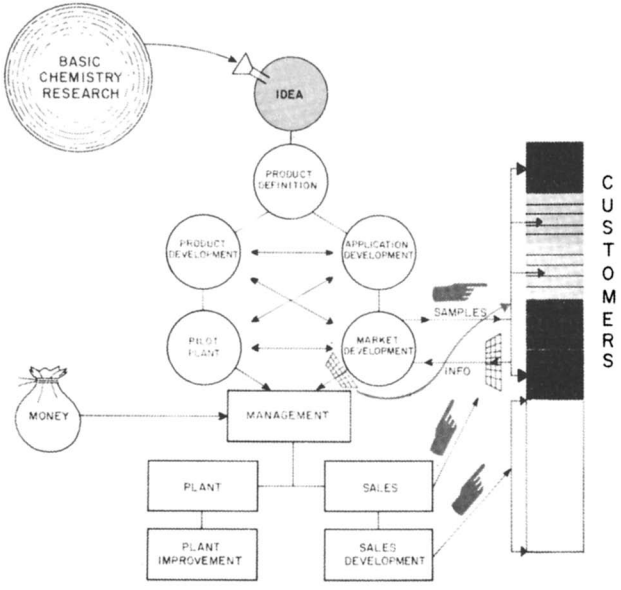


Figure 7. The role of marketing research in the progress of the development of a new chemical product

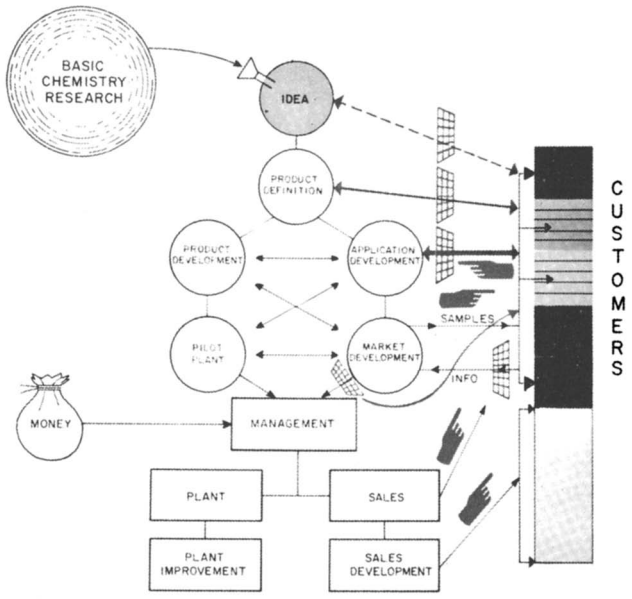


Figure 8. Relating new product possibilities to customers

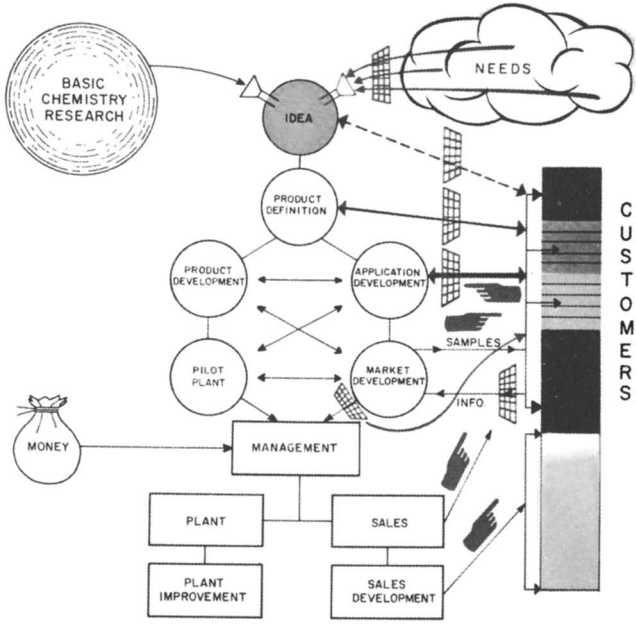


Figure 9. Feeding the idea generators with needs of various industries from the universe of possibilities (the white cloud implying a large number of such industries)

Figure 7 shows the role of marketing research in this set-up. It is engaged in directing the industries and specific customers to which samples should flow and in screening the information returning from those customers with respect to commercial possibilities.

Figure 8 portrays the "new" role of marketing research in relating new product possibilities to customers at earlier stages in the development.

Figure 9 shows a new and even earlier role for marketing research.

Acknowledgment

I am indebted to William G. Kinsinger of Hercules Incorporated for the charts for Figures 6–9.

Literature Cited

(1) Chemical Marketing and Economics Division, "Abstracts of Papers," 155th Meeting, ACS, April, 1968, G.
(2) *Proc. Chem. Marketing Res. Assoc.*, Dallas, Texas (February 1968).

RECEIVED June 12, 1968.

19

Marketing Use of the Computer for Sales, Inventory, and Distribution Control Performance

JOHN CONWAY

Air Reduction Company, Inc., 150 East 42nd Street, New York, N. Y.

The marketing challenge in the next decade will be to develop programs to utilize the computer to the department's maximum advantage. A major responsibility for providing the information from which decisions can be made on an economic and timely basis will fall upon the salesman. Marketing areas which could contribute to improving the profit picture through computerization include sales methods analysis, product quality analysis, product elimination, and customer elimination. Many techniques, such as value analysis, PERT, and operations research are available for treating these areas. Decisions in the area of distribution open to computer operations include recommending the type of distribution units, forecasting needs for warehouses and break-bulk points and determining their size and location, evaluating relative costs of shipping by private and public carriers, detailing inventory plans and shipping schedules, and evaluating packaging, materials handling, and distribution control techniques.

