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Putting R&D on a Profit-Making Basis

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R&D, that vague and amorphous entity, can be brought into businesslike focus if a few simple accounting procedures are followed. Then, the company can see which expenditures are justified—

PUTTING R&D ON A PROFIT-MAKING BASIS

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RESEARCH AND DEVELOPMENT is an umbrella-like term that shelters a variety of activities. When management sets its mind to analyzing the costs and evaluating the activities of its R&D function it often finds itself dealing less with facts than with mysteries.

The umbrella need not become a shroud, however. Management can and should separate the functions of its R&D department into those activities that lend themselves to measurement and those others, such as pure and fundamental research, that do not. Such an analysis will immediately unveil those R&D activities that relate to new-product development and old-product improvement. These activities can be subjected to the same kind of control that management expects the rest of a business to be subject to.

A company must invest a certain amount of money in R&D activities in order to develop a new product. *Can this R&D investment be justified when related to the product's expected life and rate of return?* This question can be answered not merely with the benefit of hindsight, so that management will know better in the future; it can be answered before the investment is made.

A basis for comparison

The method proposed here for answering this question, like most management techniques, may not work in every company or in every situation. But in situations where it is applicable, dollar-saving decisions will become possible with regard to the product development and improvement activities of the R&D department.

Let us assume that your company does not have an R&D department. For product development activities you contract with Neo-onics, that new company up the highway, to do your developmental work for you.

Neo-onics, as an outside company, will charge your company for its services. It seeks a 20 per cent return on the capital invested in its equipment and facilities, and this will be built into its billings to you. Like your own company, Neo-onics hopes to operate at a profit.

When you tell the people at Neo-onics that you want a bloopet developed, they will make a price quotation, taking into considera- the manpower and other costs involved and their 20 per cent expected return. You may accept their proposal or not accept it, depending on how high their cost estimate is as it relates to your

Exhibit 1

COMPUTATION OF ESTIMATED CASH FLOW ON NEW-PRODUCT EXPENDITURES

Product Name _____ Product No. _____ Division _____

	FIRST YEAR		SECOND YEAR		THIRD YEAR	
	Estimate	Actual	Estimate	Actual	Estimate	Actual
Gross Sales						
Standard Mfg. Cost of Sales						
Standard Gross Profit Contribution						
% Standard Gross Profit of Sales						
Standard Commercial Costs:						
Selling						
Engineering						
Administrative						
Financial (interest)						
Total Standard Commercial Costs						
% Commercial Costs of Sales						
Product Profit Before Taxes						
Estimated Taxes on Profit						
Product Profit After Taxes						
Add: Depreciation Included Above						
Other Non Cash Charges to Operations						
Annual Cash Flow						
Average Annual Cash Flow						

expectations – not your preconception of what the development cost might be but your expectations about bloopets. If the anticipated life span of the product and the cash flow that the product is expected to generate during its lifetime justify the cost of developing the product at the price quoted by Neo-onics, you will probably accept their proposal.

If the people at Neo-onics should successfully develop the bloopet for you at a cost well under their quoted price, you may never know the difference. If they reach the quoted limit and are not yet successful in developing the bloopet, the contract may call for their coming back to you for authorization to continue, and you will pay accordingly. Sometimes (when they think it prudent) they may go on to complete the bloopet development and absorb the loss if they exceeded the quoted price limit.

You would expect Neo-onics to keep you informed through periodic progress reports, and you might be paying them monthly as the job progressed.

Meanwhile, back in real life you have already invested in the facilities, equipment, and staff of your own R&D department, and you are not farming out your product development work. There is no reason, however, why your R&D department cannot operate as a profit center, making quotations on product development requests and building into those quotes the same 20 per cent return on investment that an outside company like Neo-onics would.

Estimating return on investment

With your R&D department acting as though it were an outside contractor, one of your product division managers asks it to prepare a quotation for developing a certain new product. Your division manager must then be able to evaluate the R&D department's quotation as it relates to the cash flow expected from the new product.

Exhibit 1, shown above, "Computation of Estimated Cash Flow on New-Product Expenditures," is an aid for the division manager's evaluation of the cash flow to be generated by the new product. Like most companies today, you have an established policy on "payout" for investments in new-product development. In line with this policy, and by application of the cash flow technique, the information in Exhibit 1 can be used to establish the approximate amount of money that can be spent to do the reseach and development work and to acquire the production tooling and equipment necessary to produce the proposed product at the assumed cost.

