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# COMMERCIAL FORECASTING OF SALES AND PRODUCTION GOALS IN THE STEEL INDUSTRY

3 November 1948

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COLONEL MICKELSEN: General Holman and gentlemen: We have this morning, in the results of the election, an example of the dangers confronting every forecaster, whether it be the weather man or a forecaster of sales and production goals. In spite of these dangers, industry, like the Military Services, finds that it must do this forecasting. An appreciation of that is evidenced by the increasing trend in industry to work out its problems of forecasting. We are fortunate this morning in having a man who is responsible for that forecasting in one of the basic industries of this country. I take great pleasure in presenting to you Mr. Bay E. Estes, Director of Commercial Research of the United States Steel Corporation.

MR. ESTES: General Holman, Colonel Mickelsen, and gentlemen: I am indeed happy to have an opportunity to meet with you here today and to discuss with you sales forecasting and related problems as seen from the standpoint of the steel industry. I use the word "discuss" advisedly, for I propose that we adopt a "case approach" in this meeting. I shall endeavor to provide the essential background information, to pose the problem, and to sketch one or more approaches to it. I suggest that you consider what I have to say both objectively and critically, and that you in your own minds seek to detect all possible weaknesses and to bring forward any feasible alternatives.

At the outset, I would like to emphasize that our forecasting procedures are not perfect, and that they are still being developed.

The sustained period of high-level operation enjoyed by the steel industry for the last seven years has had, naturally, a profound effect on our sales forecasting, procedures and practices. I would like, however, to disregard the fact that for some time the most effective way of forecasting sales in many industries has been by forecasting the ability to produce. Let us assume, for the purposes of this discussion, that we are in a more normal sort of demand situation, where supply is adequate and buyers freely decide what to buy, when to buy, from whom to buy, and whether they are going to buy at all.

One thing more I would like to clarify. The purpose of this lecture, or discussion if you will, was stated in a letter to me as follows: "To acquaint student officers with commercial methods from which they may ascertain whether there are any policies or procedures which may be used to improve planning and operation within the national security organization." I judge from this statement that the onus is on you gentlemen to

draw any likely analogies between commercial and military problems and practices.

Before getting down to my formal subject, I would like to talk to you a little about the steel industry, more specifically about the United States Steel Corporation. This is not lost motion, because in a case approach certain basic facts must be known. Without some factual background, the approach to such a problem as this is likely to be unduly academic. It is almost axiomatic that in any company sales forecasting must be tailored to the characteristics and needs of the particular enterprise.

I am sure that it is not necessary to emphasize to a group such as this that the steel industry is large, that it has immense capital investment, and that it occupies a basic position in the American economy. I do feel, however, that it will be worth while to discuss for a moment the tremendous diversity of products produced and sold by the industry and by U.S. Steel subsidiaries.

Those who are not familiar with the steel industry have a perfectly natural tendency to think of steel as just "steel" without realizing the tremendous diversity of steel products and of their uses. The new hair spring in your watch, the can from which your wife gets the peas which you eat for dinner, that new car you were just able to buy, the giant magnet in a new cyclotron--all are made from steel. All are vastly different in size, shape, and physical characteristics. The public's view of steel as just "steel" is perhaps somewhat analogous to its concept of the Armed Services as just a large number of men and a large quantity of equipment. To the military man, I am sure, the Army consists of many types of men with specific training and skills, and equipment of specific types designed for specific uses. The military man no more think of the tank driver and the infantryman as being just men and, therefore, interchangeable at will than the steel man regards a piece of pipe and a coil of wire as both "steel" and therefore capable of being lumped under a single heading.

U.S. Steel subsidiaries make and distribute scores of different steel products--shapes, plates, bars, rails, sheets, strip, tinplate, pipe, and wire--to name but a few of the major classifications. Every one of these products is produced in a multitude of grades and metallurgical specifications. Beyond this is a vast number of variations in shape, size, finish, and so forth.

