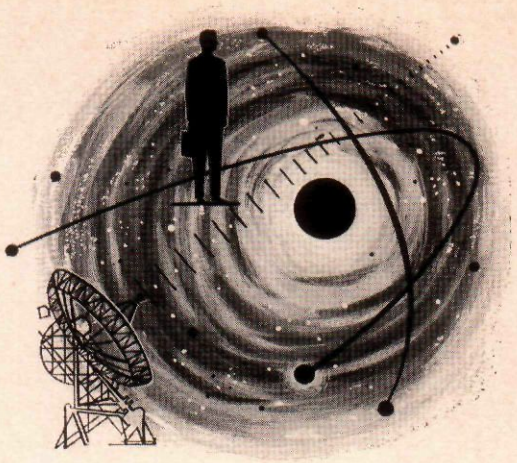

Proposal for Better Business Forecasting

There is a great opportunity to improve business planning — and improve it considerably. No matter how well a company schedules its internal operations, its plans collapse if its sales forecasts are seriously in error. And, of course, as business executives know all too well, sales forecasts do frequently fail because of economic uncertainties. This problem is not insuperable, believes Wassily W. Leontief. If business and government were to collaborate in developing up-to-date input-output tables for the economy, a real breakthrough could be made in sales forecasting. The author is Henry Lee Professor of Economics at Harvard University.

• The Editors

Planning is the organized application of systematic reasoning to the solution of specific practical problems. An alternative to planning is the trial-and-error method. Long before Charles Darwin described this alternative as "natural selection," Adam Smith showed it to be the prime mover of economic progress.

Far from being incompatible or mutually exclusive, the automatic mechanism of free competition and the principle of deliberate action guided by rational decision both play their different but equally important parts in the operation of our economic system — the system responsible for the past rapid growth and still unequaled performance of the North American, Western European, and, more recently, Japanese economies.

The issue that confronts top management is not that of how to choose between unrestricted competition and all-pervasive planning, but rather of how to choose an effective combination of the two. Despite what the professional debaters on both sides would have us believe, it is not an eternal conflict between two incompatible philosophical principles which we face today, but rather a practical question of efficient working arrangements. It is a question which the business executive should not ask — and certainly not answer — without specifying the "where" and the "when."

Internal Plans — Success

The principal seat of rational decision making in our part of the

world is the individual private enterprise. The wave of economic progress which still carries us along began to swell more than three hundred years ago when, instead of growing, making, transporting, and trading in the old, customary ways of their fathers and grandfathers, the first modern entrepreneurs dared to do things that had not been done before. Some dared and failed, but many tried and succeeded, and their success resulted in a cumulative process of economic growth.

In military contest we praise and reward the victor, but we also honor those who fall on the field of battle. Why do we not erect memorials to merchants whose cargoes sank on their way to the Indies, and to a mill owner who went into receivership because he invested in new, as yet untried, types of looms? Why do we not inscribe on a cenotaph the name of a banker who went bankrupt because a new kind of revolving credit which he tried to introduce did not turn around fast enough?

Businessmen can consider a trial-and-error procedure successful whenever, over a reasonably long run of trials, the combined gains exceed by a healthy margin the total losses. But is it not still better to eliminate, or at least reduce, the losses while keeping all the gains? An architect does this when he computes the stresses for each one of several alternative designs before he builds a bridge, and a manufacturer does it when he prepares detailed cost estimates for a new product and compares them with the estimate of its prospective market price before putting it into actual production.

The bigger the amount of capital to be invested, the larger the stakes, and the greater the incentive to plan before management acts. This explains why, with the growth of the economy and with the increasing complexity and widening scope of modern technology, private enterprise tends to rely, in the solution of its internal problems, less and less on "trial and error" procedures, and more and more on carefully conceived and meticulously elaborated planning. While only 15 or 20 years ago "operations analysis" and planning were used mainly in purely physical, engineering operations, today in many corporations most of the routine and even some of the central managerial decisions are arrived at and executed according to a carefully conceived blueprint.

For business leaders I hardly need explain in detail how this planning is done. It suffices to say that a well-designed and flexible analytical system provisioned by a steady flow of factual information and supported by an efficient processing setup will usually do the job. In the central offices of the large and medium-size companies, not only here but in Europe, too, internal corporate planning is displacing traditional trial-and-error procedures as fast as mechanical conveyers replaced manual materials handling 30 years ago.