To do this, a planned profit and loss statement is prepared for each

of the three years following the product's introduction into the market. The net earnings for each year are adjusted to the cash flow by adding the amount of depreciation and other noncash costs or expenses included in the net earnings figure. The corporate payout policy for capital investments will determine the period of time to be used for the determination of total cash flow (i.e., if payout is 24 months, the cash flow amounts for the first two years should be totaled).

Organization for control

If the nature of the R&D project being considered is old-product improvement—e.g., to reduce costs or to meet higher quality and performance requirements — the total amount that can be expended will be determined by developing a cash flow forecast for each of three years for both the existing product and the improved product, giving full recognition to both the reduced costs (or other advantages) of the improved product and the sales impact on the current product if the improvement effort were not undertaken.

Companies usually set limits for their R&D expenditures which are consistent with expenditure limits for such items as advertising or capital equipment. Where the amount of the total expenditure for R&D work and tooling is not in excess of an amount established by corporate policy, the product division manager should have authority to negotiate directly with the manager of the R&D department.

In order to avoid duplication of R&D effort and duplicate divisional expenditures for similar projects, the manager of R&D should be responsible for communicating to other affected product division managers any requests for similar projects. Sometimes product division managers can achieve their purposes through a combined R&D effort and remain within the policy limits through such cooperation. Some limit must be set, however, to division managers' authority to assure maximum corporate utilization and guidance of the R&D function.

A new-product planning committee can offer overall guidance and direction in major new-product planning. Meeting as required, its duties would include originating, discussing, approving, and following up on new-product plans. The committee should be headed by the president or the top marketing executive and should generally include executives from sales, manufacturing, engineering, finance, and R&D.

Proposals for new or redesigned products involving expenditures in excess of corporate policy limits for development and tooling should be submitted to the new-product planning committee for review. The proposed product can thus be evaluated with the benefit of the combined knowledge and experience of the committee members, who can raise questions or make suggestions about the proposal that may enhance its chances of success, or who can delay authorization until questionable assumptions or incomplete data are investigated.

While the committee has the authority to approve or disapprove

To evaluate the cash flow expected after the introduction of a new product, the division manager should see that a planned profit and loss statement is prepared for each of the three years following the product's introduction to the market...

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an expenditure of funds in excess of policy limits, its approval to proceed does not absolve the product division manager of his responsibility to accomplish the results shown on the cash flow estimates that influenced the committee's decision. Profit responsibility for the proposed product rests entirely with the product sales division.

Proposals that receive the approval of the new-product planning committee are entered on the committee's calendar for follow-up and submitted to the R&D manager for an estimate of development costs. The R&D department prepares this estimate and submits it to the sales division manager. This communication should be direct, not waiting for the next meeting of the new-product planning committee.

In the light of the cash flow projection, the product division manager should evaluate the R&D cost estimate. If the estimated cost is less than the payout-period cash flow, the product division manager should proceed to have the tool designers and engineers prepare a cost estimate for the tools and equipment necessary to manufacture the product, within the cost levels already estimated, for each of the three years shown in the computation of estimated cash flow on new-product expenditures (Exhibit 1).

When the R&D estimate exceeds the cash flow generation for the payout period, the product division manager should study the assumptions and forecasts included in his estimated cash flow very carefully. If the cash flow does not provide the necessary funds to support the estimated R&D expense, there is no value in proceeding to have an estimate made of the tooling costs —*unless* there is reason to believe that the product that has been designed or developed by R&D can be manufactured at a lower cost than planned in the cash flow estimate, thus offering greater profit and cash flow generation than originally forecast.

After tooling and manufacturing cost estimates have been studied, the product division manager is in a position to make his final evaluation of the investment potential of his new-product proposal.

Exhibit 2, facing page, "Computation of Estimated Return on New-Product Development Expenditures," illustrates the type of analysis that can assist the product division manager in this final evaluation. On this form he summarizes the estimates received from R&D and engineering to arrive at a total project cost to develop the product and manufacture it. The total project cost, divided by the average annual cash flow, results in the estimated payout period for the project.

Using a cumulative discount factors table (Exhibit 3 on page 26),* the product division manager can determine the rate of return, based on a realistic estimate of product life, and the payout period. This is done by reading the column "Periods to Be Paid" to find the number of years used as the estimated life of the product, then following that column across the table to the right until the number is reached that most closely approximates the payout years. When the payout period is located, the percentage at the top of that column is the approximate annual rate of return.