Not only do the subsidiaries distribute these products nationally and in export, but they warehouse them and ship them in small quantities to customers who require limited amounts or who cannot wait for delivery from the mill. They fabricate steel into large structures--many storied

office buildings and mammoth bridges--and into smaller ones. They produce barrels and drums, oil field pumps, Diesel engines of various types, and many other finished products too numerous to mention. You may also be interested to know that these subsidiaries produce coal chemicals which find their use in finished products ranging from aspirin to paint to nylon stockings to fertilizer and even to TNT.

I have taken the time necessary to sketch the diversity of our products because it is essential that in our subsequent discussion we should think in terms of the varying techniques and procedures required to forecast sales not of just steel, but of each of a variety of products flowing into many different uses.

A number of methods for forecasting sales are available, and I think a general review of them will be profitable. But before we begin, let's take a moment to clarify the term itself. What kind of sales forecast are we talking about?

Three separate types of sales forecasts are usually distinguished, principally on the basis of the period covered. The first is the short-term forecast, usually one year ahead or less. The second is the medium-term forecast, usually one to five years ahead. The third is the long-term forecast, usually five to twenty years ahead.

I should like to limit our discussion, in the main, to short-term sales forecasting; because forecasts are true operating tools for sales and for other departments of which the activities depend upon volume, and because they are an essential starting point from which accounting and financial people develop financial budgets. Medium- and long-term forecasts are useful chiefly in facilities and investment planning, and are of substantially less interest in connection with current operations.

Before considering the forecasting techniques to be employed, two other areas must be explored: First, the uses which will be made of the forecast must be determined, and secondly, the contents of the forecast must be decided upon.

I have no intention of repeating here the long list of important uses which can be made of sales forecasts. Some we have already mentioned. Others will come out later on. For the rest, any textbook on budgeting can provide you with a list limited in length only by the ingenuity of the author and the availability of paper. Two things I would emphasize: First, that forecasts must be tailor-made to fit the uses to which they will be put; and secondly, that forecasts are worthless unless used. A completed forecast represents a considerable expenditure of time and money, and can repay its cost many times over if properly constructed. Furthermore, no value is returned if the forecast is buried in a stack of papers on an

executive's desk. It must be used. It is an action tool. It is perishab and it gets stale quickly.

The second area I mentioned, the content of the forecast, is subject t the uses to be made of it; for the intended uses govern the information to be provided. Certain basic things should be included, however, in any sal forecast: The first is a forecast of physical volume in units--tons or gallons or barrels--whatever is the typical unit of the particular company. In some cases it may be necessary to use different units in different part of the company's production.

The second item that is required is a forecast of prices to be realize

Finally and obviously, the two parts of the forecast--the volume and the price--are put together in a mechanical way to come up with the dollar volume. The volume forecast may be more important than the dollar forecas to sales and operating men. However, when it comes to budgeting by the accounting department, dollar sales figures are essential.

These data should be provided in total and suitably broken down in det We usually think in terms of breakdowns by product, by subsidiary or manuf uring division, by sales territory, and by type of consumer.

Decisions, then, must be made in these two areas--the use and the cont so that the form and content of the final reports desired can be determine in advance. Once these two areas are clear, forecasting techniques can be selected.

In discussing forecasting techniques we can get into some rather involv problems, which are not easily handled in summary fashion. A broad-brush treatment seems desirable to me and my remarks, accordingly, have been mad quite general. More specific information as to detailed methods is available in statistical textbooks should one wish to investigate this subject further.

There are two basic approaches or techniques which may be used. Neith of these involves the use of a crystal ball nor a wand; and, as you know, tea leaves went out of fashion years ago. Today the tendency is to emphas a "grass roots" approach, based on the men who meet the trade and take the orders. I think this indicates that we have come a long way.

The two approaches I do want to mention are, first, the historical-stat tical approach, and, secondly, the analytical approach.

The Historical-Statistical Approach is the name given to the approach based on the theory that the volume of sales at any given time and place is the algebraic sum of the influence of four factors; namely, long-term growt

the business cycle, the season of the year, and random or chance variations. Further, it is based on the continuity and recurrence of these factors. In preparing a forecast through the use of this method, the analyst must first determine the long-term growth curve of the product. This gives him his base, the bottom layer of his cake. Then he determines from past history the cyclical pattern of demand for his product. This he adds as his second layer and it is usually misshapen with high peaks and low valleys. The top layer is the seasonal factor, which is again determined from historical records. All these factors are projected into the future according to this past pattern and, presto, there is your forecast. Random fluctuations by definition are normally not foreseeable and are generally not considered at this stage.