External Plans — Failure

But what about sales? The best possible internal operations plans can come to naught when confronted with uncontrollable external uncertainties of the market. An individual business enterprise, however big, is only a small component part of a much larger economic system — a system that comprises thousands of other businesses operating in the same and other industries, as well as all consumer units and, last but not least, all public enterprises and governmental households. Foreign trade, moreover, extends the interdependencies of the economic system beyond the boundaries of a single country.

How does this system operate? How does it solve its problems? It solves them by a trial-and-error method. A competitive economy can be viewed as a gigantic, natural computing machine which tirelessly grinds out solutions to an unending stream of quantitative problems automatically fed into it. It allocates labor, capital, and natural resources among all the different branches of production. It determines automatically which industry should expand and which contract its output, which corporation should invest and which go out of business.

Like any other trial-and-error process, the competitive mechanism brings about a proper adjustment between demand and sup-

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Author's note: This article is an expanded version of an address delivered at the Annual General Meeting of the Canadian Manufacturers' Association in June 1963.

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ply by way of successive approximations. As in target shooting, the bull's eye is supposed to be hit after a series of gradually diminishing misses, each of which improves the aim. Under the fast-changing conditions of the modern world, however, the target at which a modern business is shooting behaves more often like a flying pigeon, or rather a bat chasing insects at sunset, than a sitting duck.

In quest of better estimates of future markets for their products — estimates required for elaboration of internal production schedules and investment plans — American corporations are spending millions of dollars on sales forecasts. But these forecasts are conspicuous, alas, more by their failures than by their successes. As market research is conceived and organized at the present time, it cannot even come to grips with its real task. For instance:

- The steelmakers try to estimate sales of heavy plate for the next year or next five years by assessing the volume of orders that will be received by the shipyards.
- The shipbuilders are, at the same time, trying to estimate the future demand for oil so as to be able to determine the number of additional orders they might receive the next year for tankers.
- The market analysts in the oil industry are, in their turn, busily engaged in predicting the output levels of all the principal fuel-consuming branches of the economy in order to determine the possible demand for petroleum products.

Simultaneously, but separately from each other, big, small, and medium-size businesses in all sectors of the national economy are engaged in this frustrating and costly guessing game. If all these forecasts were brought together, it is most unlikely that they would prove to be compatible with each other. This means, of course, that many of them turn out to be very wrong. It is not surprising that internal company production plans and investment decisions based on

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such disconnected forecasts may prove to be either entirely abortive or much less profitable than originally expected. The greater the anticipated change is, the larger the possible miscalculation will be — and the greater the uncertainty. Uncertainty in economic affairs is the worst enemy of progress.

Risk Reduction

One method of mitigating risk is insurance. In the case of the general kind of uncertainty just described, the government, with its ability to create demand — that is, to print money — is the obvious underwriter. While insurance of this kind is helpful, and under certain conditions even indispensable, in the long run its economic and social costs might prove to be quite high.

The other solution is to eliminate, or at least to reduce, the risk itself. This is the approach which is in businessmen's interest. It calls for market research efforts which are coordinated, designed to get consistent sales forecasts, and combined with short- and long-run output projections for all branches of manufacturing, mining, transportation, and the service industries. Such an approach is the only means by which the traffic between the different sectors of a growing economy can be adjusted to the requirements of new technologies and of modern enterprise.

The scope and complexity of the fact-finding and analytical task involved in such an approach are admittedly very great. The new methods of economic and statistical inquiry developed over the period of the last 20 years are fully capable, however, of solving the technical problems involved in such a project. In fact, they have already been successfully applied in such Western European countries as Holland, Italy, and France. In Great Britain, after two years of preparatory work, the National Economic Development Council is about to follow suit. Japan, the only non-Communist country to equal and even to better Soviet Russia's rate of economic growth, has seen close cooperation between government and business in its development and application of so-called input-output analysis from 1956 on.

In the United States the trial-and-error method was so successful for so long a time that with some of us it came to be an article of faith. Not until the economic slowdown of the last decade were many serious questions raised. At present, budgetary fiscal policies — that is, the insurance approach, with the government playing the role of a general underwriter — represent the main planning tool. But they need not be the only one, or the most important one. Systematic statistical analyses which show us how we can advance along another path have been undertaken on a large scale, and they can be carried much further.

Input-Output Tables

The first officially compiled input-output table of the U.S. economy was released 15 years ago; it was for the year 1947. Soon afterwards, all work along these lines was practically discontinued until 1962. Now the Department of Commerce, in cooperation with the Departments of Agriculture, Labor, and several others, has completed — and is about to publish — an input-output table of the U.S. economy for the census year 1958.[1] Presently this table will be updated to 1961 and 1963.

