

File 38

5/11/70

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R. & D.'S ROLE IN THE PLANNING PROCESS

(Dr. Green will be at Marlow to discuss any questions arising out of this paper)

Scientific research in industry is almost entirely concerned with the future and if it does not contribute to change and control of the future, it should not be done. Equally, to plan for the future without an appreciation of the likely technological changes is likely to be unfruitful. Technological forecasting techniques are now being developed which offer exciting possibilities for government and industry to guide and control the future much more precisely than has been possible hitherto. Technological forecasting provides a systematic method of outlining possible future situations and attaching probabilities to each through careful study of possible technological developments and their social, economic and technological repercussions. So far T.F. has not been used to any extent in B-A.T. but it could contribute effectively to Corporate Planning at least at the higher levels.

There are three levels of corporate planning:-

1. Planning for policy making - defining functional objectives as a basis for policies.
2. Planning for strategic decision making - formation of alternative options to achieve specific goals.
3. Planning for tactical decision making - operational planning.

So far B-A.T. has been concerned largely with operational planning where forecasting is largely extrapolation from past experience - the model is deterministic. Some form of T.F. has been operated at this level by most companies and extrapolative techniques have been widely used in both technological and market forecasting. To move from this deterministic stage and extend corporate planning to a non-deterministic model is the main challenge today.

There are two broad approaches to technological forecasting known as "exploratory" and "normative". Exploratory forecasting starts from current knowledge in science and technology and explores future feasibilities and so on. Normative forecasting starts with the delineation of future goals and translates a desired future into technological and development missions. A complete technological forecasting exercise constitutes a trial and error process between exploratory and normative forecasts, i.e. a dialogue between functional target setting within total environment considerations and the potentialities and limitations of current science and technology. In this way,

Original Limited S.F.C. by F.H. 5/11/70

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technological forecasting stimulates basic research and provides broad guidelines for it. For example, a normative forecast that in 25 years there will be a self-administered subconsciously controlled socially acceptable administration technique for drugs without side effects to replace cigarette smoking would demand current research for stimulant-tranquillisers alternative to nicotine and psychological research in the behavioural field covering social acceptance and perceived subjective reaction. Before undertaking such an expensive exercise, exploratory forecasting would be desirable from the current position in the field of behavioural psychology. Using B-A.T.'s present management techniques, an entry into this part of life-science research would be based only on the intuitive judgment of the research managers. Perhaps this is right for the first £0.1 million expenditure but before progressing too far, such proposals might well be subjected to more rigorous examination using other techniques.

Extrapolation techniques may be quite simple. For example, fitting a Gompertz curve to the data for plain cigarettes in the U.K. forecasts that sales of plain cigarettes will fall below 5,000 million p.a. by 1980. But a great deal of apparently sophisticated technique may be extrapolative. In the so-called "Delphi" technique opinions from experts are systematically examined - one such study for the chemical industry has indicated "safe" cigarettes by 1973. Another technique is Morphological Analysis where the functions and sub-functions of an object are examined and new combinations of sub-functions are thrown up, indicating new objects which could fulfil desired functions. B-A.T. R. & D. are currently undertaking a morphological analysis of the cigarette function. Another approach known as Scenario Writing is an attempt to identify future environments which could result from currently predictable trends. Yet another useful technique is Input-output analysis. This is a trial and error calculation of the effect of changes on a mathematical model of an economy. Battelle, Geneva have a model of every economy in the European Economic Community and for the U.K. and U.S.A.

T.F. has an increasing role to play - particularly as an input into Corporate Planning. Logically Companies in the future will divide into two main organisational branches - Operations and Development (i.e. Future). Future Department will contain Corporate R. & D., Corporate Planning and later T.F. In a completely Marketing orientated business, a Marketing Department would be redundant and its feed into Corporate Planning would be replaced by T.F. As an input into Corporate Planning, R. & D. will also become redundant and be replaced by T.F.

For the present, however, a Corporate plan without some input from R. & D. would be unnecessarily limited. For our present purpose, the simplest way to summarise the likely input from R. & D. is in a series of postulates with respect to cigarette smoking and cigarettes.

1. The cigarette industry is now irreversibly connected with

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health. Cigarettes will be connected increasingly with a wide range of diseases.

2. Cigarette smoking will decrease in general social acceptability.
3. There will be increasing involvement with all governmental agencies concerned with health at all levels.

There will be an extension of the specification of cigarettes by outside agencies. It is likely that League Tables will be expanded quite soon (two years) to include easily measured gas phase constituents, e.g. acids, cyanides and possibly carbon monoxide.

4. Cigarette companies will become involved in research in the field of life sciences in the broadest sense from cellular biochemistry to behavioural psychology.
5. Cigarettes will be aimed at more specific market segments and there will be an increasing contribution from behavioural psychology in the industry.
6. Generally tobacco products will be controlled as foods and later more strictly than foods. There will be increasing concern with the microbiological flora and trace materials on tobacco products. New materials and increased processing generally will contribute to the solution of some of these problems.
7. In general the cigarettes current today will be increasingly replaced by a number of modified products and it is unlikely that any one design will completely dominate. Similarly the general tailing off in total cigarette consumption will present enormous opportunity for entirely new products or competitive habits.
8. Reconstituted tobacco will be used increasingly. Probably 30% of all cigarette filler will be reconstituted within ten years. Tobacco cultural practices will be changed and some tobacco will be mechanically harvested on the stalk. Non-tobacco base materials will be incorporated in cigarettes in increasing proportions from about 1975.
9. Tobacco will remain the cheapest source of nicotine at least until 1990.
10. The predominance of cellulose acetate filters will end within (say) 7 years. There is no technical reason why a textile

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surplus material should continue to provide the best filter. Paper filters will become freed from some Patents in 1971 and new combinations of paper, polypropylene, expanded plastics, etc. are certain to emerge. In turn, new chemical filters will be used with these new materials and the filter design will be freed from the restriction of acetate and current machinery. However, there will be no dominating breakthrough. The acetate filter will be increasingly replaced over the next ten years by a series of new filters.

11. There will be outside pressures to market cigarettes of novel construction and content, endorsed to some extent on health grounds by outside agencies. Such innovations will be made by some cigarette companies but also by some at present outside the industry.
12. The production of cigarettes will increase in technical complexity. The necessity for increasing knowledge and control over the physical and chemical characteristics of smoke will lead the industry into the field of the process industries. The discipline dominating the production resources in the future increasingly will be chemical engineering.
13. The usual cigarette making unit will become bigger, faster and more complex. But smaller machines will still be required for some of the new products.
14. Most cigarettes will be filled with mixtures of relatively few processed uniform blend constituents.
15. The conflict between big investment in high speed machines and increasing variation on the product theme will demand longer storage periods for cigarettes or, at least, cigarette rods. R. & D. will provide new processes to meet this need. Presumably these will be concerned with enzyme deactivation and will be High Temperature-Short Time or irradiation processes. Alternative or parallel developments in packaging will provide increased shelf-life.
16. The proportion of expenditure and allocation of resources on R. & D. in B-A.T. will double between 1970 and 1978.

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