Other statistical devices are also used in this type of forecasting. One popular device is correlation. Relationships between sales and external indexes of business activity are studied. Such indexes include industrial production, national income, retail sales, employment, and so forth. Charts are prepared posting sales against index readings. A high degree of correlation is evidenced by the points falling pretty well on a straight line or measurable curve. Then, a relationship is derived by the use of a formula, and this relationship can be used to interpret the index as forecast by independent agencies into a sales forecast for a particular company.

Sometimes these simple correlations are not adequate. Then one goes to more elaborate statistical techniques.

Correlations may be particularly valuable when a lead-lag relationship is observable. Take, for example, a leading company in the field of plumbing supplies. It found a high degree of correlation between building contracts awarded and its sales, but its sales had a lag of three to four months. When building contracts, as reported by a national service, fall off or rise, it confidently expects a decline or increase in its own business three or four months later.

On the other hand, correlations can be dangerous and misleading. They are such convenient pegs on which management can hang its thinking cap that there is serious danger that management may consider them an adequate substitute for thinking. Sometimes correlations may appear to exist where there is no actual cause and effect relationship. There is a story that periodically goes the rounds about the statistician who found a perfect correlation between the income of churches and the consumption of hard liquor. Well that's the kind of thing you must watch out for here.

Proponents of the use of these statistical techniques claim they are valuable in that they tend to limit the scope within which executive judgment must be exercised. I do not wish to belittle this approach, for I am sure many companies use it fairly effectively. However, it appears to me to be less valuable than the analytical approach, for a number of reasons.

First, in the short-term, long-range growth factors are relatively unimportant and are obscured by cyclical fluctuations. The major ups and downs of the business cycle tend to hide the long-term growth factor unless the industry or company is growing at a rapid rate. Such rapid growth is usually found only in new industries and companies. For most industries, long-term growth is not too meaningful in short-term forecasting. In the long run it is very different, of course.

Second, cyclical movements are frequently irregular and not observable until well after the turning point has been reached. When past movements are charted, it is easy enough to say when the upturn or downturn came. When you are in the middle of things, it is very difficult to prophesy both continuing and changing trends.

In the third place, seasonal fluctuation patterns change. Particularl has this been true in the past three years, when high-level activity has kept almost all production facilities humming at top speed.

There have been seven years since we could look at a normal seasonal pattern. Therefore, if we investigate the seasonal pattern prewar and expect that the same seasonal pattern will exist when we come back to a more normal level of production and business activity, we may be badly fooled. It will take us several years to see what the new pattern will be. Then, too, if seasonal variation is minor, it is hardly worth fussing with at all.

This is generally true of our own industry. Looking at the steel industry's production broadly, it is very difficult to see a significant seasonal pattern. Years ago we thought we had one. We have become more and more dubious. The Federal Reserve Board has stopped adjusting its indexes for seasonal variations in steel output. Some individual product such as tin plate and rails do exhibit considerable seasonal fluctuation. But broadly, the steel industry does not have a very marked seasonal.

Fourth, and most important, the results of a purely statistical approach are difficult for management to evaluate or interpret, and may, therefore, be regarded with distrust. This is true even though the results are modified according to the best current commercial judgment. You don't have to be a mind reader to figure out that I don't get a fast pulse when I see a forecast based on this historical-statistical techniqu

Now let's look at the other method, the analytical approach to sales forecasting. This approach is a much more personal and nontechnical one. The forecasting procedure begins with the forecasting by qualified persor of general business activity and of activity in those industries which ar major customers; for example, forecasting the activity of the automotive industry, the construction industry, the home appliance industry, the rai road industry, etc. Judgments of line sales personnel at all levels are gathered. Analyses of pertinent economic factors are collected, and outs

forecasts are studied. Then, this material is digested into a forecast of activity for the entire steel industry.

The next and final step is to determine what chunk of this total business will come to a particular company. In other words, you take a rather specialized poll of opinions about a given market, fold in all the hard facts you can lay your hands on, season it with a generous amount of common sense, and dish it out in simple business English. You would be surprised how often the result is accurate.

