Selection in human resource accounting

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'*It is perfectly possible to look at all the old information and come up with a very worthwhile new way of putting it together ... A re-organisation of information does not have to await the impact of new facts; it can take place whenever anyone appreciates the arbitrary nature of a theory and proves competent to evolve a different one. Dissatisfaction with the old theory or simply curiosity may provide the motive.*'

Edward de Bono, *The Use of Lateral Thinking*,
Penguin Books Ltd, Middlesex, 1971, pp. 17, 76

Foreword

In the Preface to his book titled *The General Theory of Employment, Interest and Money*, John Maynard Keynes states that 'the composition of this book has been for the author a long struggle of escape ... from habitual modes of thought and expression.' (Papermac edition, Macmillan and Co., Ltd, London, 1970, p. viii) He considers that 'the ideas which are here expressed so laboriously are extremely simple and should be obvious. The difficulty lies, not in the new ideas, but in escaping from the old ones, which ramify, for those brought up as most of us have been, into every corner of our minds' (*ibid.*, p. viii).

Similarly, the author of this study is engaged in a struggle of escape. This is marked by a departure from what hitherto may be described as classical accounting to what appears to be greener pastures, that is, contemporary accounting. Further, contemporary accounting involves selection in human resource accounting and/or human resource accounting per se. Not only are the basic assumptions and/or assertions of this study distinct from classical accounting but the emphasis of the study, to the best of the author's knowledge, is unique in the field of human resource selection. This new perspective of contemporary accounting contravenes what, at present, is considered to be the norm.

This study is directed towards managers, students, etc., and its acceptance is for them to ascertain. If the author's struggle is judged unacceptable, the author must stand alone. If, however, the converse is true, the credit is willingly shared, for the author of a study of this kind – one which journeys into foreign pastures and is occasioned by the inability to empirically test one's ideas under laboratory conditions – is dependent on others.

I am indebted to the following people for their varying contributions and for their willingness to sacrifice their valuable time, and I wish to express my gratitude to them.

Michael Harding accepted the task of helping to make this study more readable. His acid and constructive comments regarding methodology, including expression, phraseology, form and other matters relating to methodology were most helpful and for his meticulous endeavour in this regard involving the various manuscripts, I am most grateful.

Mervyn Silverstein's patience during our numerous discussions relating to actuarial matters has been of great benefit.

His willingness to participate in discussion, review drafted chapters and that of the manuscript and comment on statistical matters have enabled me to grapple with some areas of human resource accounting which, to the best of my knowledge, have not been previously documented.

Professor Graham Peirson willingly reviewed the drafted manuscript and his commentary was of great assistance. His suggestions regarding, inter alia, subject matter were most significant and for his advice in this regard I am indebted. My thanks are also due and freely go to Ken Middleton, Myer Mirsky and Inars Bredrichs, all of whom kindly reviewed and commented on the drafted manuscript.

Many friends, colleagues and academics, unwittingly contributed to this study through conversation and, although too numerous to name, I am most grateful. Further, I wish to thank Frances Reilly for her tireless work in typing the initial draft, subsequent revisions and final manuscript.

Finally, it should not be construed that participation by the aforementioned people necessarily implies their acceptance of the emphasis and/or subject matter of this study.

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Part 1

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Introduction

Human resource acquisition (or selection) is the process of acquiring human services to achieve organisational objectives. Wendell French asserts that systems designed to select human resources include, almost universally, application blanks, interviews, psychological tests, reference checks and physical examinations. 1 Similarly, Chruden and Sherman suggest that the steps that are typically found in the selection process include, inter alia, interviews, the completion of application blanks, employment tests, background investigations and physical examinations. [2]

It is submitted that the criteria used to select human resources should be similar to, if not the same as, those used to evaluate the performance of human resources, once selected. With the knowledge that profitability is a criterion applied to evaluate the performance of many human resources, this study investigates the possibility of including estimated profitability as a criterion (as distinct from the criteria) in the selection process.

The inclusion of estimated profitability in the selection process would improve the decision-making process as it would direct financial resources to where they were expected to be the most efficient. In particular, the choice between alternatives would be properly related to consequences. Chruden and Sherman affirm that 'in the case of an executive, for example, criteria of success include such factors as profitability on the part of the organisation that he manages...' [3] Furthermore, many human resources are selected on the expectation that they will contribute, directly, to the profitability of the organisation, not only through maximising the earnings of others but also, by individually contributing to profitability. Another parallel may be drawn between the selection criteria of human resources and the criteria used to evaluate organisational success. The justification for this assertion is stated by Donald Crane when he observes that 'the accuracy with which an organisation selects its employees determines its ... overall success.'[4] Since profitability is an evaluation criterion of the performance of many human resources and, furthermore, most organisations regard profitability as a criterion of success, then estimated profitability should be a criterion of human resource selection.

Capital budgeting procedures

Brummet claims that 'we can extend the applications of well-known capital budgeting procedures to human capital investments ...' [5] Burke, in his 1970–71 survey, sampled 228 Australian companies and found that 50 per cent of these companies used only traditional capital budgeting procedures (for example, accounting rate of return) and that the remaining 50 per cent employed discounted cash flow (D.C.F.) techniques. [6] Also, he found that 10 per cent of the latter group of companies used D.C.F. techniques exclusively and 40 per cent used these techniques as well as the traditional methods. [7]

The D.C.F. techniques – the net present value and internal rate of return methods – are cash models. The accounting rate of return method employs an accrual basis. The hypothesis adopted for this study is that these three capital budgeting procedures, which are used to estimate the economic worth of, and select, capital equipment investment projects, may be modified and extended to the selection of alternate, human resource investment proposals.

This is a secondary research study and, to the best of the author's knowledge, it is the first of its type. [8] The author does not know of any organisation which includes, or any publications which advocate, the use of capital budgeting procedures in the selection process human resources.

Human resource accounting is the inclusion of the dichotomy of human resource costs, and other financial data pertaining to human resource investments, in accounting (refer Figure 1.1). Unlike traditional accounting practice, human resource accounting asserts that organisations incur investment expenditure and cash investments in human resources, that they derive net income and annual net cash inflows from this investment[9] and that human resources have an economic life. For the most part, this quantitative data is the prerequisite to the modification and extension of capital budgeting procedures to the selection of alternate human resource investment proposals. Human resource accounting, and its assumptions, is germane and, as such, 'holds the key' to the emphasis placed in this study.