The product division manager presents his new-product proposal (including Exhibits 1 and 2) to the new-product planning committee for final evaluation. All parties involved in the program are notified of the committee's decision, and approved projects are referred to the manager of R&D for scheduling into the department's workload.

*Also commonly known as a "present value" table. The simple one-page summary table shown is from Robert N. Anthony, *Management Accounting: Text and Cases* (Richard D. Irwin, Inc., Homewood, Ill., 1960). A more complete table, with 1 per cent increments, is to be found in J. Bracken and C. J. Christiansen, *Tables for Use in Analyzing Business Decisions* (Richard D. Irwin, Inc., Homewood, Ill., 1965).

Accounting approach

With R&D operating as a profit center, it should use a project control type of accounting system with regular reporting of accumulated costs to the manager of R&D, the chairman of the new-product planning committee, and the product division managers who have projects in process in the R&D department.

Cost accumulation and billing

To facilitate the measurement of return on investment in new-product development at the level of the product division, and also to estimate the return on investment for the R&D facility, the following accounting techniques are suggested:

The services of the R&D department should be quoted to the product division on the basis of a standard charge rate per hour of R&D labor planned for the project, plus material costs. This firm quote becomes the billing price if accepted by the product division.

A standard charge rate should be established at the beginning of each fiscal year. It should be based on the planned budget for the subsequent year plus a planned profit increment which will yield the 20 per cent return on average investment in the R&D department's tangible assets (basically facilities and equipment) at a planned utilization factor of estimated available man-hours in the department for the coming year.

Actual costs of labor, materials, and supplies incurred by the R&D department should be accumulated against the project control record.

At the end of each month an internal billing should be made from the R&D department to each of the product divisions covering the time charges (at

Exhibit 2

COMPUTATION OF ESTIMATED RETURN ON NEW-PRODUCT DEVELOPMENT EXPENDITURES

Product Name _____

Product No. _____ Division _____ Date _____

	Estimated	Actual
1. Research & Development Expenditure		
2. Depreciable Expenditure		
a. Tooling		
b. Patterns		
c. Dies		
3. Non Depreciable Expenditure		
4. Total Project Cost		
5. Average Annual Cash Flow (Exhibit 1)		
6. Estimated Pay-Out Period (line 4 ÷ line 5)	_____ yrs.	_____ yrs.
7. Estimated Product Life	_____ yrs.	_____ yrs.
8. Annual Rate of Return*	%	%

*From Cumulative Discount Factors Chart

EXHIBIT 3

CUMULATIVE DISCOUNT FACTORS CHART
(Present Value of $1 Received Annually)