With the advent of third generation computers, fourth generation programming languages, and fifth generation management science techniques, chemical marketing management can and will choose to demand in the Seventies more data for decisions. The impact of this demand will be felt most intensively by the middle level manager, who shares the responsibility for identifying problems, analyzing situations, defining possible courses of action, and evaluating alternatives. With 17 billion dollars worth of computer installations now in the United States, it is clear that the computer is already having a tremendous effect on management environment. Today's manager wants more time to

make his decision, needs more alternatives to consider and desires greater resources of information and available techniques than ever before. The biggest challenge of the Seventies to chemical marketing is to utilize the computer effectively to meet these needs.

There is now in development in many firms (and to gain greater momentum in the next decade) business computer systems linked by communication methods, permitting all offices of a business organization—regardless of geographical distribution—to comprise one large information system so that an individual in any part of that system can communicate with computer elements, as well as with any other office location.

But how are current operations being handled and what are the major factors inhibiting current use of the computer?

The accounting function is today the major computer user but an approach to decision-making areas is under way. The computer's capacity for evaluating many alternative courses of action can provide management with a most powerful analytical tool.

The major factor inhibiting increased computer use as a forecasting tool is a shortage of people trained to use data processing systems qualitatively and quantitatively. However, top management is becoming aware of the need to educate managers who have major assignments from an overall company viewpoint. Managers must become knowledgeable about problems related to sales, engineering, finance and manufacturing.

Furthermore, they should be able to offer decisions based on top management considerations, requiring an understanding of economic and other public issues. The manager must develop a highly responsive data processing network that can provide information of common utility to all areas of management; he must play an effective role in the Company's research and development activities. He must be given complete freedom to explore in depth the problems of management information systems.

Management must concern itself with these developments; expert technicians are needed of course, but management must set the information systems goals. If management leaves refinement of the system to the technician, the result will be what could be expected—the application of interesting equipment to the solution of interesting problems, which may or may not be problems of prime concern to the Company. The organizations that have produced really good results with computer systems have almost universally been those where senior management has addressed itself to system development. After they decided what the company needed, their technicians designed the programs required to achieve the stated goals.

A top chemical executive was recently heard to say "our real goal is to make sure that we achieve more benefits from computers than our competitors." Further to justify this comment, the following statistics were reported in the *Harvard Business Review* by Mr. Neal Dean of Booz-Allen-Hamilton, Consultants (*2*).

Approximately 110 firms were interviewed regarding how they are using their computers currently and what growth factors or changes would occur in the next three to five years.

	Percentage of Use	
	Today	*After 3-5 Years*
Research, Development and Engineering	11	13
Production	19	24
Distribution	10	12
Marketing	13	15
Planning and Control	3	7
Finance and Administration	44	29
	100	100

Although the accounting function is currently the major computer user, these statistics show that there will be a 15% gross reduction in its computer service requirements; whereas production, distribution, marketing and control will increase by 13% in all. However, it should be borne in mind that the total volume of on-line computer time will probably double over the period analyzed.

It would appear therefore from statistics that the marketing challenge in the next decade shall be to develop programs to utilize the computer to the department's maximum advantage.

One of the major questions that would arise is: "who will supply the computer the information from which decisions can be made on an economic and timely basis?"

In a recent article in *Dun's Review*, J. N. Bauman (*1*), the President of the White Motor Company, suggests, "It is time to take a fresh look at the salesman and to consider how we can urge him on to a new level of effectiveness. He has a fundamental role to perform in marketing—profit by listening to him. Marketing statistical reports give data about customers in the mass, but it is the salesman who shakes the individual customer's hand. However, the salesman I have in mind for the era of computer marketing is different from his counterpart of today and yesterday. Aside from his selling activities he would be principally a provider and interpreter of marketing intelligence."

It appears the subject is of interest to many people and to the American Management Association which recently published a book by

Elizabeth Marting (*3*) entitled "Reporting Sales Data Effectively" and, for those who may be interested, this work covers the way companies collect and report sales facts. There are displayed 175 sales forms used by leading companies to insure a steady flow of data on sales results and sales performances. These forms analyze all phases of the sales effort and accompanying texts explain each form or suggest ways they can be adapted to special requirements.

In addition, "The Marketing Executive of the Future" by Patrick J. Montana (*4*) is a valuable reference. This publication of the American Management Association presents the challenges which will face future marketing executives, including new products and materials, accelerated automation, increased competition and shifts in trained manpower distribution. It examines current programs aimed at developing the marketing executive and recommends practical changes to improve their quality in association with a computerized world.

In another approach to the title of this chapter, a number of firms were called and were requested to advise how they are utilizing their computer in the area of sales, inventory, and distribution control performance. If they were not utilizing a computer, were they contemplating use of one and, in general, they were requested to advise their management's concurrence on proposed plans and techniques and also what management science methods were going to be utilized for the aforementioned applications. These calls developed strongly that increasing competitive pressure and the resultant gross profit squeeze are forcing business organizations to reduce cost ratios through improved marketing productivity. Cost control measures to lower manufacturing and administrative expenses in all areas of the business should be sought through the utilization of such techniques as value analysis, PERT (Program Evaluation Review Technique), operations research, a greater use of computers, and systems and procedures analyses. Marketing areas which management thought could contribute to improvement of the profit picture included:

(1) Sales Methods Analysis—Performance can usually be improved through revisions in sales territories, building individual account penetration, stepping up prospecting, sharpening sales compensation, etc.

(2) Product Quality Analysis—Perhaps products incorporate too much quality; quality which is indiscernible to the customer. Value analysis of products against competition could yield valuable results.

(3) Product Elimination—Product lines get out of hand and may include hundreds of items, where dozens would suffice. A soundly managed product line should periodically undergo a systematic weeding of marginal profit performers.

(4) Customer Elimination—Through loyalty, inertia, or lack of facts, many salesmen continue to service unprofitable accounts. Today's

competitive situation requires the expulsion of accounts failing to produce a profit.