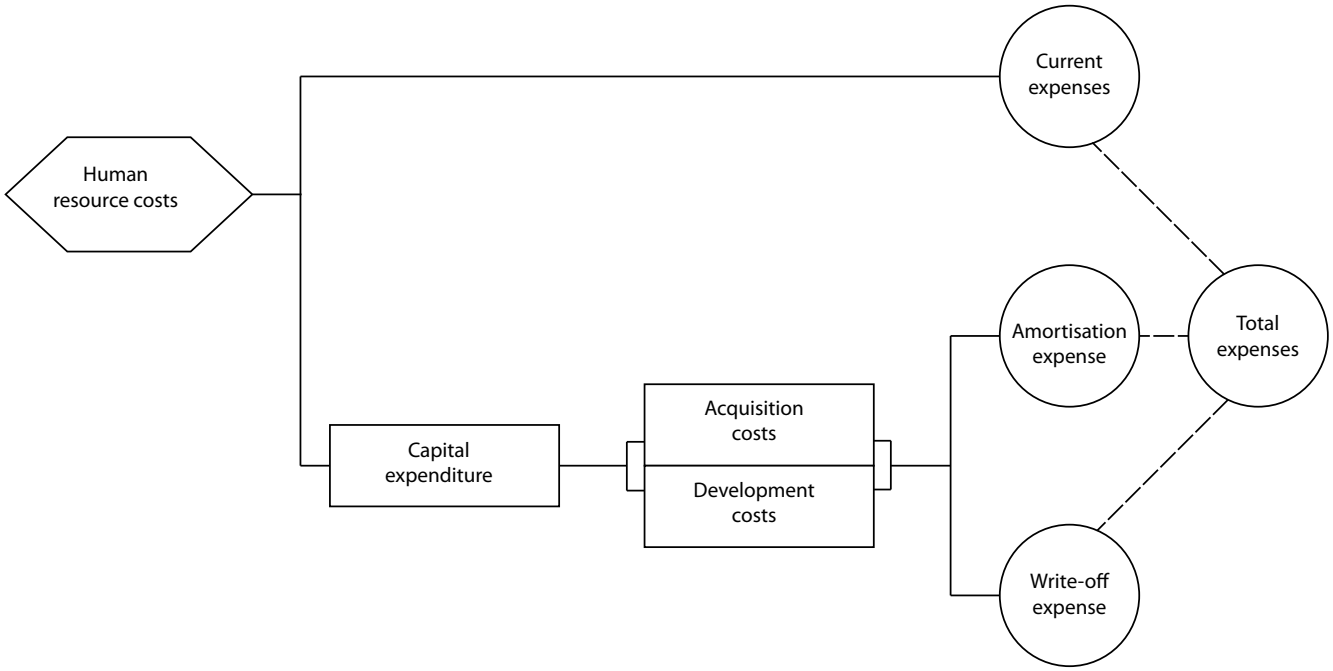

Figure 1.1 Dichotomy of Human Resource Costs

The format of this figure is a modification of a figure presented in an article by Brummet, R.L., Flamholtz, E.G., and Pyle, W.C., 'Human Resource Measurements – A Challenge for Accountants', *The Accounting Review*, Vol. XLIII, No. 2, April 1968, p. 218

Scope of this article

It is beyond the scope of this study to discuss the following areas. Firstly, the selection process[10] currently being used by organisations. Secondly, the payback period, human resource replacement and the arguments for and against the acceptance of human resource accounting and its assumptions and/or assertions are also excluded. Finally, the use of surrogate measures as a means of estimating net income and net cash inflows is precluded and, as such, it should be pointed out that this study does not have application to all human resources.

This study covers the following topics and issues: the modifications necessary to extend the use of capital budgeting procedures to alternate human resource investment proposals; a model to ascertain investment expenditure and its adjustment to cash investment for the purpose of the D.C.F. techniques; a computation of economic life; various methods to estimate net income, and its adjustment to net cash inflow; and finally an approach to assessing risk with reference to the discount rate.

Human resource selection

The importance of extending the traditional capital budgeting procedures to the selection of alternate human resource investment proposals should not be underestimated. Assume, for example, that an organisation has decided to select a human resource and that it has a choice between two executives. Irrespective of which executive it selects, the organisation expects to incur $30,000 on investment expenditure. Ideally, it should select that executive which, all other criteria being equal, is expected to return the greater profitability. The traditional capital budgeting procedures which may be modified and used to estimate the economic worth of alternate human resource investment proposals should be included in the selection process. This would direct the financial resources of the organisation to where they were expected to be most efficient. As such, it would maximise profitability and increase organisational wealth.

This chapter is divided into two sections. These are the D.C.F. techniques and the accounting rate of return method. Each section takes an 'a priori' approach and starts with the traditional capital budgeting procedures. Once defined, the modifications necessary to these procedures to extend their use to human resource selection are outlined. The means by which the prerequisites are incorporated into the capital budgeting procedures are also considered in this chapter. However, the method of comparison of alternate investment proposals which have different economic lives, the means by which the effects of inflation may be incorporated into the calculations and the rationale for regarding the capital budgeting procedures as tests of profitability, are not discussed.

D.C.F. techniques

The net present value and internal rate of return methods are discounted cash flow (D.C.F.) techniques.

Peirson and Bird state that 'the internal rate of return is that rate of return which will equate the present value of the net cash inflows from the project with its initial cash outlay ... (that is, cash investment). The internal rate of return may be found by solving the following equation for r:

$$C = \frac{R1}{(1+r)} + \frac{R2}{(1+r)2} + \ldots + \frac{Rn}{(1+r)n}$$

C = the initial cash outlay on the project
R = annual net cash inflows generated by the project
n = the life of the project
r = internal rate of return.' [11]

Further, Peirson and Bird affirm that 'the net present value of a project represents the difference between the present value of the net cash inflows generated by the project and the initial cash outlay ... (that is, cash investment). Assuming a cash outlay at the beginning of the project's life and a series of net cash inflows in the following periods, the net present value is calculated using the following formula:

$$\text{Net Present Value} = \frac{R1}{(1+k)} + \frac{R2}{(1+k)2} + \ldots + \frac{Rn}{(1+k)n} - C$$

where C = the initial cash outlay on the project
R = annual net cash inflows generated by the project
n = the life of the project
k = company's required rate return.' [12]

The cash investment in capital equipment may arise at a particular point in time; specifically, at the start of the project's economic life. It should be noted that economic life is the estimated length of time over which the benefits of an investment (proposal) are expected to be derived. When this is the case and/or when it is assumed that the subsequent cash investment is deducted from net cash inflows, the above formulae are used. The cash investment in human resource investment proposals is not generally a one-time cash outlay but is incurred over the span of time which includes the acquisition and development periods; namely, the investment period. The acquisition period is the span of time during which acquisition costs are incurred. These costs include the costs associated with recruiting, selecting and hiring and placement of a human resource. Typically, the acquisition period takes place prior to, and ends at, the commencement of the economic life of the human resource investment proposal. The development period is the span of time during which development costs are incurred. These costs include the costs associated with formal and on-the-job training and development of a human resource (refer Chapter III). The development period commences at the start of the economic life of the investment proposal.

To include the human resource cash investment in the above formulae, the cash investment is split into its two components:- acquisition cost and development cost.

$$C = A + D$$

where C = cash investment;
A = acquisition cost; and
D = development cost.

The acquisition cost is treated as a cash outflow at the start of the proposal's economic life, (which is assumed to be Year 0). However, it should be increased to its accumulated value. The development cost is treated as an outflow after the commencement of the proposal's economic life. It is subtracted from the net cash inflows and discounted to its present value.

The point in the investment period at which the calculations pertaining to human resource cash investments meet is illustrated in the following diagram. Year 0, in the diagram, is the commencement of the proposal's economic life. It is the focal point at which acquisition costs are accumulated and to which development costs are discounted.

Cash investment

For the internal rate of return method, the accumulated value of 'A' is the amount to which it would have accumulated in Year 0, by the addition of interest had it been invested at the internal rate of return (r) in an alternate investment. To increase 'A' to its accumulated value, interest is added to the individual cash flows for the period of time between the outlay and the end of the acquisition period, that being the start of the proposal's economic life. The present value of 'D' is determined by discounting 'D' at the internal rate of return (r).