Periods to Be Paid	1%	2%	4%	6%	8%	10%	12%	14%	15%	16%	18%	20%	22%	24%	25%	26%	28%	30%	35%	40%	45%	50%
1.....	0.990	0.980	0.962	0.943	0.926	0.909	0.893	0.877	0.870	0.862	0.847	0.833	0.820	0.806	0.800	0.794	0.781	0.769	0.741	0.714	0.690	0.667
2.....	1.970	1.942	1.886	1.833	1.783	1.736	1.690	1.647	1.626	1.605	1.566	1.528	1.492	1.457	1.440	1.424	1.392	1.361	1.289	1.224	1.165	1.111
3.....	2.941	2.884	2.775	2.673	2.577	2.487	2.402	2.322	2.283	2.246	2.174	2.106	2.042	1.981	1.952	1.923	1.868	1.816	1.696	1.589	1.493	1.407
4.....	3.902	3.808	3.630	3.465	3.312	3.170	3.037	2.914	2.855	2.798	2.690	2.589	2.494	2.404	2.362	2.320	2.241	2.166	1.997	1.849	1.720	1.605
5.....	4.853	4.713	4.452	4.212	3.993	3.791	3.605	3.433	3.352	3.274	3.127	2.991	2.864	2.745	2.689	2.635	2.532	2.436	2.220	2.035	1.876	1.737
6.....	5.795	5.601	5.242	4.917	4.623	4.355	4.111	3.889	3.784	3.685	3.498	3.326	3.167	3.020	2.951	2.885	2.759	2.643	2.385	2.168	1.983	1.824
7.....	6.728	6.472	6.002	5.582	5.206	4.868	4.564	4.288	4.160	4.039	3.812	3.605	3.416	3.242	3.161	3.083	2.937	2.802	2.508	2.263	2.057	1.883
8.....	7.652	7.325	6.733	6.210	5.747	5.335	4.968	4.639	4.487	4.344	4.078	3.837	3.619	3.421	3.329	3.241	3.076	2.925	2.598	2.331	2.108	1.922
9.....	8.566	8.162	7.435	6.802	6.247	5.759	5.328	4.946	4.772	4.607	4.303	4.031	3.786	3.566	3.463	3.366	3.184	3.019	2.665	2.379	2.144	1.948
10.....	9.471	8.983	8.111	7.360	6.710	6.145	5.650	5.216	5.019	4.833	4.494	4.192	3.923	3.682	3.571	3.465	3.269	3.092	2.715	2.414	2.168	1.965
11.....	10.368	9.787	8.760	7.887	7.139	6.495	5.988	5.453	5.234	5.029	4.656	4.327	4.035	3.776	3.656	3.544	3.335	3.147	2.752	2.438	2.185	1.977
12.....	11.255	10.575	9.385	8.384	7.536	6.814	6.194	5.660	5.421	5.197	4.793	4.439	4.127	3.851	3.725	3.606	3.387	3.190	2.779	2.456	2.196	1.985
13.....	12.134	11.343	9.986	8.853	7.904	7.103	6.424	5.842	5.583	5.342	4.910	4.533	4.203	3.912	3.780	3.656	3.427	3.223	2.799	2.468	2.204	1.990
14.....	13.004	12.106	10.563	9.295	8.244	7.367	6.628	6.002	5.724	5.468	5.008	4.611	4.265	3.962	3.824	3.695	3.459	3.249	2.814	2.477	2.210	1.993
15.....	13.865	12.849	11.118	9.712	8.559	7.606	6.811	6.142	5.847	5.575	5.092	4.675	4.315	4.001	3.859	3.726	3.483	3.268	2.825	2.484	2.214	1.995
16.....	14.718	13.578	11.652	10.106	8.851	7.824	6.974	6.265	5.954	5.669	5.162	4.730	4.357	4.033	3.887	3.751	3.503	3.283	2.834	2.489	2.216	1.997
17.....	15.562	14.292	12.166	10.477	9.122	8.022	7.120	6.373	6.047	5.749	5.222	4.775	4.391	4.059	3.910	3.771	3.518	3.295	2.840	2.492	2.218	1.998
18.....	16.398	14.992	12.659	10.828	9.372	8.201	7.250	6.467	6.128	5.818	5.273	4.812	4.419	4.080	3.928	3.786	3.529	3.304	2.844	2.494	2.219	1.999
19.....	17.226	15.678	13.134	11.158	9.604	8.365	7.366	6.550	6.198	5.877	5.316	4.844	4.442	4.097	3.942	3.799	3.539	3.311	2.848	2.496	2.220	1.999
20.....	18.046	16.351	13.590	11.470	9.818	8.514	7.469	6.623	6.259	5.929	5.353	4.870	4.460	4.110	3.954	3.808	3.546	3.316	2.850	2.497	2.221	1.999
21.....	18.857	17.011	14.029	11.764	10.017	8.649	7.562	6.687	6.312	5.973	5.384	4.891	4.476	4.121	3.963	3.816	3.551	3.320	2.852	2.498	2.221	2.000
22.....	19.660	17.658	14.451	12.042	10.201	8.772	7.645	6.743	6.359	6.011	5.410	4.909	4.488	4.130	3.970	3.822	3.556	3.323	2.853	2.498	2.222	2.000
23.....	20.456	18.292	14.857	12.303	10.371	8.883	7.718	6.792	6.399	6.044	5.432	4.925	4.499	4.137	3.976	3.827	3.559	3.325	2.854	2.499	2.222	2.000
24.....	21.243	18.914	15.247	12.550	10.529	8.985	7.784	6.835	6.434	6.073	5.451	4.937	4.507	4.143	3.981	3.831	3.562	3.327	2.855	2.499	2.222	2.000
25.....	22.023	19.523	15.622	12.783	10.675	9.077	7.843	6.873	6.464	6.097	5.467	4.948	4.514	4.147	3.985	3.834	3.564	3.329	2.856	2.499	2.222	2.000
26.....	22.795	20.121	15.983	13.003	10.810	9.161	7.896	6.906	6.491	6.118	5.480	4.956	4.520	4.151	3.988	3.837	3.566	3.330	2.856	2.500	2.222	2.000
27.....	23.560	20.707	16.330	13.211	10.935	9.237	7.943	6.935	6.514	6.136	5.492	4.964	4.524	4.154	3.990	3.839	3.567	3.331	2.856	2.500	2.222	2.000
28.....	24.316	21.281	16.663	13.406	11.051	9.307	7.984	6.961	6.534	6.152	5.502	4.970	4.528	4.157	3.992	3.840	3.568	3.331	2.857	2.500	2.222	2.000
29.....	25.066	21.844	16.984	13.591	11.158	9.370	8.022	6.983	6.551	6.166	5.510	4.975	4.531	4.159	3.994	3.841	3.569	3.332	2.857	2.500	2.222	2.000
30.....	25.808	22.396	17.292	13.765	11.258	9.427	8.055	7.003	6.566	6.177	5.517	4.979	4.534	4.160	3.995	3.842	3.569	3.332	2.857	2.500	2.222	2.000
40.....	32.835	27.355	19.793	15.046	11.925	9.779	8.244	7.105	6.642	6.234	5.548	4.997	4.544	4.166	3.999	3.846	3.571	3.333	2.857	2.500	2.222	2.000
50.....	39.196	31.424	21.482	15.762	12.234	9.915	8.304	7.133	6.661	6.246	5.554	4.999	4.545	4.167	4.000	3.846	3.571	3.333	2.857	2.500	2.222	2.000