The aforementioned methods of reducing the profit squeeze are being computerized in many of the chemical companies contacted. However, the programs and sophistication are all governed by the capital and payroll costs which management wishes to invest in support of reducing these profit-squeezing items.

The initial awareness of such possibilities, of course, came after the introduction of electronic data processing in the financial areas of the company. After the data processing department had finished billing and extracted the various informations about a customer as to what products he purchased, purchasing company, the area in which it was sold, the salesman who sold it, etc., the controller could apply to the supposed profitability created by these sales the real costs which had been recorded. The combination of these records processed through a computer would bring illumination to management on the fact that some items being sold were not as profitable as some people in the company thought they were.

As a result of such accounting/marketing dialogues, methods to reduce the profit squeeze and to improve distribution effectiveness could be started. Many techniques previously noted such as value analysis, PERT, and operations research could be applied to the factors known and programmed through the computer for various decision design tables and profit information analysis.

In order to improve distribution and to make it more effective, a definition is needed. Distribution, in its broadest concept, involves the physical movement of goods, including the channels through which products move from the maker to the user. Controlled management of the distribution function is a key source of better profit performance. It covers the control and planning of inventories from raw materials and work in process to customer inventories. It is concerned with packaging, shipping, materials handling and scheduling. It may involve the sales force, purchasing and production scheduling.

With the use of computer technology, improved distribution effectiveness will command top management attention. Distribution management is now gaining recognition organizationally at the vice president level; however, regardless of internal organization, the marketing function must play a major role in distribution decisions.

Decisions in the area of distribution which are prescribed for computer operations permit management to:

(1) Recommend the type of operation for the field distribution units including company branches, independent warehouse distributors, jobbers, retail outlets, and service units.

(2) Computer programs permit forecasting present and future needs for private or public warehouses and "break-bulk" points and to determine their size and location.

(3) Evaluations and relative costs of shipping by private and public carriers. Leased equipment has also become a computerized management tool for decision and control.

(4) Detailed inventory plans and shipping schedules can be developed, taking into account forecast of demand, economic lot size and planned production capacity. These are all correlated to financial advice on costs, and a model is utilized to project the cause and effect if any of these particular items are radically modified.

(5) The latest packaging material handling and distribution control techniques can be developed and utilized, again as models on EDP (Electronic Data Processing) equipment. This permits management again to control cost effectively and to make decisions as to the profitability and effectiveness of the distribution methods.

In summary, it has been found that inventory management as a system, contains the following factors or relationships:

There should be an interaction of forecasting, inventory planning, inventory management, scheduling, and operations evaluation. These interactions are being, or, will be computerized—and their effects can be evaluated in the direction of maximizing profits by effective utilization and control of materials, machines, manpower, and money. The objective of all of the courses of action being taken in computerizing sales, inventory and distribution performance is to have materials of the right quality in the right quantity, at the right time at the right price, from the right source of delivery and at the right place.

Another vital role that the computer can play is in marketing research to assist management to determine and measure product-market opportunities, requirements, and customer needs; to recommend the structure and methods for internal development of new product plans and programs. The resultant advice and factors should suggest distribution and selling techniques and could assist in developing an overall marketing plan. Finally appropriate and effective cost control tools in relation to the model could be prepared so that management could verify, modify, and continue in a profitable course of introducing new products.

It appears that marketing departments are playing a vital role in material management utilizing the computer to assist in their decisions. The old concepts of developing and designing systems for individual activities within an organization can no longer apply to a marketing department. Marketing is a vital link in the overall materials management process. Therefore, it becomes necessary for the marketing activity to participate in and actively to contribute to the development and design of any systems that involve the management and control of

materials. In this respect, it becomes incumbent upon the marketing department to become aware of data processing, materials management and systems contents. The greater the degree of understanding of data processing activities—the greater the degree of contributions that can be made in developing an integrated system to support the company needs and requirements.

It would appear that in the next decade the chemical marketing challenge will be met by management's development of internal educational facilities and utilization of computer manufacturers' training facilities to become better acquainted with sophisticated data processing techniques. It cannot be stressed too strongly that human ambition and endeavor can never be replaced by electronic hardware. Brainpower and creative thinking must precede and guide any mechanical advances to be achieved *via* the computer.

The following seven steps should be considered in any information system being developed:

(1) Question whether it is financially appropriate to collect and process all the data that the organization thinks the system might generate for a management decision.

(2) Determine the essential, adequate supply of data required in the organization.

(3) Collect data at the stages of the operation which will enable the organization to optimize and reach its goals and objectives from the computer processed information.

(4) Data, once recorded, should not be re-recorded at other stages in the information system. Suggest methods in which the data may compare to goals and advise on variances so that action can be taken on a current basis.

(5) Be sure that the items of information are not meaningless, but are relatable to other facts which are installed as a measure to prove compatability to the overall information system.

(6) Data should be recorded in forms or styles appropriate to their eventual use.

(7) The information should be arranged, stored and manipulated in such a way as to satisfy the goals and objectives of the organization economically and efficiently.

Conclusions

Most of the chores performed by computers in the business world until recently were routine clerical assignments, such as preparation of payrolls or customer bills. But the really significant use of the computer in the Seventies will be giving the head of the company and his associated managers a total picture in graphic form of what the company is doing right now. With up-to-date information, quick assessments of situations will enable managers to cut waste. Up until now, a great deal of the middle manager's work has been routine or repetitive; the

kind a computer can do. In the future, the middle manager will handle more creative tasks. Perhaps, some of these will be to think of new ways of doing business, rather than looking back and seeing what has been done.

Acknowledgment

Boris Masters, formerly of Air Reduction Company, Inc. gave major assistance in preparation of this chapter and his contributions are gratefully acknowledged.