So far as technical capabilities are concerned, this work should put us in a position which France reached some 15 years ago, and somewhat behind West Germany, where the Institut für Wirtschaftsforschung in Munich has just released an excellent set of input-output tables for the year 1961 and announced that from now on such compilations will be released annually.

Without entering into technical details, it suffices to say that such input-output tables show the flows of goods and services among all the different sectors of a national economy,[2] but that a broad tabulation of economic activity is not enough for business purposes.

To supply a reliable statistical base for coordinated market analysis on the part of business firms, an input-output table must be much more detailed. It should describe the actual state of the particular national economy in the base year — that is, the year from which the forward-demand projections are to be made — in terms of, say, 150, 200, or even as many as 300 or 400 separate industries or sectors. The conventional division of the economy into agriculture, mining, industry, and services might suffice for purposes of an over-all aggregative description, but any factual conclusions obtained on that basis are too general to be of much use in answering specific questions asked by market analysts in any one particular industry.

Management needs much additional information, particularly on the concrete details of impending technological changes, investment plans, and other developments in various industries. This information should be supplied in the course of the cooperative effort (which I will discuss presently) by private and public corporations and obtained in consultation with technical experts from professional and industrial associations.

Practical experience has shown, incidentally, that an input-output table can be understood and interpreted as readily as, say, a railroad timetable, once the initial apprehension of a "technical approach" has been allayed. What businessman would find it difficult to understand a table showing in what amounts the commodities or services in the production or distribution of which he takes part are being actually absorbed by all the other sectors of the U.S. economy; and — looking at the table from the other side — what kinds of goods and services, and in what

[1] Available, or soon to be available, from the Office of Business Economics, Department of Commerce, Washington, D. C.

[2] For a nontechnical description of input-output tables and their use in the solution of various practical economic problems, see my article, "Input-Output Economics," *Scientific American*, October 1951, p. 15.

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amounts, his own industry received from each one of these other sectors?

For a specific illustration, take the case of a welding equipment manufacturer:

> A glance at an input-output table of the United States economy would show this manufacturer how much welding equipment was purchased, in that particular year, by each one of the many different industries using welding equipment. A comparison with the corresponding figures for other years would not only reveal upward or downward trends in each group of purchases. It also could indicate to him the causes of such changes. Thus, a particular group of customers might have expanded or contracted its purchases because it had expanded or contracted its own level of output; on the other hand, changing technology might have resulted in a use of more or less welding equipment and supplies per unit of output in a particular consuming industry.
>
> But what is still more important, in turning to the comprehensive and, at the same time, detailed over-all projections described above — that is, in examining the projected input-output table for, say, the year 1968 — the welding equipment manufacturer could arrive at a consistent and, because of that, reasonably reliable sales forecast for his own product. Anticipation of special conditions, such as a cut in military spending, could in this case be actually taken into account. Computations of the kind that have already been performed — but which would become much more dependable if the program of research described above were carried out — would tell him, for example, how a reduction of defense expenditures by, say, 10% or 20%, combined with a compensating expansion of civilian demand, could be expected to affect the demand for his welding equipment and supplies in the year or years ahead.

Developing the Dialogue

The analytical methods that are used to transform raw economic data into the final product of specific market forecasts and other types of economic projections are well known to economist-technicians (whom I would like to distinguish from political economists or economist-politicians). The large-scale data-processing operation, which only a few years ago would have made the realization of the entire project unwieldy, if not impossible, can be performed today rapidly and cheaply.

But an important caveat is needed here. By their very nature, consistent projections of the demand for goods and services produced and consumed in all the many different, but mutually interdependent, sectors of the national economy cannot be run off as so many cars on an assembly line. Despite the use of electronic computers, the entire operation should first be visualized and organized like a construction job; all the parts have to be fitted skillfully to each other, although no two of them are alike.

During this process, the potential users should be consulted and given an opportunity to stand by and, where appropriate, take part. If the project directors intend the work to be something more than a large-scale academic exercise, the professional staff engaged in the task must maintain constant contact, or rather a running dialogue, with the knowledgeable members of the representative groups in all the different sectors of the economy. Consider the advantages:

- Such an exchange would enable the experts with practical experience in each field to pass their experience on to economists and statisticians engaged in preparing the actual market forecasts.
- The workings of an unfamiliar tool can be best understood by the corporate planners who would use it if they are given all possible opportunity to watch step-by-step the process of its actual construction.

As time goes on and experience is accumulated, such a dialogue can provide a solid factual basis for informed and detailed consideration of many practical issues of national economic policy. Technical change and its effect on productivity and unemployment; on private investment, public investment, and economic growth; on the inflow and outflow of capital and the structure of foreign trade — all these and many other aspects of economic growth can be understood much better if presented within a unifying framework of a detailed and, at the same time, comprehensive economic projection.