Authors' Note: These values are obtained by compounding at the end of each period. Other tables use different schemes of compounding, without changing the magnitudes greatly.

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standard charge rate) and the material costs incurred during the month. Because the billing amount will contain an element of intra-company profit which must be eliminated in a corporate consolidation, procedures should be established to recognize the amount of such profit in each month's billing (amount billed less actual cost) and to summarize these amounts monthly for all projects.

Controls should be established in the accounting system that will allow billing of R&D services to the product division on any specific project only up to the accepted quotation submitted by R&D. All charges in excess of the agreed billing should be retained in R&D and absorbed against the planned profit unless the new-product planning committee authorizes the product division to accept additional charges. All projects completed below the quoted price will nevertheless be billed for full price, thus permitting R&D to increase its profit and return on investment.

Monthly reporting and action

The monthly "R&D Project Progress Report" (Exhibit 4, facing page) should clearly identify those projects which have not been completed but which already have been billed up to the quoted limit. These projects should receive the attention of the new-product planning committee.

For such projects, a re-evaluation is in order, looking at sales volume, costs, and tooling expenditures. The accuracy of the original data might have been improved by the passage of time, and this exercise will give all concerned a better understanding of the product's chances of success. Exhibits 1 and 2 would be prepared again.

The new-product planning committee would at this point select one of three possible decisions about the project:

Authorize continuation of the project with additional billing of service to the product division if the cost of completing the project is acceptable to the product division manager. He would be guided in his re-evaluation of the project by the new cost estimates.

Authorize continuation of the project without additional billings to the product division, causing R&D to make less profit than planned or experience a loss.

Authorize discontinuation of the project with the concurrence of the product division manager.

When the cost of completing the project eliminates the possibility of meeting the criteria for minimum return on investment, discontinuation is usually decided upon.

Measuring annual ROI

Once the new product is actually on the market and sales are being made, records should be kept of sales and actual costs. This will make possible an annual evaluation of product profitability and return on R&D expenditures to develop the product. This evaluation should be made for each of the first three years. The reporting of sales and actual costs can be scheduled so as not to enlarge the accounting workload at fiscal year-end.

The original computation of estimated cash flow form (Exhibit 1) to indicate whether the product is generating the cash flow anticipated at the time the product was authorized and whether the planned payout period is being met. This kind of analysis can show where deviations from the planned cash flow have developed—e.g., whether in sales volume or manufacturing cost ratios.

At the end of the third year of sales, actual data for development costs and average cash flow are entered in the Exhibit 2 form to determine the actual rate of return.

What one learns from this kind of historical record can, of course, refine the planning under this method for other new products.

The project cost system with an acceptable profit factor built into the standard charge rates permits the R&D department, or at least its product development function, to operate as a profit center. By pricing his department's services on a fixed-quote basis, the R&D manager is required to estimate realistically—or he may price himself out of the job. He is also required to control his costs and maintain adequate utilization of his available man-hours in order to realize his planned profit. And, not least important, management now is able to obtain a meaningful operating statement on its R&D activities and relate its profit or loss on these activities to the actual average amount of its investment in R&D facilities.

Exhibit 4

R&D PROJECT PROGRESS REPORT

MONTH OF _____

		This Month			To Date		
Sales Div.	PROJECT NUMBER	Actual Cost	Amount Billed	R & D Profit or (loss)	Actual Cost	Amount Billed	R & D Profit or (loss)