Literature Cited

(1) Bauman, J. N., *Dun's Review*, p. 45 (March 1968).
(2) Dean, Neal, *Harvard Business Review*, p. 89 (1968).
(3) Marting, Elizabeth, "Reporting Sales Data Effectively," American Management Assocaition, New York, 1968.
(4) Montana, Patrick J., "The Marketing Executive of the Future," American Management Association, New York, 1967.

RECEIVED May 23, 1968

20

The Computer and Forecasting of Market Demand and Prices

GEORGE B. HEGEMAN

Arthur D. Little, Inc., Acorn Park, Cambridge, Mass.

Although marketing management has solved many information and control problems through the use of computers, we are just beginning to apply mathematical models to improve forecasting of market demand and prices. In complex market situations it is often useful to use a network demand forecasting model such as developed recently by Arthur D. Little for projecting demand of the four major chlor-alkali products. However, the economic laws balancing supply and demand create a strong link between any forecast of demand and price, and any long-range forecast of these factors must reflect this interrelationship. In recent years, marketing simulation models have been built for chemical products which provide this linkage and give a clear view of the future cycles in supply, demand, and price.

In recent years, marketing management has made considerable use of computers in their operations. Management information systems, supplying up-to-the-minute details on sales, inventory levels, and distribution schedules, are now a routine part of most companies' operations. Computer control systems, which make routine decisions involving inventory control and distribution patterns, have also been well accepted as a means of effecting considerable savings compared with earlier systems. While many information and control problems have now been solved through the use of computers, we are just beginning to apply mathematical models to improve our long-range forecasting and planning in marketing.

The process of planning usually involves getting ready for changes in the market environment, in a company's marketing operations, or even in management's marketing philosophy. The consequences of these changes vary widely and, while small changes can usually be handled in

stride, large or unexpected changes often put the entire marketing effort in peril. Despite the development of careful planning efforts during the past decade, crises in marketing are still common occurrences. The challenge of the Seventies is thus clear: How do we improve our market planning and forecasting?

Fulfilling the need for improved planning and forecasting has two dimensions. First, what new techniques should be applied, and second, what new information do we need? Surprisingly enough, the answer to both these questions is none! What is required is the revamping of older techniques and the better use of available information on the market environment. To improve our planning and forecasting efforts, what is needed are not more sophisticated mathematics, but a better understanding of the complex interrelationships that exist within the market environment. This means analyzing the marketplace as a system and establishing quantitatively each of the important relationships and response mechanisms within the system. By reproducing the system in the form of a mathematical model, it is possible to project the course of events over time within the system. Certainly, reducing well-known marketing relationships to equation form in a systems model is not really a new concept.

Already, most companies process more marketing information than they can use. The fact is, however, they are not harnessing the most useful information available which is the understanding and judgment of the marketing management. To date, the area of market planning and forecasting has been the realm of "expert" subjective judgment and it is clear that to improve on our current forecasting and planning effort, we must bring these judgment factors within our forecasting systems. Thus, the primary information base can be expanded by adding to the existing statistics the understanding of the market relationships and response mechanisms that are well understood by the knowledgeable marketing men handling each product line. Here again we are not developing new information but rather making better use of available information.

The key forecasts for any planning effort are those involving market demand and price. The need for demand forecasts can be divided between short-term forecasts used for budgeting purposes and long-term (five to ten years) projections used for strategic planning. At present, short-term forecasting is being adequately served by the use of statistical techniques such as correlation analysis and exponential smoothing. However, these techniques, which rely on historical data, are of little value in long-term forecasting because they ignore the significance of new developments and impending market shifts; thus, simulation models which can reflect these anticipated changes are particularly useful in long-range

forecasting. When major changes in the market environment are expected in the near future, simulation models may, in fact, prove extremely useful in short-term forecasting as well.

A major uncertainty in the outlook for any product involves the development of a reasonable estimate of future prices. Price forecasting is a relatively uncertain art and no one has a totally satisfactory or foolproof method of projecting prices into the future. However, during the past few years there has been an increasing amount of research effort in this area which suggests that simulation models are also useful in providing a better grasp of the underlying forces at work causing price changes. Based on the limited experience available to date with simulation models, there is some evidence that both demand and price can be projected with some improved degree of "reliability" or with some increased "confidence" regarding the future course of events; with this advantage, marketing management is better able to evaluate the risks inherent in alternate courses of action and to reach a decision with more confidence as to its outcome. In forecasting demand and price, a prime variable is, of course, the changing level of acceptance of a company's product in the marketplace. While our advanced engineering skills permit us to understand and control our manufacturing and distribution costs, I am sorry to say that our marketing skills have not advanced to the point where we can sharply reduce the uncertainty involved in forecasting the level of sales for either a new or an old product. Paradoxically, in fact, our research and development efforts have only compounded this problem because the customer now has an increasing number of interchangeable products to choose from; this makes marketing more expensive and complex, and the risk and cost of failure grow higher every year.

As the cost of failure mounts, management is increasing the intensity of its analysis and asking such questions as: What if something happens to the forecast? or What alternatives do we have? These questions are most difficult to answer using the standard techniques of estimation where the "best guess" is inserted at each point and a single calculation made of an entire venture. The availability of computers makes it possible to develop simulation models that can be recalculated hundreds of times using a whole variety of assumptions about the future course of events. In fact, the model permits multiple solutions that can establish the range of results possible from the upper and lower limits of the forecast for key variables. Knowing the range of results provides an indication of how large a penalty will be paid for a poor judgment forecast at any point. Thus, management questions which involve changes of assumption about the future can be quickly and efficiently answered with a simulation model.