A similar approach is adopted for the net present value method. For this method, the accumulated value of 'A' is the amount to which it would have accumulated in Year 0, by the addition of interest, had it been invested at the desired rate of return (k) in an alternate investment. To increase 'A' to its accumulated value, interest is added to the individual cash flows for the period of time between the outlay and the end of the acquisition period, that being the start of the proposal's economic life. To ascertain the present value of 'D', it is discounted at the desired rate of return (k).

Investment Period	
Year 0	
Acquisition period	Development period
Acquisition costs accumulate to Year 0	Development costs discounted to Year 0

Assuming the development cost is incurred throughout the first year and a series of net cash inflows over the human resource investment proposal's economic life, the internal rate of return for a human resource investment proposal may be calculated using the following formula:

$$A = \frac{R1-D}{(1+r)} + \frac{R2}{(1+r)2} + \ldots + \frac{Rn}{(1+r)n}$$

where A= acquisition cost;
D = development cost;
R = annual net cash inflows generated by the proposal;
n = economic life of the proposal; and
r = internal rate of return.

Similarly, assuming the development cost is incurred throughout the first year and a series of net cash inflows over the human resource investment proposal's economic life, the net present value of a human resource investment proposal may be calculated using the following formula:

$$\text{Net Present Value} = \frac{R1-D}{(1+k)} + \frac{R2}{(1+k)2} + \ldots + \frac{Rn-A}{(1+k)n}$$

where A = acquisition cost;
D = development cost;
R = annual net cash inflows;
n = economic life of the proposal; and
k = organisation's required rate of return on investment.

Although the above formulae assume that the development cost is incurred throughout the first year of the proposal's economic life, when this cost does not extend to the end of the first year one approach to ascertain its present value is to discount it on a shorter periodic basis, for example, monthly. Alternatively, when the development cost extends beyond the first year of the proposal's economic life, it is included in the calculation by treating it as an outflow in the year in which it is incurred. Once included, it is then discounted on an appropriate periodic basis.

The following hypothetical information may be

Table 2.1

Calculating the net present value of a human resource investment proposal

Year	Net cash flow (1)* $	Present value factor at value (2)	Present (1) x (2) = (3) $
0	(4057) (I)	1.000	(4057)
1	(4000) (II)	.893	(3572)
2	7000	.797	(5579)
3	6000	.713	(4272)
Net Present Value (Positive) $2,222			

* Cash flows are assumed to occur at the end of each period to comply with the assumptions of the interest tables. This table assumes that the reader has an understanding of present value and its determination.

(I) $4057 is the accumulated value of $4000 acquisition costs, accumulated at 12% per annum
(II) $4000 net cash outflow is calculated by subtracting $8000 net cash inflow from $12,000 development costs

used to calculate the net present value and internal rate of return of a human resource investment proposal. Management is considering the appointment of a new executive. Cash investment is estimated at $16,000 – comprising a four-month acquisition period, acquisition costs of $1000 incurred at the end of each month and $12,000 development costs incurred throughout the first year of the proposal's economic life. Economic life is three years, new cash inflows are $8000, $7000, $6000 and the organisation's required rate of return is 12 per cent per annum. The net present value may be calculated as follows (see Table 2.1).

Peirson and Bird assert that 'the amount of any positive net present value represents the immediate increase in ... wealth which will result from accepting the project.' [14] 'If management is simply interested in whether a project should be accepted or rejected, then, provided the project has a net present value greater than zero, it is acceptable.'[15] if there is more than one investment proposal with a positive net present value and the proposals are mutually exclusive, the proposals are ranked. Priority is given to that proposal with the highest net present value as it is expected to contribute greater profitability to the organisation.

By investing in the executive, the organisation anticipates receiving a series of net cash inflows in the future. The net effect being that at the end of the proposal's economic life, the organisation expects to be better off by an amount which equals $2222 now. If an alternate investment proposal has a net present value of, say, $1700 both proposals would be acceptable. However, assuming that they are mutually exclusive and all other criteria render the proposals indistinguishable, the executive in the above example would be selected.

Middleton states 'in general ... the rate of return cannot be found by direct calculation but only by trial and error – discounting at various rates of interest until two are found which yield net present values just above and just below zero, respectively.' [16] Given the information in the above example, the internal rate of return may be calculated as follows (see Table 2.2).

Having proceeded by trial and error, it is found that, at 26 per cent, the net present value is greater than zero but at 28 per cent, the net present value is less than zero. As such, the expedient rate (that which results in a zero net present value) lies between 26 per cent and 28 per cent. Interpolation may be used to approximate the rate. [17]

$$\left(26 + \frac{116-0}{116-(-118)} \times 2 \right) \% = 26.99\%$$

Peirson and Bird consider that 'once the internal rate of return has been found, the acceptability of an investment project is determined by comparing the internal rate of return with the ... required rate of return. Thus, any project with $r > k$ is accepted while any project with $r < k$ is rejected.'[18] In the above example, the internal rate of return (r) is 26.99 per cent per

Table 2.2

Calculating the internal rate of return of a human resource investment proposal

Year	Net cash flow $	Present value factor 26%	Present value $	Present value factor 28%	Present value $
0	(4118) (I)	1.000	(4118)		
0	(4126) (II)			1.000	(4126)
1	(4000) (III)	.794	(3176)	.781	(3124)
2	7000	.630	4410	.610	4270
3	6000	.500	3000	.477	2862
			$116		$(118)

(I) $4118 the accumulated value of acquisition costs, accumulated at 26 % per annum
(II) $4126 the accumulated value of acquisition costs, accumulated at 28% per annum
(III) $4000 net cash outflow is calculated by subtracting $8000 net cash inflow from $12,000 development costs.

annum and the required rate of return (k) 12 per cent per annum. Therefore, the proposal is acceptable as, all other things being equal, it is expected to increase organisational wealth.

Accounting rate of return method

The accounting rate of return method is distinct from the D.C.F. techniques. In reference to this method, the National Association of Accountants claim that 'it is called the financial statement method to distinguish it from calculations which use a discounting process and because the calculations are similar to return on investment measurements using the income statement and the balance sheet.'[19] That is, unlike the D.C.F. techniques, the accounting rate of return method employs an accrual and not a cash basis. Whilst this may be regarded as an advantage of the accounting rate of return method, many writers criticise the method because it does not consider the time value of money. For example, the National Association of Accountants suggests that 'it does not recognise any advantage to high ... (incomes) ... in early years; or vice versa, it does not penalise a project for ... (incomes) ... that are delayed. The income is averaged.[20]

Although the accounting rate of return has its drawbacks, it is not without its virtues. Assume, for example, that an organisation is a public company listed on the stock exchange and that it has a choice between two mutually exclusive investment proposals. Proposal A is not subject to depreciation and/or amortisation and is expected to earn $30,000 in after-tax profits and cash flow. Conversely, proposal B is subject to depreciation and/or amortisation and is expected to earn $60,000 in cash flow and no after-tax profits. Although proposal B is preferable in terms of cash flow, the organisation may select proposal A as failure to maintain and maximise after-tax profits may cause a decline in the value of the company's shares on the stock exchange and lead shareholders to seek alternate opportunities for investment.

