THE ECONOMICS OF TRAINING AND DEVELOPMENT

some tools for influencing management on training and development

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If management's two most basic questions about the feasibility of beginning or continuing training programs are, as E.A. Wheeler points out in his excellent article *(Training and Development Journal,* January 1969, Economic Considerations for Industrial Training):

> "What does it cost if we do it," and
> "What does it cost if we don't do it?"

the starting position of the training director is not at its best. If you let them ask these two questions (and not much more) few programs will be started and less will be achieved.

There is one important truth we are perceiving here in Europe, at least in political circles, and as a consequence in the whole field of education (and training and development) is that education is an *investment* and has to be treated as such. So if you want to control an existing program you may well use the techniques described in Wheeler's article. But if you want to influence corporate training policy and to sell your concept to management, please don't talk too much of fixed, variable and total costs, but of investment and return on investment. This article will provide you with some simple tools to do so.

BUDGET

The economic calculation for personnel training is based on the budget, the various items of which are listed according to fixed and variable costs. The budget can be drawn up for any desired period, e.g. for a whole year or only for a definite period, such as the duration of a course. This is important when it comes to determining the time factor for the sums invested.

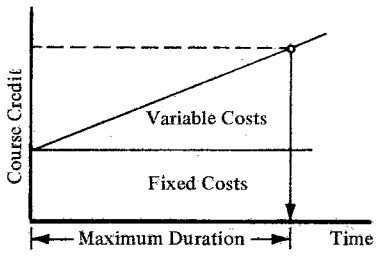
The following table gives examples of fixed and variable costs in terms of the duration of a course and the number of participants.

These budgeted costs are divided by the number of participants, giving the cost per head.

DURATION

From the budgeted cost per head it is then possible to fix the duration of a course. The maximum duration is given by the point of intersection of the straight line of variable costs and the line parallel to the abscissa axis.

Figure 1. Course Duration.



It may, however, be found that this maximum duration is too long in relation to the sum that has to be invested, so that it must be shortened. On the other hand, reducing the length too much can result in the fixed and variable costs rising in proportion and thus reducing the success of the instruction.

INVESTMENT CALCULATION

To assess the economic value of management development there are various ways of carrying out the investment calculation. Those most commonly em-

Fixed Costs	Variable Costs
Preparatory work (instructional materials)	Working hours (instructors and students)
Travelling expenses, board and lodging	Work and laboratory space (instructional materials)
Rental of own premises	Additional instructors

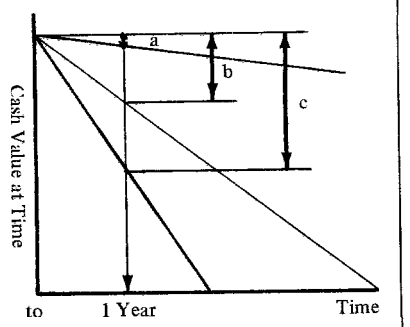
ployed are as follows:

- the determination of the payback period
- the determination of the present value
- the determination of the internal rate of return.

PAYBACK PERIOD

The payback period is the criterion for comparison, e.g., between various training facilities, and is that period in which the sums initially invested in a project are recovered by financial returns. The outstanding feature at first sight is that, with various facilities available, it is possible to decide on the one which yields the quickest return of the invested money. The relationships of this method are illustrated in Figure 2 for firms with high (a), moderate (b) and low (c) average years of service of personnel.

Figure 2. Minimum Annual Additional Income



The most significant drawback of the payback method is that the income to be expected after the return of the invested capital is not taken into account. In fact, though, this is just the factor that may decide the profitability of a project. If the payback period and utilization period were identical, all the profit would have to be used in repaying the invested capital. An employee who leaves the firm after the payback period does not bring the firm any net profit. It is only those items of net income that occur after the payback period which yield profit, only they result in the management development scheme showing any profit on the invested sums. A further disadvantage of the method is that it does not allow for the weighting of the returns with respect to time.

PRESENT VALUE

Using this method an investment is regarded as profitable if the income at the set time (end of the year or course) and at the capital cost rate is at least as high as the outlay plus interest. The rate of interest applicable in the calculation can be advantageously made the capital charges of all money serving the undertaking.

It is logical for the discounted additional income to be determined over that period which represents the average effectiveness of the company. Of course, this period depends to a marked extent on the rate at which employees leave the company, the retirement age and other transfers.

This annual additional income, known as useful income, which accrues from the activity of the employee in the company, is generally not constant, but should increase with the years of service and the consequent wealth of experience (Figure 3a).