Demand Forecasts

A major function of most planning efforts is to develop a demand forecast based on certain assumptions on price and anticipated shifts in the competitive environment. Unfortunately, these forecasts, once prepared and bound in a report, are rarely kept up-to-date and hence their accuracy and usefulness fade with time. In order to provide a mechanism to keep current major studies involving complex relationships and extensive assumptions, Arthur D. Little developed a detailed market model program for use with its recently completed multi-client chlor-alkali study. This network demand forecast works equally well with projections based on statistical forecasts as well as subjective estimates of end-use demand so often required for those products where no basic market data exists. Through a series of summary steps, the network of end-use markets is consolidated in the model until it shows the impact of the growth of all end uses on the demand for each of the key products which in this case are chlorine, caustic soda, soda ash, and hydrochloric acid. Figure 1 shows in diagrammatic form how one sector of this model relates to chlorine demand. By establishing supply sectors in the model, it is also possible to show the production levels associated with the projected demands. Where one product is the leading factor (such as chlorine) and other products are related to it—*i.e.*, caustic soda and HCl, it is possible to establish in the model the anticipated supply-demand

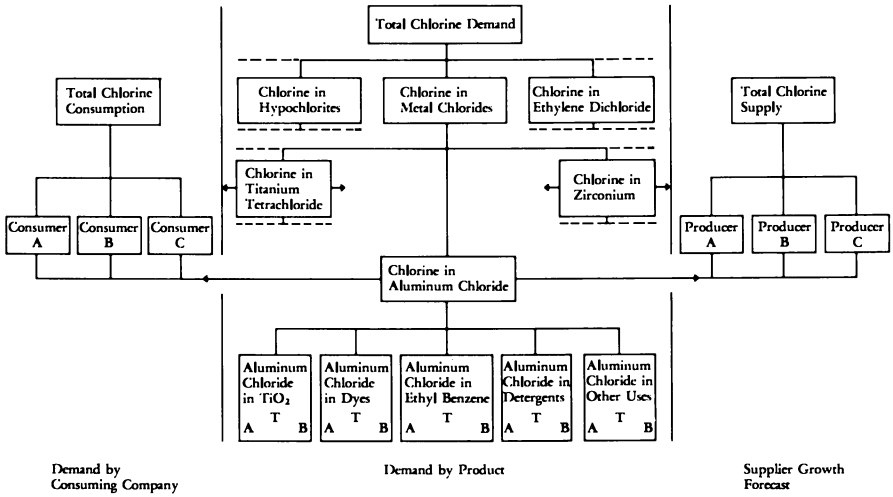


Figure 1. Sample network demand forecasting model

T = Base year tonnage
A and B = Growth rates by time period
X = conversion factor—tons of chlorine/ton of aluminum chloride

balances for the secondary products. Because of the flexibility of the model to accept secondary relationships for each product, it is also possible to develop both a customer demand and a supplier growth forecast within the model, as outlined in Figure 1.

These demand forecasts developed through the application of network models are only a first step in establishing an overall planning model such as a venture simulator. There have been numerous presentations (*1*, *2*) of these more complex simulation systems in the past, and for a new product in a new market, a venture simulation as outlined in Figure 2 provides a useful means of evaluating the outlook for such a project. This approach involves the development of a series of simulation models which when complete contain at least four sectors:

(1) A market model to project demand

(2) A marketing model to evaluate competitive materials and forecast market share

(3) A cost, profit, price model to establish the competitive environment and anticipate future price changes

(4) An investment timing model to project plant expansion.

By integrating this system of models, an overall framework is established which permits the model to assess the impact of changing economic factors on the environment as well as to review alternate strategies open to the corporation and its competitors.

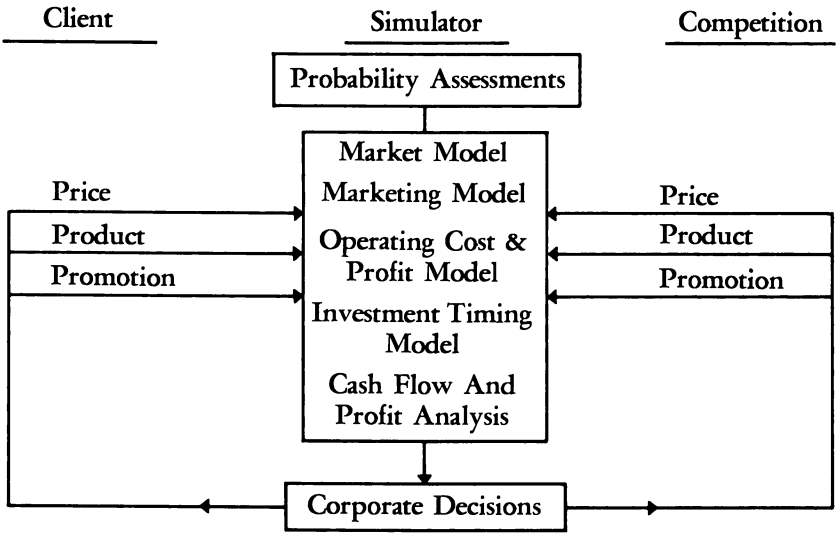


Figure 2. Venture Simulation

Price Forecasting

There is, however, one factor often missing in many demand forecasting models. This factor is the relationship between price and demand. For new products in new markets, this is very difficult, if not impossible to judge, and therefore demand and price forecasts are often treated as separate independent variables with attention focused on probable levels of profitability given a specified price. However, even a cursory knowledge of economics makes one think twice about the validity of models that forecast demand and price as independent variables. Therefore, for those simulations involving new or old products in established markets, it is essential that some indication of price elasticity be included. While the principles of price elasticity and supply-demand curves have been known for generations, there is virtually no data available which gives a marketing manager detailed insight on this issue for his product. He is, however, sensitive in many cases to how much he will gain or lose from a change in price relative to a competing material and this is often sufficient raw material for defining a crude price elasticity function.

The one element most often missing in the typical demand and price forecasts is a projection of supply. While industry capacity can be forecast with some degree of reliability for one to two years ahead based on announced plant expansions, it is essential to gain some insight to capacity cycles further in the future if any meaningful attempt at long-range price forecasting is to be undertaken. How is this accomplished? Simply by forcing the model to follow the general guidelines of the industry regarding new investment planning as the model proceeds through time and by making sure that when projected profits look especially attractive, there is an occasional new producer entering the market to upset the best laid plans of all existing producers.