Peirson and Bird state 'there are numerous versions of this concept but basically the accounting rate of return refers to the average net income from a project as a percentage of either the initial investment or the average investment in the project. Thus:

$$Ra = \frac{\text{Average Net Income from a Project}}{\text{Initial Investment in a Project 1}} \times 100$$

$$Ra = \frac{\text{Average Net Income from a Project}}{\text{Initial Investment in a Project 1}} \times 100 \quad 1 \ (21)$$

Furthermore, Peirson and Bird postulate that the 'accounting rate of return ... may be ... based on a simple average of capital invested in the first and last years of a project's life.' [22]

As already suggested, investment expenditure in a human resource is incurred over a period of time which is called the investment period. To include this expenditure in the various accounting rate of return formulae, it is advantageous to determine a point in time when investment expenditure may be assumed to be incurred. Once determined, this point in time is assumed to be the start of the proposal's economic life for the purpose of the accounting rate of return method. The initial investment expenditure is assumed to be incurred at this point and the investment expenditure may then be amortised on a periodic basis (for example, annually) commencing at this point.

The investment point is that point in time when investment expenditure in a human resource is assumed to be incurred. The following example illustrates the method to calculate the investment point. An organisation incurs investment expenditure of $10,000 in a human resource, over an investment period of six months, commencing 1 January.

The acquisition period extends for two months and the development period extends for four months. Therefore, the mid-point of an acquisition period is 1 February and that of the development period is 1 May. Assuming acquisition costs are $1000 monthly and development costs are $2000 monthly, the ratio of acquisition costs to investment expenditure is 1/5 ($2000 –$10,000) and the ratio of development costs to investment expenditure is 4/5 ($8000 – $10,000). Therefore, the investment point is April 12th, 4/5 of three months, three months being the interval between the midpoint of each period.

Cautious use should be made of the investment point, although it is advantageous. It assumes linearity; that is, it assumes that investment expenditure is incurred at constant and regular points during the investment period. Therefore, extreme volatility in investment expenditure during the investment period may lead to significant distortions in an investment proposal's accounting rate of return. Generally, there is an inverse relationship between the length of the investment period and the expedient use of the investment point. Investment expenditure incurred over an excessive period of time may be subject to greater fluctuations than that incurred over a short investment period.

The following information may be used to calculate the various rates of return of a human resource investment proposal. Investment expenditure is estimated at $14,000. The investment point is calculated at July 1st and net income is estimated at $3000, $4000 and $5000 respectively.

Acceptability of an investment proposal is determined by comparing its accounting rate of return with the organisation's required rate of return. 'If the rate of return is greater than the required rate of return, the project is acceptable; if the rate of return is less than the required rate of return, it is not acceptable.'[23] Therefore, in the above example, assuming that the organisation has a required rate of return of 20 per cent, the investment proposal is acceptable. If two investment proposals have an accounting rate of return higher than the organisation's required rate of return and they are mutually exclusive, they are ranked and the one with the higher accounting rate of return (assuming other criteria render the proposals indistinguishable) is accepted, as it is expected to be the more profitable.

Summary

An approach to extend the use of capital budgeting procedures to the selection of human resources has been discussed in this chapter. These procedures are an essential criterion to be included in the selection process. However, organisations have a social and moral responsibility and as such, it is not suggested that what is profitable is necessarily right. Also, each human resource is unique, therefore each investment proposal has extraneous factors which should be considered before the final selection is made. Consequently, whilst these procedures should be included in the selection process, they are not the only, or necessarily the over-riding, factor in the selection of a human resource.

Each procedure is different and each has advantages and disadvantages. An advantage of the D.C.F. techniques is that they consider the time value of money. The accounting rate of return method employs an accrual basis and, consequently, the criterion that it applies to evaluate an investment proposal is similar to that used to evaluate performance in/of the organisation. As such, more than one of the procedures should be used to evaluate the economic worth, that is, estimate profitability, of a human resource investment proposal. (to be continued)

Table 2.3

Calculating the accounting rate of return of a human resource investment proposal

	Years			Average
	1	2	3	
Net income	$3000	$4000	$5000	$4000
Investment expenditure				
W.D.V.* 1 July	14,000	10,000	7875	
30 June	10,500	7875	5906	
Average	12,250	9187	6890	9442
Simple average	14,000	—	5906	9953

*W.D.V. is an abbreviation of written down value and is calculated assuming amortization of 25 per cent employing the reducing balance method.

Accounting rate of return calculations:

(1) Utilising initial investment expenditure:

$$\frac{4000}{14{,}000} \times \frac{100}{1} = 29 \text{ per cent}$$

(2) Utilising average investment expenditure:

$$\frac{4000}{9442} \times \frac{100}{1} = 42 \text{ per cent}$$

(3) Utilising simple average of investment expenditure:

$$\frac{4000}{9953} \times \frac{100}{1} = 40 \text{ per cent}$$

References

1 Wendell French, *The Personnel Management Process: Human Resource Administration* (third edition), Boston, 1974, p. 226

2 H. J. Chruden and A. W. Sherman, *Personnel Management* (fourth edition), Cincinnati, 1972, p. 150

3 *ibid.*, p. 269

4 Donald P. Crane, *Personnel Management: A Situational Approach*, Belmont, 1974, p. 129

5 R. Lee Brummet, 'Accounting for Human Resources', *The New York Certified Public Accountant*, Vol. XL, No. 7, July 1970, p. 500

6 E. J. Burke, *A Survey of Capital Budgeting Practices by Australian Companies*, Newcastle, 1970–1, pp. 28–9

7 *ibid.*, pp. 28–9

8 The one exception to this rule is the author's dissertation, titled, *Economic Evaluation Techniques Applied to Human Resource Accounting*, presented to the School of Business for the Diploma of Business Studies at the Prahran College of Advanced Education, Melbourne, Semester 2, 1976. It should be noted that, whilst the hypothesis of this study and that of the dissertation are similar, the treatment of the subject matter is, for the most part, different.

9 It should be noted that the findings of Rensis Likert support this assertion. He affirms that 'when all the relevant factors are taken into consideration, especially time, and the proper analysis made, consistent, positive relationships can be expected among causal, intervening, and end-result variables in every organization', R. Likert, *The Human Organization: Its Management and Value*, Tokyo, 1967; pp. 98–9; for a list of these variables, refer *ibid.*, Appendix 111, pp. 212–29

10 For discussion of the selection process refer P. I. Royce, 'Employment', in W. J. Byrt and L. Pickett (eds.), *Personnel Management in Australian Industry and Commerce,* Melbourne, 1971, Chapter 9

11 C. G. Peirson and A. G. Bird, *Business Finance* (second edition), Sydney, 1976, p. 78

12 *ibid.*, p. 78

13 It should be noted that if the reader is not familiar with, or wishes to do further reading in this field, he is directed to M. M. Scorgie, I. Urquhart and I. Greene, *Interest: A Programmed Introduction*, Victoria, 1976

14 Peirson and Bird, *op. cit.*, p. 87

15 *ibid.*, p. 87

16 K. A. Middleton, *The Economics of Capital Expenditure* (fourth edition), Sydney, 1977, p. 21

17 For explanation as to why interpolation is an approximation, refer *ibid.*, p. 22

18 Peirson and Bird, *op. cit.*, p.86

19 National Association of Accountants, *Financial Analysis to Guide Capital Expenditure Decisions,* Research Report 43, New York, July 1967, p. 115

20 *ibid.*, p115

21 Peirson and Bird, *op. cit.*, p. 77

22 *ibid.*, p. 80

23 *ibid.*, p. 79

Part 2

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Ascertaining investment expenditure

Investment (or capital) expenditure is a cost incurred, the benefit from which is expected to be derived over a period exceeding twelve months (one accounting period). Investment expenditure is a prerequisite to the accounting rate of return method. Cash investment is a prerequisite to the D.C.F. techniques – the net present value and internal rate of return methods. In this section the costs assumed to constitute investment expenditure are defined and a model to ascertain them is developed. Then, the adjustment from investment expenditure to cash investment is illustrated.