Table A should be used for the calculation. A simplified method of calculation can only be used when the annual useful income remains unchanged during the years of service of a given employee ($G_1 = G_2 = \ldots G_n$). For this calculation Table B is used, showing the present value of an annual monetary unit of income, at a definite rate of interest. Table B contains the cumulated values of Table A (see example). With the aid of these two tables the calculation of the investment in training is very easy to perform.

INTERNAL RATE OF RETURN

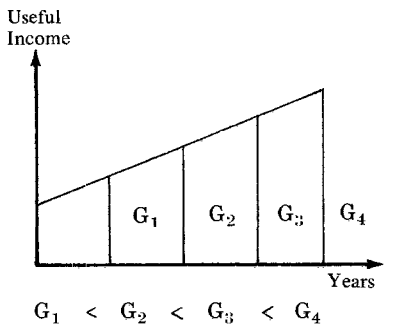
Instead of working with the rate of interest on the company's own and outside capital, the internal rate of return may be used. This is the rate of interest which, if used, results in the sum of all present values of income equalling the present value of all outlay. The calculation is based on the cash flow method.

Examples:

a. *Feasibility study.* A training course lasting six months with 10 participants costs 300,000 units (including salaries). The average length of time the participants remain in the company thereafter works out to five years. How high must the average

Figure 3. Internal Rate of Return.

a. Useful Income Rising

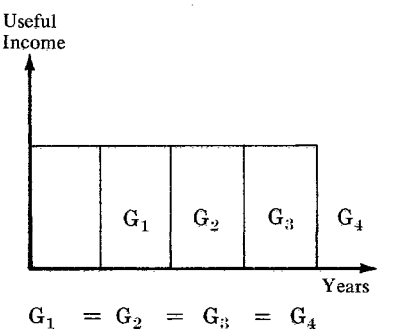


$G_1 < G_2 < G_3 < G_4$

Table A

(calculate with the individual sums G_1, G_2, etc.)

b. Useful Income Constant



$G_1 = G_2 = G_3 = G_4$

Table B

(calculate with the sum total)

additional income per participant per year (useful income) be at an internal rate of interest of 9%?

Solution

Cash outflow per participant
30,000. (t_c = end of course)

Cash inflow:

Year	Interest factor at 9%
1	0.917 (from Table A)
2	0.841
3	0.771
4	0.707
5	0.648
	3.884 (from Table B)

$$\frac{30{,}000}{3.884} = 7724.$$

Thus at 9% interest the average additional income per year must be at least 7724. per head. If the useful income does not reach this figure, it is doubtful whether the training opportunity is economically worthwhile.

b. *Alternative decision.* Without attending the course, the employee would have gained the same knowledge in 1½ years on his own. The salary costs per year and participant of 40,000., however, would have flowed out of the company for the sake of training. What is more economical, to run the course or not?

Solution

To simplify matters we will calculate only with the excess cash inflow. As further simplification we will work with a constant average net cash inflow at the end of the training period (G).

Present value calculation at time t_o, cash inflow = outflow (No loss = criterion of economic success)

With course		Interest factor with 9% from Table A	Without course	
Year	Cash out Cash in		Cash out	Cash in

$$30{,}000 = 3.884 \times G \qquad G = \frac{30{,}000}{3.884} = 7724.$$

$$10{,}000 + (0.917 \times 20{,}000) = 2.967 \times G \qquad G = \frac{28{,}340}{2.967} = 9552.$$

The variant 'with course' is economically preferable because it demands less useful income per year per head. If, on the other hand, the annual useful income per head is less than 1816. = (30,000-28,340)/0.917, the course is not worthwhile. However, in this case there can be no talk of "profitability." Then the average length of service of the employee is too short compared with the additional income. The calculation of the success of training proves in this case that the profit margin is too small, or that the right personnel policy is not being applied.

Finally a further simplified method can

TABLE A

Present value of 1 unit, amount flows in at the end of year

Interest rate, number of years . .goes from to. .