A special case in demand and price forecasting is the situation where both supply and demand are independent of each other and the problem is one of allocating supply during shortage periods or allocating demand between producers during periods of oversupply. In this case linear programming techniques are most useful to give a clear picture of the allocation pattern and probable price levels assuming all other controlling factors can be forecast. While situations where supply and demand are actually independent are relatively rare, they do occur with some frequency in the chemical and petroleum refining industry because of co-product problems; a particularly acute problem today of this type is in the matching of supply and demand for caustic soda, a co-product in the manufacture of chlorine.

For more typical products, however, simulation models are of primary interest. A flow sheet for a demand and price forecasting model already in use in the plastics industry is shown in Figure 3. Included within the scope of this model were several major producer groups and different grades of material. Perhaps the most striking feature of this flow chart is the heavy dependence of the model on information feedback systems. This type of model is based on the assumption that changes in the system at a given point in time affect subsequent decisions, thus, when given appropriate guidelines for response to change the model is capable of continuing to project the course of events over an extended period of time. Since so many factors are included in a model of this sort, much more information is developed which is useful in planning than just price and demand. Obviously, the most important use of model output is to estimate the probable profit level that can be expected each year based on the projected price and cost structure. In addition, the model provides insight into the cycles of investment that can be anticipated during the forecast period which in turn permits the timing of investment to produce a maximum return on investment. Models such as this also permit extensive sensitivity tests on the price forecast through

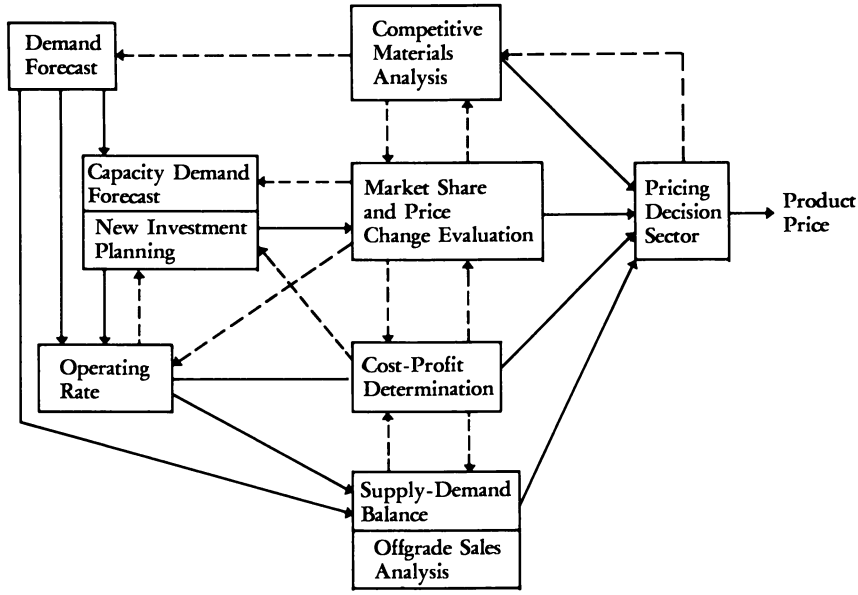


Figure 3. Typical price forecasting model

——→ *Calculation Path*
- - - - → *Information Feedback*

changes in such key factors as shifts in investment timing, demand growth or changes in product mix by producer group.

In reality, most product prices are the result of a balance in the forces at work within the market environment. Therefore, in order to establish a valid price forecasting model, it is essential that the model simulate as realistically as possible the development and dissipation of each of these forces over time. The impact that these forces have on the environment is counterbalanced by the reaction of customers, competitors, and competitive materials suppliers. Thus, it is also necessary to incorporate decision rules covering competitive response mechanisms and to assure feedback of these reactions within the model as the demand and price forecasts proceed through time. Where many forecasts fall down is in the sense of timing and in reproducing the cycles that plague most industries. The need for an improved sense of timing is critical in anticipating major shifts in pricing and the rate of growth in demand, as well as in evaluating the probable competitive response to changes in the market environment. Though there is still much to be done, it is apparent that the computer will play an increasingly important role in any efforts to improve our market planning and forecasting efforts.

Literature Cited

(1) *Chem. Eng. News* p. 20 (January 2, 1967).
(2) Hegeman, George B., Div. of Chem. Marketing and Econ., Reprints, p. 166, New York, New York, September 1966.

RECEIVED June 16, 1968

21

Sales in a World Market

MONTE C. THRODAHL and ONNIK S. TUYGIL

Monsanto Company, St. Louis, Mo.

Changes have come about in the attitudes of U.S. chemical corporations towards their marketplace during the postwar period. Worldwide marketing, as seen by the customer, moved from the supplier's being an aloof, distant seller of excess production to an involved local marketer with international strengths. The several major problems, real and imagined, that have been encountered during the transition are described and solutions proposed.

It is perhaps no exaggeration to say that the American chemical industry "discovered" markets outside the United States after World War II. For a number of years the clamor for chemicals, dyestuffs, and plastics, mainly from Europe's renascent industries, was loud enough to allow U.S. manufacturers to get rid of surpluses at favorable prices and terms—favorable to the seller.

In the 50's, however, European and Japanese chemical producers began making their weight felt on world markets, and the buyers began to have a greater choice of supply. But it wasn't until after the Korean War that the world chemical market began to evolve into a buyer's market.

The challenge that developed then for the U.S. chemical industry is the same challenge that will face it in the Seventies: when does an export buyer become an international customer—and how do we organize and orient ourselves to serve him?