We feel that this general approach fits our needs best, and I should like to explore in greater detail with you how it already works in our organization, even though we are still in the process of refining our techniques.

This approach is basically a "grass roots" approval. Through it we take our own poll on business prospects as seen by our line sales organization. Their judgments are reviewed carefully and are compared with check totals based on our best group judgment about what the economic and business future holds. Through such a multiple approach and cross-checking, we hope to achieve results which will be increasingly accurate and which will provide a sound base for the management decisions of other departments.

The basic responsibility for sales forecasting must rest in the hands of the Sales Department. This is true because only Sales can have the direct contact with the trade which is so essential to realistic forecasting, because only Sales can have first-hand knowledge of sales plans and policies, which influence sales to such a marked degree, and because Sales must play a major part in developing the sales goals against which it will measure and evaluate its performance.

Once the sales forecast has been made, the Sales Department puts it into action in its own sphere of activity in many ways. Advertising bases its programs on sales forecasts. The Line Sales organization plans distribution channels, sales territories, and allocation of manpower on the basis of sales forecasts. Personnel finds, selects, and trains additional personnel and assists in the development of present personnel as required by Line Sales after reviewing sales plans. Market Development plans and executes many sorts of sales promotional programs on the basis of forecast sales. Commercial Research keeps the forecast current making interim revisions as economic conditions change, and aids Line Sales in measuring achievement in terms of forecast opportunity and actual achievement. Finally, Line Sales works out over-all sales expense budgets in accordance with sales forecasts and controls expenditures in terms of those budgets.

Let us follow through the various steps involved in making a typical forecast for a year ahead.

We begin with the salesman. He sizes up the business he expects to do with his various customers and prospects during the next year. He submits to the district sales manager, to whom he reports, a forecast showing the quantity of each product which he thinks he will be able to sell next year in his territory. The District Sales Manager reviews the forecasts that the salesmen return and combines the forecasts for his district into a single forecast which he sends in to the General Manager of Sales.

Concurrently the Product Sales Managers who have responsibility for the distribution of particular products, prepare forecasts of the total sales of each of their products. Their forecasts are also forwarded to the General Manager of Sales.

The company's Commercial Research Division then compiles company-wide forecasts--the Line Sales forecast and the Product Manager's forecast. Incidentally, salesmen are often accused of being poor forecasters. When business is good, they may let their exuberant enthusiasm run away with them and be over optimistic. Conversely, when orders are hard to get, men in direct contact with the customers may become unduly pessimistic and may tend to underestimate the immediate future. So, an independent check at this point is vital.

Commercial Research uses several cross checks on the forecasts. It obviously compares the two forecasts side by side. It compares the forecast, product by product and territory by territory, with past sales performance. It reviews over-all goods in terms of forecasts of general business conditions. Based on these cross checks, the original forecasts are revised wherever necessary with those responsible for submitting them; and necessary adjustments are agreed upon, often after further investigation.

The sales forecast then moves to top sales management for review, adjustment, and final approval.

As pointed out earlier, completion of the forecast is only the beginning of the story, because it must then be put to work. Management must interpret the predictions into swift, decisive action and must do everything in its power to see that the performance forecast is achieved in reality. Then, and then only, is the forecast worth while.

In the original discussion regarding this session it was requested that some attention be given to the use of sales forecasts in setting production goals and raw material requirements. At present the steel industry's ability to get orders is not the factor which governs production and raw material needs. Instead, production is at a maximum, and in many cases raw material availability is a factor limiting output. In more normal times, however, production planning must interpret sales forecasts into detailed product schedules; that is, in terms of sizes, finish

etc., on the basis of past experience. These figures can be used to plan over-all facilities allocations. Actual production plans, however, will continue to be based for most products on orders actually booked; for comparatively little manufacturing for inventory is done in the industry.

In the same way, under more normal conditions sales forecasts may be converted back into raw material requirements and steps taken to see that these requirements are met. For example, iron ore can be estimated to determine how much ore must be brought down before the lakes freeze in order to keep the blast furnaces supplied through the winter.