n	Interest Rate (%)																			
	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	6	7	8	9	10	11	12	13	14	15
1	0.995	0.990	0.985	0.980	0.976	0.971	0.966	0.961	0.957	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870
2	0.991	0.980	0.971	0.961	0.952	0.943	0.934	0.925	0.916	0.906	0.890	0.874	0.857	0.841	0.826	0.812	0.797	0.783	0.769	0.757
3	0.985	0.971	0.956	0.942	0.929	0.915	0.902	0.889	0.876	0.863	0.840	0.817	0.794	0.771	0.751	0.732	0.712	0.693	0.675	0.659
4	0.980	0.961	0.942	0.924	0.906	0.888	0.871	0.855	0.839	0.822	0.792	0.764	0.735	0.707	0.683	0.660	0.636	0.613	0.592	0.573
5	0.975	0.951	0.928	0.906	0.884	0.863	0.842	0.822	0.802	0.783	0.747	0.714	0.681	0.648	0.621	0.595	0.567	0.543	0.519	0.499
6	0.971	0.942	0.915	0.888	0.862	0.837	0.814	0.790	0.768	0.745	0.705	0.668	0.630	0.594	0.564	0.536	0.507	0.481	0.456	0.434
7	0.966	0.933	0.901	0.871	0.841	0.813	0.786	0.760	0.735	0.709	0.665	0.625	0.583	0.545	0.513	0.483	0.452	0.426	0.400	0.378
8	0.961	0.923	0.888	0.853	0.820	0.789	0.759	0.731	0.703	0.675	0.627	0.584	0.540	0.500	0.467	0.435	0.404	0.377	0.351	0.329
9	0.956	0.914	0.875	0.837	0.801	0.766	0.734	0.703	0.673	0.643	0.592	0.546	0.500	0.459	0.424	0.392	0.361	0.334	0.308	0.286
10	0.951	0.905	0.862	0.820	0.781	0.744	0.709	0.676	0.644	0.612	0.558	0.511	0.463	0.421	0.386	0.353	0.322	0.296	0.270	0.249
11	0.947	0.896	0.849	0.804	0.762	0.722	0.685	0.650	0.616	0.583	0.527	0.478	0.429	0.386	0.350	0.318	0.287	0.262	0.237	0.217
12	0.942	0.887	0.836	0.788	0.744	0.701	0.662	0.625	0.590	0.555	0.497	0.447	0.397	0.354	0.319	0.287	0.257	0.232	0.208	0.189
13	0.937	0.879	0.824	0.773	0.725	0.681	0.639	0.601	0.564	0.528	0.469	0.418	0.368	0.325	0.290	0.259	0.230	0.205	0.182	0.164
14	0.933	0.870	0.812	0.758	0.708	0.661	0.618	0.577	0.540	0.503	0.442	0.390	0.340	0.298	0.263	0.233	0.204	0.181	0.160	0.143
15	0.928	0.861	0.800	0.743	0.690	0.642	0.597	0.555	0.517	0.479	0.417	0.365	0.315	0.273	0.239	0.210	0.183	0.160	0.140	0.124
16	0.923	0.853	0.788	0.728	0.673	0.623	0.577	0.534	0.494	0.456	0.394	0.341	0.292	0.250	0.218	0.189	0.163	0.142	0.123	0.108
17	0.919	0.844	0.776	0.714	0.657	0.605	0.557	0.513	0.473	0.434	0.371	0.319	0.270	0.229	0.198	0.170	0.146	0.126	0.108	0.094
18	0.914	0.836	0.765	0.700	0.641	0.587	0.538	0.494	0.453	0.413	0.350	0.298	0.250	0.210	0.180	0.153	0.130	0.112	0.095	0.082
19	0.910	0.828	0.754	0.686	0.626	0.570	0.520	0.475	0.433	0.393	0.331	0.279	0.232	0.193	0.164	0.138	0.116	0.099	0.083	0.071
20	0.905	0.820	0.742	0.673	0.610	0.554	0.502	0.456	0.415	0.374	0.312	0.261	0.215	0.177	0.149	0.124	0.104	0.088	0.073	0.062

assist in the decision between "formal training" or "practice." It is quite obvious that this decision does not depend solely on the results of an investment calculation. Nevertheless we are of the opinion that it is worthwhile trying to obtain a quantitative basis for this decision.

What advantages or disadvantages of a given system of training exert an economic influence?

	Advantages	Disadvantages
Formal training	The objective for basic and functional subjects is reached more quickly. The trainee can be of practical use sooner.	The cost of wages and the net costs of the course (instructors, training facilities, etc.) are a burden on the company. Only costs during training, no returns.
Practice	The employee is serving a useful purpose from the very start. He is "useful" to the company at an early stage.	Attainment of the objective depends almost entirely on personal initiative (risk of gaps in knowledge later). Disturbs flow of work owing to lack of knowledge and questions.