A variety of methods have been proposed to turn this challenge into an opportunity. We would like to examine some of the factors involved in the transition of the U.S. supplier from a distant, aloof seller of excess production to an involved local marketer with international strengths.

In the immediate post-war period, responsibility for export sales generally lay in the hands of an export department or an overseas division. Working with sales agents in a number of countries, these depart-

ments quoted prices, made supplies available, and even signed long-term contracts, as long as domestic needs could be met first. As the volume of sales increased, two factors started coming into play: the buyer began coming back for more—thus the volume of exports began to grow and assume increasing importance in overall profitability; and competition began to increase—threatening that profitability. The buyer was beginning to act like a customer, demanding competitive prices, consistent delivery, and technical service.

Concurrent with this growth in exports from the U.S., another development was taking place, often uncoordinated with export activity: manufacturing facilities outside the U.S. began to proliferate as companies attempted to exploit opportunities to participate in a growing market with a product or products based on technical or production strengths or specific tariff protections. These subsidiaries soon began to succumb to the lure of world markets to sell excess production to countries outside the ones in which they were established.

Thus, companies were responding from two vantage points to increasing world demand: with surpluses available from domestic production and with surpluses available from ex-U.S. facilities. Both these responses, however, were being channeled into world marketplaces through the same medium—the local sales agent, who thus became the decision maker. He could play off prices, availabilities, and deliveries from among his principal's production points. By sending his orders to the supply point most favorable to his customer, he exercised substantial leverage on profitability.

There is no question but that this system worked so long as a seller's market existed and the volume of ex-U.S. business represented a small—say 10%—portion of total domestic business. But as volume grew under the pressure of increasing world demand and increasing international trade, the profitability contributed by this volume assumed significant proportions, both directly and as a contribution to divisor. Variations began to make themselves felt. In the same sense that the buyer was developing into a customer, so the international business arena began evolving into a marketplace, a marketplace where the U.S. chemical industry had a stake it could not longer afford to abandon or to maintain merely as a means of getting rid of excess domestic production.

This crossroad was reached by the U.S. chemical industry during the early 60's. The key decision to be made was: should the overseas department (or international company or overseas division) continue to have sole responsibility for ex-U.S. business, or should responsibility for worldwide business permeate the company as a whole? If the latter course was to be followed, the next step was to determine how policy

and operational responsibilities were to be delegated for maximum impact on world markets and maximum profitability to the company.

At this point, let us pause and take a few composite snapshots from the crossroads. The problems and opportunities to be seen look different, depending on your viewpoint, but they each have salient common features that should be examined.

Export Marketing from the U.S.

The international group, generally located at company headquarters, is the sales organization responsible for contact with overseas customers. It discharges this responsibility through a network of agents and through the marketing organization of their international subsidiaries in countries where they exist.

In effect, it acts as the "product manager" for exports and has the world outside the U.S. as its marketplace. It indulges in "arms-length" dealings with the producing divisions of the company and competes with the domestic market for supplies, favorable deliveries, competitive prices, and technical service. A domestic product manager probably does not get credit for export sales and therefore has little incentive to make product available for export except when his domestic supply/demand ratio is out of phase. Thus, there is no assurance of continuity of a product for a customer in export. The magnitude of the company's stake and involvement in the domestic market overshadows other considerations. Yet the growth potential of the overseas markets is a continual incentive to the international group for increased participation.

Sales Agents

The role of the sales agent, who originally acted as a purveyor and broker of chemical commodities, has changed subtly as the nature of competition and the sophistication of the marketplace have changed. He now imports for his own account to resell in local currency, he carries consigned stocks to make rapid deliveries, he may even have on his staff a technical man or two, trained by his principal.

Yet his profitability is primarily tied to volume, since his income depends on commissions. Therefore if he is a good businessman his activities are primarily directed towards getting orders for the highest volume of products at the lowest cost to himself—irrespective of their profitability to his principal. His interest in new, technically sophisticated products developed for long-term payoff is minimal if not absent. Any effort directed away from getting today's order—market research, environmental reporting, forecasting, budgeting—is uneconomical for him.

Marketing from Ex-U.S. Subsidiaries

Basically, the ex-U.S. subsidiary has been set up to manufacture and market a product, or series of products, in a given country. Often, but not always, it is also charged with the responsibility of selling the rest of the parent company's product line in the country where it is domiciled. Primarily, it believes its function to be marketing its own production—lesser attention is given to selling products made at other locations. In countries where the local subsidiary is charged only with selling its own production, there is an agent—or agents—responsible for imported products, thus creating a split image for the company and confusion among customers.

Adding to the confusion, in cases where a local subsidiary also exports, it uses the same network of agencies the parent company and other subsidiaries do.

The Customer

This snapshot is perhaps more blurred than the others, partly because at the crossroads you cannot be entirely sure whether you are focusing on a buyer or a customer. To the sales agent, he is a customer who must be served and serviced, since his continuing business is essential. To the domestic product manager he is a buyer who is at best a convenience, at worst a nuisance. In the middle stands the export organization—or international group—which must reconcile those two views.

One important aspect in this reconciliation is the growing internationalization of U.S. customers themselves. They, like the basic chemical industry to which they are closely linked, are growing outside the United States, through subsidiaries, joint ventures, or acquisitions. They, too, are going through the throes of meeting the challenge posed by doing business on a worldwide scale. The names that form the basic fabric of the domestic customer network are beginning to crop up on export orders.

In fact, more and more often an overseas subsidiary wants to know specifically which product or service the parent company supplies to the parent of a customer of theirs. The worldwide supplier is now meeting the international customer, whose requirements of supply, service and back-up are essentially the same outside the U.S. as inside.

This customer wants to do business directly with the supplier—having a sales agent simply quote a price on an "as required" basis is not satisfactory in such a situation. Sporadic or only occasional travel by technical service personnel or product specialists from the U.S. home office is insufficient.