The thought has probably occurred to you, as naturally it has on occasion occurred to me, "Is this all worth the trouble?" We spend much valuable time in preparing, reviewing, adjusting, and compiling. By the time such a forecasting program has been devised, installed, and adjusted, and by the time the forecasts start rolling in, there are literally millions of frayed nerve ends scattered about. Gallons of midnight oil will have been burned, scores of pencils worn to stubs, and reams of paper used. What makes it all worth-while?

I think, for one thing, forecasting forces us to do some good, hard thinking. It forces a salesman to know his accounts. It forces all of us to take a periodic look at what is ahead.

Beyond that, sound forecasting of sales is the cornerstone of every business just as logistic plans are the cornerstone of every military campaign. I know little of military intelligence and its methods; but I am sure that you gentlemen would not care to launch an invasion without knowing the depth of water, the terrain, the number and deployment of opposing forces, and all the other factors which are carefully analyzed and forecast before laying the plans for a military movement.

Let me assure you that it would be equally foolhardy for a business to go plunging ahead without facts, and forecasts based upon these facts. The firms which have perished in the crossfire of unforeseen conditions are legion. Any business to survive and to progress must have the facts. Forecasting supplies the facts for the future. With such information, management can skilfully plot its course and sail with maximum safety on the rough seas of inflation, deflation, competition, and change. Of course, it is worth it.

QUESTION: Mr. Estes, I didn't quite get the time element involved in your forecasting. When you start collecting dope from the salesmen, say, in January, when is that going into effect?

MR. ESTES: Actually we start well in advance. Salesmen are now beginning to bring information in to District Managers for next year's forecast. U.S. Steel has many subsidiary companies and company forecasts must be built up before the corporation forecast can be arrived at. The company forecasts are in the hands of the corporation by the middle of December, which means that in the companies they begin work by the middle of October.

QUESTION: At the present time and for the last few years the steel industry has not been able to meet the demand. Surely there must be a requirement for an estimate of what the demand would have been. Would you comment on the techniques and procedures by which you arrive at such forecasts?

MR. ESTES: I think there is some question as to whether we actually can arrive at any true estimate of how much steel would have been consumed last year if all had been available that would have been called for In the first place, if steel were no longer the limiting factor, somethin else would very promptly become it. It might be labor or it might be oth materials.

Your question is closely allied to long-range forecasting. In our long-range forecast, we forecast in terms of what we call a "normal." We don't feel that there is any use in trying to predict just what 1960 will be. But we say, if 1960 is an in-between year, a year that will be looke back on as we today look back on 1940 or 1937, what will the demand be th

Basically we use two related methods of making that type of forecast. In the first place, we try to set up a concept of the economic climate. make certain assumptions as to what conditions will be. Having made thos broad assumptions, we do two things. In the first place, we try to deter under those conditions what such factors as population, employment, gross national product, and the Federal Reserve Board index would be. And, we try to determine for our consuming industries what the level of their activity might be. By building up two ways, first by comparing the steel relationship with the over-all measurement of the economy, and then on th other hand determining how much steel will be used in each of the consumi industries, we are able to come up with a long-range forecast for a normal year.

Question: You made no mention in your talk of foreign export busines It seems to me after a little reflection that the factors of the economy and political goings on in the other countries would be more of a factor than could be measured by your sales forecasting system ordinarily. In other words, the forecasts by your representatives of your firm in other countries which would give them to you, particularly if they were not you own people but foreign firms, would be colored perhaps by the shorter rar You must have some way of assessing that. Would you enlarge on that?

MR. ESTES: As I mentioned, we have a number of subsidiary companies. One of these is our Export Company. That company is responsible for selling our products in export. Therefore that particular company will prepare the export portion of the forecast. In that company we obviously have people who are particularly informed on conditions in each foreign country. We have a man at the head of that company who probably knows as much about the steel export field as anybody in the United States. We rely very heavily on the judgment of the export people. By and large the export figure is just added on; and great authority is given to the people who make that particular portion of the forecast.

QUESTION: I wonder if you would care to remark on how successful your forecasts have been.