It may be suggested that, since the D.C.F. techniques are cash models, it is unnecessary to distinguish between capital and current human resource costs. This view is of dubious merit. The wages/salaries of the acquirer, developer and other members of the organisation should be included in the investment expenditure and its adjustment to cash investment incurred by the organisation in the newly-acquired human resource. However, these costs should only be included to the extent that they are incurred in the acquisition and development of a human resource. The failure to distinguish between capital and current human resource costs may lead to incorrect inclusions and/or exclusions of costs, or a portion of costs, in the calculation of investment expenditure and cash investment.

Cost factors

The costs of acquisition and development are assumed to be the total investment expenditure in a human resource (refer Figure 1.1). Flamholtz states 'the original cost of human resources refers to the sacrifice that was actually incurred to acquire and develop people. This is identical to the concept of original cost for other assets, i.e., the original cost of plant and equipment is the cost incurred to acquire these resources.'[1] Acquisition and development costs are the start-up costs incurred by the organisation in a human resource.

Acquisition costs are those costs associated with acquiring a human resource. The components of these acquisition costs are recruiting, selecting and hiring and placement costs. Recruiting costs are those costs incurred to recruit a human resource. Typically, they include advertising, travelling, employment agency fees and the cost of recruiting programs.

The other category of costs included in investment expenditure are development costs. Development costs are those costs associated with developing a human resource and these can be classified into formal and on-the-job development costs. Formal development costs are the costs of familiarising a human resource with the organisational procedures (as distinct from the procedures of his job) and include the costs incurred on training programs. On-the-job development costs are the costs incurred in training a human resource on the job.

Measures

June Gleeson suggests that 'time may be used as a measure of many of these costs'.[2] She points out that recruitment requires personnel and executive time for, amongst other things, job specification and preparation of advertisements. Selection involves personnel and executive time for, inter alia, interviews and reference checking. She observes that 'induction may involve formal courses or on-the-job training entailing employee's and manager's time, and lost productivity'. As such, time can be employed to ascertain investment expenditure in human resources.

As was pointed out previously, investment expenditure in a human resource is incurred over the span of time, which includes the acquisition and development periods namely, the investment period. The acquisition period is the span of time during which acquisition costs are incurred. The development period is the span of time during which development costs are incurred. Investment expenditure in a human resource is measured by the total cost incurred by the organisation during the investment period. Typically, it takes the form of non-salary cash outlays and comprises the total revenue that is sacrificed by the organisation as a consequence of acquiring and developing a human resource. These components of investment expenditure are illustrated in Figure 3.2.

Expense centres

The 'wages/salaries' and 'total revenue sacrificed' components of investment expenditure may be derived from four sources: the acquirer, the developer, the newly-acquired human resource and the other members of the organisation. Knowledge of these sources, and the extent to which an investment proposal may be subject to them, can facilitate the estimation of investment expenditure in a newly acquired human resource.

Firstly, 'in an expense centre, inputs are measured in monetary terms, while no attempt is made to measure outputs in monetary terms. Expense centres typically render services to other subunits of an organisation.

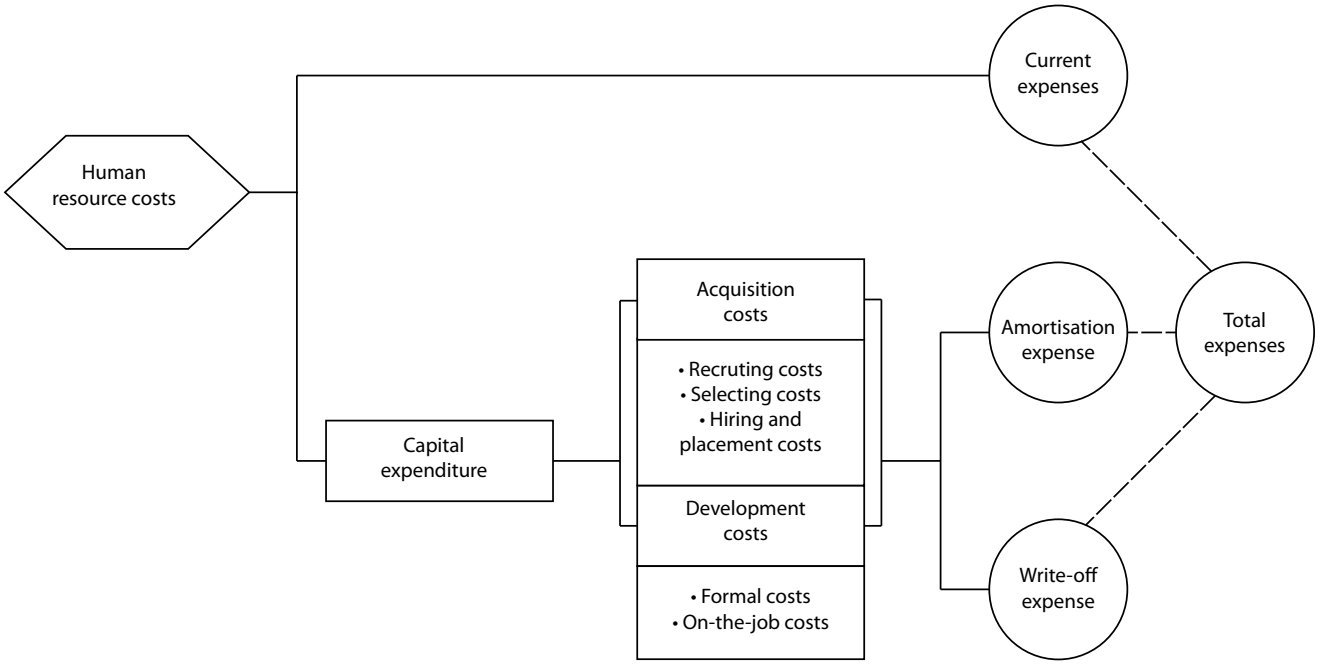

Figure 3.1 Expanded Dichotomy of Human Resource Costs

For example, the personnel department is an expense centre.'[3] When the acquirer is employed in an expense centre, he is fulfilling a service function. As such, total revenue is not generally sacrificed. However, the wages/salary paid to him during the acquisition period is included in the investment expenditure incurred in the newly acquired human resource.

Conversely, 'in a profit centre, both inputs and outputs are measured in monetary terms. For example, a division that is responsible for both manufacturing and sales constitutes a profit centre.' When a person, from a profit centre, is allocated the task of acquiring a human resource, the organisation will usually sacrifice total revenue. This sacrificed revenue, and the wages/salaries (refer Figure 3.3) paid to the acquirer during the acquisition period, is included in the investment expenditure incurred in the newly-acquired human resource.