Accentuating the situation is the increasing frequency of direct contacts by the chemical industries of the United Kingdom, Germany, Switzerland, and Japan—to name but a few—with their customers overseas.

The picture now becomes sharper—the buyer is evolving into a customer, and the customers are creating a market that cannot be overlooked, nor can it be cultivated without bringing all the necessary resources of the company to bear upon it.

How, then, are these resources to be marshalled and organized for maximum effectiveness in the market? In addressing ourselves to this question, let us consider the following factors.

Growth of the Regional Market

The regional market may mean several things—the European Economic Community or the Central American Common Market are among those that come to mind. For our purposes, however, let us think in terms of larger geographic definitions: Europe, Latin America, Canada, Japan, Australia, Southeast Asia, and Africa. Over the last twenty years, each of these areas has developed differently and, from the point of view of the world's chemical industry, has exhibited a different set of needs. In the foreseeable future, the differentiation will continue. This basic fact underlies, and is a key factor in, the determination of how we must organize to sell in the world market.

In each of these areas not only are the customer needs different, so is the competitive battleground. For example, in Europe the U.S. chemical industry battles the transatlantic giants on their home grounds, but in Southeast Asia all Western competitors are more or less equivalent in their competition with the Japanese chemical industry. The needs and requirements of Africa are of a totally different dimension than those of, say, Canada.

While all this may seem self-evident, it has taken the U.S. chemical industry longer than its European competition to adjust to these realities, and to identify the types of opportunities it can profitably grasp. During the lag, valuable opportunities have been lost.

One caution may be worth mentioning here: however broadly we may look at world areas, we must avoid two myths that can haunt and bedevil us. The first myth is that national boundaries do not exist. They do exist; they will continue to exist; and national practices will continue within them, as will national objectives to which we must be sensitive and knowledgeable.

The second myth is that product applications are the same everywhere as in the United States. They are not; the solutions to customers' needs that have been found in the domestic market are not necessarily

transferrable to another market or imposable on another set of customers. To market on a truly international scale, we must serve the customer, not merely make available to him that which we have developed for domestic use.

Development of Area Marketing Organizations

We said earlier that in its role of export marketing, the international group acted as the "product manager" for the world outside the United States. But in the context of international marketing this is an anomaly. Those sections of the company charged with the development and production of goods are themselves capable of managing the products. Rather than being product-oriented, and attempting to duplicate those capabilities and resources, international marketing must address itself to the needs and opportunities outside the United States. It must, in effect, become market-oriented. To do so it must consciously take these steps:

(1) Analyze the company's relationships to the various world markets, considering both the current and potential business level.

(2) Organize on a uniform basis—but not with doctrinaire identity—across world areas—the network of sales agents, sales offices, and subsidiary companies in such a manner that the importance given to a particular world area in the company's business deliberations is consistent with the area's potential contribution to profit.

(3) Recognize that while an area group must have the credibility and knowledge to bring to bear the strengths and capabilities of the supranational parent organization on opportunities, it must also have the image and flexibility of a local marketer.

Incidentally, it is worth keeping in mind that these steps are part of the development of area marketing organizations, and are evolutionary and occur unevenly rather than suddenly and across the board. This development will generally take place within the concept of using the international division as "area manager."

Hand in hand with this concept goes that of the producing divisions as product managers, with worldwide product responsibility. Under this concept, the preoccupation with the profitability of products sold outside the United States that was previously possessed only by the international group—perhaps by default—now rests solidly with the producing divisions. The international group now becomes responsible for area profitability, for total business in an area. In short, it is the "area manager."

A variety of specific solutions to organizing this responsibility have been put into practice: a series of area managements reporting directly to the corporate executive with no international headquarters function;

area managements reporting to an international division headquarters; product managements and area managements themselves forming the corporate executive. Throughout all these solutions runs the same trend: decentralization of international marketing and its focus on the marketplace.

Only through the selectivity that can be exercised by marrying the in-depth knowledge of the marketplace and its potential with the intimate knowledge of product profitability and capability can we embark on the path of internationalization. The wedding, however, is only the beginning—a long series of marital problems can be expected and they must be resolved. For example:

(1) We have successfully exported our technology and manufacturing capabilities in the past, and they have now become indispensable to opening new markets. Paradoxically, however, technology has now become so freely available that it is no longer sufficient in itself, to guarantee leadership and protection. Technology must now be interlocked with innovative marketing and distribution systems to attract and serve today's international customers.

(2) The new breed of international customers, with their sophistication and instant communication systems, will deal only with suppliers who are equally sophisticated and fast on their feet. European and Japanese competitors have practiced the fine art of doing business on a world scale for many years, and many, particularly the Japanese, are now able to offer services which cannot be matched by most American-based companies. We must find some way of providing counterpart services within our free-enterprise system if we are to compete with these companies.

(3) We must build up an international "gestalt" throughout the entire corporation, rather than restricting international operating concepts to a single group. This will require that all producing groups determine in their own minds who are their customers and who are their buyers, and then treat the customers as such no matter where they are located, whether in Oslo or Oshkosh.

(4) We must gain better understanding of the forces of our business environment. Products are bought more and more for what they do, rather than what they are. Hence, product marketing management will become so complex that it will be essential to organize it to serve a mission rather than to satisfy a functional need. Satisfying functional needs is more convenient from the supplier's standpoint, but the real rewards of the future will go to those who organize for the convenience of the customer.

(5) We must devise more effective systems of communication within and between our component organizational groups, in order to keep up with the demands imposed by changing market factors. However, it is equally important to determine what information should be communicated, to avoid being drowned in irrelevant information, irrelevant, that is, to the satisfaction of the need at hand.

These are major problems. Some are inherent in the new method of doing business, others are upon us now and demand urgent solutions. It is only through their solution, however, that we will be able to consumate the union of skills and abilities which will enable us to meet the real challenge of the Seventies.

RECEIVED August 9, 1968.

INDEX