MR. ESTES: That is a good point. I think in many companies there is a tendency to make a forecast and be guided by it and never compare it with what actually happens. I think it is very important in any company and any operation that we compare the actual course of events with the forecast, basically for the purpose of checking the forecast and seeing where we made our mistakes and trying to determine why we made them.

In our company, I would say that our experience is that our total forecasts are pretty good. However, when you go back and look at individual products, you often find considerable variation.

QUESTION: What weight, if any, in your forecasting do you give to consideration of the individual item characteristics? I am thinking principally of characteristics, say, for a finished item, which might be durability, producibility, complexity of mechanism, need for repair, perhaps materials that go into it that might be scarce, and things of that sort.

MR. ESTES: I don't think I understand exactly what you mean.

QUESTION: Suppose you are forecasting a new item. If you have one where you have a background, where it has been a going item, like steel sheet, it may be simple. But take an example of a product like a flatiron of a new type. How do you predict how that particular new type is going to take hold? In that prediction what weight, if any, do you give to the various characteristics of the item itself?

MR. ESTES: You see, the big part of our forecasting involves the base material. I wouldn't try to forecast the demand for a new flatiron, because we would go to all the flatiron manufacturers and discuss with them the outlets for that iron generally. If they are a new type, we would ask, "Does that change the type of steel you are going to use? Is the product such that everybody is going to throw their old flatirons in the rubbish and get the new one, so as to bring up the total demand?"

QUESTION: Let us take nails as an example.

MR. ESTES: Suppose a new type of nail has been developed. Obviously you examine its characteristics for that particular use and the possibilit of its replacing other types of nails or some other product in that use. It is a little difficult to answer your question very specifically.

COLONEL MICKELSEN: May I give a hint as to what he is driving at. This question was a little below the belt, because he is talking in terms of another problem that we are trying to work out and using terminology with which you are not familiar. I think that the question can be tied to the remark that you made in your talk where you said that the procedure for forecasting is tailored-made for its purpose in terms of the particula item. I believe that is the particular thing he is trying to bring out.

QUESTION: That is right. I caught those words when you said them. I was thinking particularly of a case where you are forecasting for a clas of civilian goods. One of our committees has to do with civilian goods. What consideration is given to the characteristics of the particular item in your forecast of how many you are going to turn out and what you think the demand is going to be? In other words, you are in a way guessing your requirements the same as we guess requirements in the military service. I was wondering if you take the individual item characteristics into conside tion, and if so, how you weave it in, how you get your facts.

MR. ESTES: I would say that we get the facts. We go and ask the fel who knows. If it is the automobile industry, we go out and talk to its representatives in order to ascertain the facts.

QUESTION: Isn't your forecasting department in a pretty favorable position? You forecast, say, that the demand will be for 90 million tons of steel, so you buy probably 50 million tons of scrap and 50 million tons of ore and come out even. I would say your department couldn't miss very far, because all the steel you buy is all that you can sell. You might possibly go under it. How about that?

MR. ESTES: I tried to make the point that today in the steel indust over-all forecasting is relatively easy. You need only determine what yo capacity is and consider the possibility of getting the various raw mater ore, scrap, satisfactory coal, and so forth. So there is nothing to it.

You should recognize, however, that as you go into the individual products, you are making decisions about how much you will produce of eac product, because there aren't enough ingots to keep every single steel facility at every level going. There is more finishing capacity than there is ingot capacity.

QUESTION: In taking the analytical approach to your forecast you actually make an industry study. Is there any possible way that you can see that that basic information can be made available to the Munitions Board and to the National Security Resources Board so they can get away from crystal-ball gazing and utilize your information in their forecasting?

MR. ESTES: I don't know. I suspect that that problem is probably beyond the realm of you and me. But it would seem to me, and probably to most of you, that at the proper level it should be possible for the Armed Services and industry to get together on problems of that size.

GENERAL HOLMAN: Mr. Estes, the College, both the faculty and the students, is depply indebted to you for this very practical and to us very useful discussion. I think the thing I will probably remember most of all in your talk will be that when you want information, you go out and find the man who knows most about it. That is a pretty hard thing to do sometimes. I think the key point there is that it is up to the people who want the information to know where to find the man who knows most about it. We are very appreciative. Thank you very much.

(22 November 1948--450)S./mmg