TABLE B

Present value of a certain number of annuities, payables at end of year

n	Interest Rate (%)																		
	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	6	7	8	9	10	11	12	13	14	15
1	0.995	0.990	0.985	0.980	0.976	0.971	0.966	0.961	0.957	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870
2	1.986	1.970	1.956	1.927	1.934	1.913	1.900	1.886	1.873	1.859	1.833	1.808	1.783	1.758	1.736	1.713	1.690	1.668	1.647	1.627
3	2.971	2.941	2.912	2.884	2.856	2.828	2.802	2.755	2.749	2.723	2.673	2.624	2.577	2.529	2.487	2.445	2.402	2.361	2.322	2.286
4	3.951	3.902	3.854	3.808	3.762	3.717	3.673	3.630	3.588	3.546	3.465	3.387	3.312	3.236	3.170	3.105	3.037	2.974	2.914	2.859
5	4.926	4.853	4.782	4.713	4.646	4.580	4.515	4.452	4.390	4.329	4.212	4.100	3.993	3.884	3.791	3.700	3.605	3.517	3.433	3.358
6	5.897	5.795	5.697	5.601	5.508	5.417	5.329	5.242	5.158	5.076	4.917	4.766	4.623	4.478	4.355	4.236	4.111	3.998	3.889	3.792
7	6.863	6.728	6.598	6.472	6.349	6.230	6.114	6.002	5.893	5.786	5.582	5.389	5.206	5.023	4.868	4.719	4.564	4.424	4.288	4.170
8	7.824	7.652	7.486	7.325	7.170	7.020	6.874	6.732	6.596	6.463	6.210	5.971	5.747	5.523	5.335	5.154	4.968	4.801	4.639	4.499
9	8.780	8.566	8.361	8.162	7.971	7.786	7.608	7.436	7.269	7.107	6.802	6.515	6.247	5.982	5.759	5.546	5.328	5.135	4.946	4.785
10	9.731	9.471	9.223	8.983	8.752	8.530	8.317	8.111	7.913	7.722	7.360	7.024	6.710	6.403	6.145	5.899	5.650	5.431	5.216	5.034
11	10.678	10.368	10.072	9.787	9.514	9.252	9.002	8.760	8.529	8.306	7.887	7.499	7.139	6.789	6.495	6.217	5.988	5.693	5.453	5.251
12	11.620	11.255	10.908	10.575	10.258	9.954	9.663	9.385	9.119	8.863	8.384	7.943	7.536	7.143	6.814	6.504	6.194	5.925	5.660	5.440
13	12.557	12.133	11.732	11.348	10.983	10.635	10.303	9.986	9.683	9.394	8.853	8.356	7.904	7.468	7.103	6.763	6.424	6.130	5.842	5.604
14	13.490	13.004	12.544	12.106	11.691	11.296	10.920	10.563	10.223	9.899	9.295	8.745	8.244	7.766	7.367	6.996	6.628	6.311	6.002	5.747
15	14.418	13.865	13.344	12.849	12.381	11.938	11.517	11.118	10.740	10.380	9.712	9.108	8.559	8.039	7.606	7.206	6.811	6.471	6.142	5.871
16	15.341	14.718	14.132	13.578	13.055	12.561	12.094	11.652	11.234	10.838	10.106	9.447	8.851	8.289	7.824	7.395	6.974	6.613	6.265	5.979
17	16.260	15.562	14.908	14.292	13.712	13.166	12.651	12.166	11.707	11.274	10.477	9.763	9.122	8.518	8.022	7.565	7.120	6.739	6.373	6.073
18	17.174	16.398	15.673	14.992	14.353	13.754	13.190	12.659	12.160	11.690	10.828	10.059	9.372	8.728	8.201	7.718	7.250	6.851	6.467	6.155
19	18.082	17.226	16.427	15.678	14.979	14.323	13.709	13.134	12.593	12.085	11.158	10.335	9.604	8.921	8.365	7.856	7.366	6.950	6.550	6.226
20	18.987	18.046	17.169	16.351	15.589	14.877	14.212	13.590	13.008	12.462	11.470	10.594	9.818	9.098	8.514	7.980	7.469	7.038	6.623	6.288

To justify formal training from the economic aspect, it is necessary for the salary costs and the net costs of the course lost during the period of training to be recovered by increasing the useful income. It must be borne in mind, though, that training under practical conditions also takes time, depending on the complexity of the particular field of work.

Example:
It takes either a three-month formal course or one year of practice to grow accustomed to a given job. During this period there is no useful income, but there also is no losses.

Costs

With course	Without course
3 months' salary (s) + costs of course (C_p)	No capital flow
9 months' useful income (N)	

To decide whether the course should be held:

$$9\,N - (3s + C_p) \geqslant 0 \text{ i.e., } 9\,N \geqslant 3s + C_p$$

In other words, nine times the useful income following the course must be greater than the total cost of the course per head, it being taken for granted that the two employees considered are of equal value at the end of one year. We can see that a company stands to gain more from formal training, the higher the useful income per employee. Hence industries and factories with more intensive profit prospects are more "friendly" towards training.

BEYOND COSTS

Of course, the economic calculation cannot and must not be regarded as the sole criterion for the holding of training programs. Apart from the fact that certain complex knowledge and relationships cannot be accumulated or understood by employees working on their own in a useful period, training and development activities are an ideal means of establishing a healthy atmosphere in a company.