Secondly, when the developer is employed in an expense centre (for example, personnel department), he is fulfilling a service function and, as such, total revenue will not generally be sacrificed. However, his wages/salary is attributed to investment expenditure in the newly-acquired human resource. When a person from a profit centre is allocated the task of developing a human resource, the organisation will generally sacrifice total revenue. This sacrificed revenue, and the wages/salary (refer Figure 3.3) paid to the developer during the development period, is included in the investment expenditure incurred in the newly-acquired human resource.

Although the time spent on development will occur during the development period, this period may not be totally spent on developing the newly-acquired human resource. When this is the case, a portion of the salary paid to the developer (calculated on the basis of the time spent on developing a particular human resource) is included in the investment expenditure incurred in the newly-acquired human resource. This same principle is applied to the acquirer. However, it should be noted that, in the process of acquiring a human resource, costs may be incurred during the acquisition period on recruiting and selecting human resources who, for one reason or another, are not hired. These costs are allocated to the acquisition cost of the human resource hired.

Thirdly, a newly-acquired human resource may be placed in a position and his experience, qualifications and the nature of his job might not require him to go through a development period. However, when this is not the case, the wages/salary paid to him (refer Figure 3.3) and the total revenue that is usually sacrificed by the organisation during the development period, is included in the investment expenditure incurred in the newly-acquired human resource.

Fourthly, investment expenditure may also be incurred in a newly-acquired human resource from members of the organisation other than the acquirer, the developer and the newly-acquired human resource. The organisation may incur investment expenditure in a human resource as a result of the nature of its work flow. Thompson suggests that there are three types of work flow: pooled, sequential and reciprocal.[4] Yuill states that, in the case of pooled interdependence, there is no immediate work flow between work roles; an example may be two clerks employed on simultaneous operations which have no immediate work relation with each other.[5] When

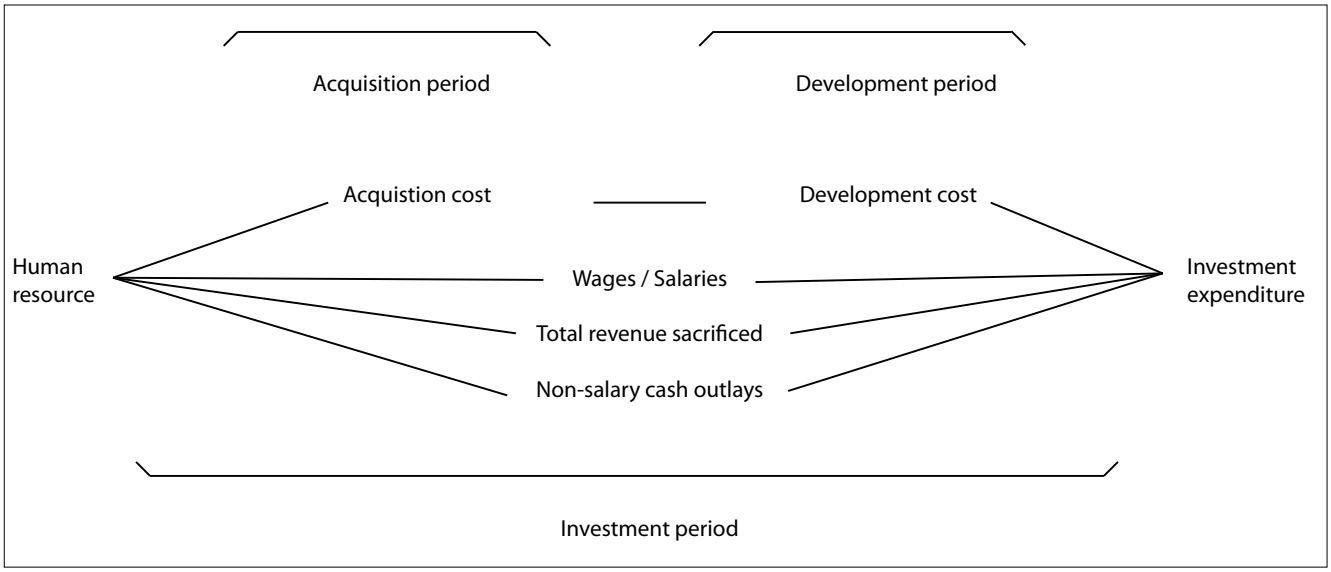

Figure 3.2 Components of Investment Expenditure

an organisation has a pooled interdependent work flow, the newly-acquired human resource is not likely to retard the work of others and, as such, the wages/ salaries paid to other members of the organisation may not be included in the investment expenditure incurred in the newly-acquired human resource.

Alternatively, 'in sequential interdependence, the work flows clearly from one role to another; an example is one man passing work to another. In reciprocal interdependence the work flows back and forth from one work role to another'. When the organisation has either sequential or reciprocal interdependent work flow, the newly acquired human resource may temporarily retard the work of others and, as a consequence, the organisation may sacrifice total revenue. This sacrificed revenue, and the wages/ salaries (refer Figure 3.3) paid to other members of the organisation during the development period, is included in the investment expenditure incurred in the newly-acquired human resource.

Having discussed the sources from which an organisation may incur investment expenditure in a newly-acquired human resource, Figure 3.2 can now be expanded. The sources from which the wages/ salaries component of investment expenditure is derived are highlighted in Figure 3.3.

Revenue sacrifices

In Figure 3.3 the assertion that investment expenditure in a human resource does not necessarily consist only of cash outflows is elucidated. Total revenue sacrificed is not a cash outflow. However, it is included in investment

Table 3.1
Ascertaining Investment Expenditure

Components	Time	
	Status Quo	Investment Period (Say 6 months)
A. Total Revenue	$50,000	$40,000
Total Revenue Sacrificed		$10,000
B Wages/Salaries		
1 acquirer		1000
2 developer		2000
3 new human resource		3000
4 retarded workers		4000
C Non-Salary Cash Outlays		400
Investment Expenditure		$20,400

Table 3.2
Ascertaining Investment Expenditure for the Accounting Rate of Return Method

Components	Time	
	Status Quo	Investment Period (Say 6 months)
A. Total Revenue	$50,000	$40,000
Total Revenue Sacrificed		$10,000
B Wages/Salaries		
1 acquirer		1000
2 developer		2000
3 new human resource		3000
4 retarded workers		4000
C Non-Salary Cash Outlays		400
Investment Expenditure		**$20,400**
Less: taxation benefit*		**(9180)**
Net Investment Expenditure		**$11,220**

*The calculation of the taxation benefit assumes a taxation rate of 45%

expenditure. It is an opportunity cost and, therefore, may be defined as a benefit sacrificed by an organisation as a consequence of pursuing a particular alternative. This alternative is assumed to be the existing situation prior to acquiring a human resource, that is, the maintenance of the status quo. The benefits which are sacrificed are assumed to be measurable in cash.

Similarly, Flamholtz advocates the inclusion of opportunity costs in the measurement of original cost in human resources, calculated for managerial purposes. For external reporting purposes, opportunity costs are excluded from the original cost of human resources. Firstly, 'because there are often difficulties involved in measuring opportunity costs, it may not be feasible to obtain objective estimates' and, secondly, their inclusion contravenes current accounting conventions.

The components of investment expenditure which are illustrated in Figure 3.3 are shown in Table 3.1.