Tracing Indirect Effects

It is a natural habit of advocates of various economic policies to concentrate their and our attention on the principal effects (usually recognized by all as beneficial) of their programs and to neglect the less conspicuous, indirect effects which, on close investigation, often turn out to be less desirable. Road-building subsidies, for example, encourage driving, consumption of gasoline, and employment in the automobile and construction industries, but at the same time they tend to reduce the utilization of railroads and cause unemployment among railroad employees.

To business executives, needless to say, these indirect effects may be crucial. The industries affected may be their own. Input-output analysis therefore assumes added value. By its very nature, the comprehensive type of inter-industrial analysis just described is bound to bring into full relief the less as well as the more obvious parts of the entire picture without camouflaging any economic blemishes that it may contain and that partisan supporters may have overlooked.

Difficulties in appraising the probable effects of changes in the level of public expenditures, of a reduction or an increase in tariffs, and of other government actions and proposals affecting, to a larger or to a lesser extent, each sector of the national economy inhibit private business not less — and sometimes even more — than risks associated with the normal functioning of the trial-and-error mechanism of our competitive system. If modern analytical techniques can help management to trace through the direct and indirect repercussions of specific policies and changes, the result should be a stimulus to business initiative.

Organizational Questions

So far as the organizational setup is concerned, the experience of other countries which entered the field before us and our own tradition of carrying on activities serving broad public interests suggest

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that a combination of governmental and private operations might prove to be most appropriate in drawing up input-output programs.

The collection of basic statistical data can obviously be handled most expeditiously by the government. If given the necessary direction and budgetary support, the Bureau of the Census could — at a fraction of the cost of a single, routine moon probe — compile detailed input-output tables of the U.S. economy once every five years, and compile less detailed tables on an annual or biannual basis. With modern data-processing facilities, the lag between collection and publication of the final figures should not exceed 12 months and could be even shorter.

The analytical work might be performed by an autonomous, nonprofit research organization financed partly from private funds and partly by the government on a contractual basis. Elaboration of regional projections would naturally be in the hands of the interested state governments, while some of the details regarding industry sectors could well be handled by the appropriate trade and industrial organizations.

Stimulating Progress

Controversies and conflicts on questions of economic policy must and will, of course, go on. Nothing could be more futile and self-defeating than to pretend that factual analysis can supersede the traditional process of political decisions on economic matters. But it can smooth the path and thus increase the rate and reduce the costs of economic progress.

The type of planning whose anatomy I have described is not the monstrous beast with clawed paws and coiled tail that some businessmen may have expected; neither is it a Trojan Horse. I would compare it, rather, to a young trotter that shows good time in preliminary workouts. With some fast entries competing with us under other colors, it might not be a bad idea to have it run the next race for our stable.

— *Wassily W. Leontief*

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"Despite the potential turndown by SBA, there is a source close to SBA which should receive Trent's attention — the small business investment company. SBIC's are privately owned and operated investment companies licensed by SBA to provide long-term financing (minimum of five years) and equity capital to established or newly formed small businesses. While the SBA's Investment Division licenses, regulates, and helps finance SBIC's, our part in their day-to-day operations is minimal. All transactions with small businesses are independently negotiated, with the managements of the individual SBIC's subject only to over-all rules laid down by our regulations.

"While I am not sure a man with Trent's limited experience would be enthusiastically received by many SBIC's, they might provide financing in such a case. If he selected carefully, he also might find an SBIC which would serve as a valuable partner to him. A number of SBIC's are experienced in developments and shopping centers, and such a firm could provide management know-how, as well as financial stability, to Trent's operation.

"Trent should expect to give up a minority equity position in return for SBIC financing, but he would be assured use of the added funds for at least five years."

Trent's Future

What is the outlook for Darrell Trent? Our commentators see some problems for him, and, at the same time, reasons for hope. Dealing with the question of where Trent goes from here, Mr. Swensrud analyzes:

"Despite my critical view of some of Trent's past moves, his position is probably a good deal better than it might have been had he decided to apply his entrepreneurial talents in some other field. He has an asset in the form of cleared and consolidated land which, we are told, has actually increased in value. Rarely in venture projects is the entrepreneur so well situated at the expiration of his initial capital, when he finds he must readjust his thinking on the availability and sources of further financing.

"Assuming Trent is able financially to sustain his properties for another several months (indications are that he does have some remaining capital), a number of reasonable and potentially fruitful courses of action are available to him. Possible