Tax aspects

The present Australian taxation laws provide a tax deduction for wages/salaries and non-salary cash outlays. Most forms of revenue are taxable pursuant to the *Income Tax Assessment Act*. Therefore, if the total revenue component of investment expenditure had not been sacrificed, it more than likely would have been subject to taxation. As such, the taxation saving on investment expenditure is included in the capital budgeting procedure computations. To include it in the accounting rate of return method, the taxation benefit is deducted from investment expenditure (that is, gross investment expenditure) to determine net investment expenditure. In Table 3.2, the illustration in Table 3.1 is extended and the impact of the taxation benefit on investment expenditure for the accounting rate of return method is shown.

Investment expenditure is a prerequisite to the accounting rate of return method and, therefore, is calculated on an accrual basis. Alternatively, cash investment is a prerequisite to the D.C.F. techniques and, as such, is computed on a cash basis. The adjustment of investment expenditure to cash investment is twofold. Firstly, the taxation saving on investment expenditure is treated as a cash inflow in the year in which the benefit accrues, which is the year subsequent to when the investment expenditure is incurred. It should be noted that this treatment, to include the taxation saving on investment expenditure, is different from that outlined above for the purpose of the accounting rate of return method. Secondly, non-cash items, for example, accruals, are included in the calculations in the year the cash transactor takes place, as distinct from when the accrual arises.

Investment expenditure in some resources (for

example, movie actors, sportsmen) may be a one-time cash payment upon signing a contract but investment expenditure in human resources in industry and in the professions does not usually take this form. For the most part, the acquisition and development process is not conducted in a vacuum. The process necessarily affects the acquirer, the developer and may affect other members of the organisation, depending on the nature of the organisation's workflow.

Computing economic life

Economic life is the estimated length of time over which the benefits of an investment (proposal) are expected to be derived and is a prerequisite to the D.C.F. techniques. Further, average net income is a prerequisite to the accounting rate of return method. It is calculated by dividing the total net income from an investment proposal by the proposal's economic life. As such, economic life is a prerequisite to the accounting rate of return method. A statistical method to compute the economic life of a human resource is developed in this chapter. The notion of economic life is distinct from that of maximum life. Maximum life is the mandatory retirement age, less the person's age when hired.

Economic Life is the estimated length of time over which the benefits of an investment (proposal) are expected to be derived. This length of time is assumed to be the person's expected length of tenure and, therefore, benefits are assumed to extend to, and cease on, termination. Determination of the net present value and internal rate of return of an investment proposal are based on economic life. To use maximum life when it is different from economic life may distort estimates of economic worth and lead to acceptance of unprofitable investment proposals.

Some proponents of human resource accounting assert that actuarial predications can be employed to compute economic life. Thomas McRae describes the 'Bell System' project of the American Telephone and Telegraph Company (A.T. & T.). He asserts that 'tenure is actuarially determined'.[6]

Flamholtz suggests that the factors that determine a person's service life cannot be known with certainty and, consequently, 'we must measure the individual's service life probabilistically'. He submits that 'we refer, therefore, to "expected service life" meaning the mathematical expectation of his service life.'

Labour turnover

June Gleeson comments that 'the use of groups, rather than individuals, may help the prediction' of expected tenure. Further, 'Andrew Young for example has shown that for homogeneous groups employee turnover follows predictable patterns.' Andrew Young asserts 'there is general agreement in the literature, see for example Hedberg,[7] that turnover ... decreases with increasing age, decreases with increasing tenure, decreases with increasing skill, and, is greater among women than men."[8] 'Labour turnover refers to changes in the personnel of any organisation caused by people leaving its employment.'[9] Furthermore, more commonly, a firm's labour turnover is indicated by its separation rate, which may be calculated by the number of terminations (for whatever reason) in a

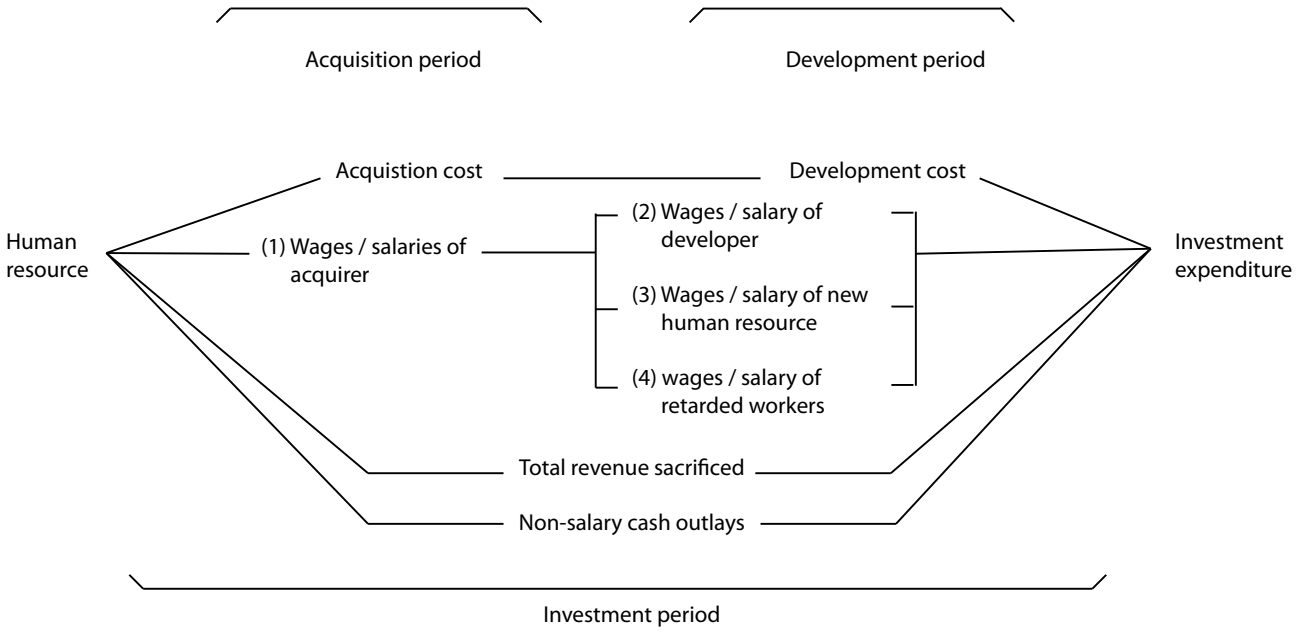

Figure 3.3 Sources of Investment Expenditure

given period divided by the average number of people serving in the organisation in that period. Therefore, the factors that determine turnover are, for the most part, the determinants of economic life. As such, this information can be used to compute economic life.

Actuaries have already determined the required probabilities to enable the computation of economic life of many human resources. Their work involves the theory and practice of statistics. In practice, these statistics usually relate to mortality, sickness and withdrawal probabilities for superannuation funds. They also have techniques and resources at their disposal to enable any analysis of movements within any population. Whilst these probabilities have been developed for other purposes, they nevertheless can be used for the computation of economic life.

Actuarial techniques

The actuarial technique is iterative in that it carries forward the answer to a calculation and uses it as the starting point for the next calculation in the estimation process of economic life. Accordingly, the actuarial technique employed here to compute economic life may be described as an iterative process which reduces maximum life to economic life.

The computation of economic life entails three steps. Firstly, probabilities of termination are developed. Secondly, this data is used to compute the complete economic life of a human resource. Thirdly, the complete economic life of a human resource is adjusted to compute his/her economic life.

The first step to compute economic life is to determine the probabilities of termination. These are assumed to be death, ill-health and withdrawal. Withdrawal may be defined as voluntary resignation, or compulsory dismissal, but may not necessarily include retrenchment. Factors affecting the probability of withdrawal may include, for example, qualifications, marital status, nature of work, personal financial position and the organisational environment. The organisational environment includes the 'informal organisation', which is the complex network of relationships among different organisational members. Ill-health may be defined as either the inability of a person to continue in his/her own job, or the inability to continue in any gainful employment with the organisation.

The definition of ill-health may depend on the managerial policy of the organisation. As a consequence of the nature of work, a person may become unable to continue in their job but be able to do other work with the organisation. For example, the stress of being a bank manager may cause a heart attack and the manager could then be utilised as an assistant manager or supervisor. When this is the case, the latter definition may be utilised. Alternatively, if the organisation has a policy of not transferring and/or demoting human resources (for reasons other than discipline) and provides adequate life insurance for the benefit of the individual (in order that he is not financially disadvantaged by the cessation of employment), then the former definition may be utilised. That is, the individual may be retired on the grounds of ill-health and may receive a lump-sum payment or pension benefit on retirement.

The probabilities of termination are expressed as a function of age. The probabilities of death and ill-health increase at an increasing rate with age and the probability of withdrawal is inversely related to age. The primacy of age, as a background factor to death, is explained by Benjamin and Haycocks when they state that 'at later ages the wearing out of the human frame rather than inimical qualities of the environment becomes the dominant cause of mortality.'[10] Similarly, the same applies for ill-health. At later ages, age is the dominant cause of ill-health.

The probabilities of termination in a hypothetical organisation (Baps P/L) are illustrated in Table 4.1. They include death, ill-health and withdrawal and are shown as a function of age. The data contained in the Table is for females only and, as probabilities will differ for females, another table should be developed.

The first step to compute economic life may then be amended to determine multiples of probability of withdrawal. As already mentioned, the probability of withdrawal decreases as the period of service with the organisation increases. Moreover, the probability of a human resource remaining in their job is a function of the time already spent in their job. This factor is not considered in Table 4.1. Withdrawal is shown as a function of age only.

An expedient approach involving the inclusion of the length of service effect into the computation of economic life, is to assign a multiple (as distinct from probability) which is dependent upon the length of service of a human resource and not dependent upon their age. Whilst this approach increased subjectivity, it should not distort, significantly, estimates of economic life. Multiples are developed mathematically, based on the experience of the organisation.

The multiples of probability of withdrawal applicable to Baps P/L are shown in Table 4.2.

Once the probabilities of termination are developed (probabilities of withdrawal by age and by duration, as well as death and ill-health), this information is utilised to compute the complete economic life of a human resource. The computation of complete economic life

Table 4.1
Probabilities of Termination – Baps P/L – Males Only

Age	Death	Ill-Health	Withdrawal	Age	Death	Ill-Health	Withdrawal
20	.0012	.0002	.1107	43	.0024	.0012	.0493
21	.0012	.0002	.1081	44	.0026	.0013	.0440
22	.0012	.0002	.1063	45	.0029	.0014	.0400
23	.0012	.0002	.1027	46	.0032	.0015	.0360
24	.0012	.0003	.1000	47	.0036	.0016	.0320
25	.0012	.0003	.0973	48	.0040	.0018	.0280
26	.0012	.0004	.0947	49	.0045	.0020	.0240
27	.0012	.0004	.0920	60	.0050	.0022	.0200
28	.0012	.0004	.0893	51	.0056	.0025	0160
29	.0012	.0005	.0866	52	0062	.0026	.0120
30	.0012	.0005	.0840	53	.0069	.0033	.0080
31	.0012	.0006	.0813	54	.0077	.0037	.0040
32	.0012	.0006	.0787	65	.0086	.0042	Nil
33	.0013	.0007	.0760	56	.0095	.0047	Nil
34	.0013	.0007	.0733	67	.0105	.0052	Nil
35	.0014	.0007	.0707	58	.0166	.0057	Nil
36	.0015	.0008	.0680	59	.0128	.0062	Nil
37	0016	.0008	.0654	60	.0142	.0067	Nil
38	.0017	.0009	.0627	61	.0158	.0072	Nil
39	.0018	.0009	.0600	62	.0177	.0077	Nil
40	.0019	.0010	.0573	63	.0199	.0082	Nil
41	.0020	.0010	.0547				
42	.0022	.0011	.0520	64	.0225	.0087	Nil

is the second step in the method to compute economic life. Given the data contained in Tables 4.1 and 4.2, the complete economic life of a man at the age of 50 is 12.99 years. This computation is illustrated in Table 4.3.

Examples

The above computation assumes that a newly-acquired human resource will remain at least one year with the organisation. The cumulative probabilities of survival, in Table 4.3, relate to the probability of an individual starting the subsequent year. Consequently, once a human resource is employed, the probability of him starting the first year is defined as 1.000. As such, the above computation also assumes that a newly acquired human resource will only leave at the end of a complete year of employment and, therefore, if a man commences employment on 1 January in any year, the assumption is made that he will terminate employment on 31 December in that or any subsequent year. Similarly, if a man commences on 15 April, then it is assumed that he will only leave on any subsequent 14 April.

To avoid these assumptions implicit in the computation of complete economic life, a further assumption is made. Exits from employment will occur, on average, in the middle of the year of employment of the newly-acquired human resource. This assumption is made on the basis that exits from service will occur continuously throughout the year and not on specific dates, viz., not at the end of each year. To include this assumption in the computation of economic life, the computation of complete economic life is adjusted. This adjustment is the third and final step in the computation of economic life.

Table 4.2
Multiples of Job Tenure –Baps P/L. – Males Only

Years of Past Service	Multiples	Years of Past Service	Multiples
1	2.500	6	1.250
2	2.250	7	1.000
3	2.000	8	1.000
4	1.750	9	1.000
5	1 500	10 on	1.000

Table 4.3
Computing Complete Economic Life Baps P/L. – Male Aged 50

Age		Probabilities of Termination				Cumulative Probabilities of Survival
		Death	Ill-Health	Withdrawal		
				By Age	By Duration	
50	1.0000 x (1 –	.0060 –	.0022 –	.0200 x	2.5000) =	.9428
51	.9428 x (1 –	.0056 –	.0026 –	.0160 x	2.2500) =	.9012
52	.9012 x (1 –	.0062 –	.0026 –	.0120 x	2.0000) =	.8717
53	.8717 x (1 –	.0069 –	.0033 –	.0080 x	1.7500) =	.8506
54	.8506 x (1 –	.0077 –	.0037 –	.0040 x	1.6000) =	.8358
55	.8358 x (1 –	.0066 –	.0042 –	0.0000 x	1.2500) =	.8251
66	.8251 x (1 –	.0085 –	.0047 –	0.0000 x	1.0000) =	.8134
57	.8134 x (1 –	.0105 –	.0052 –	0.0000 x	1 0000) =	.8006
58	.8006 x (1 –	.0116 –	.0057 –	0.0000 x	1.0000) =	.7867
59	.7718 x (1 –	.0128 –	.0062 –	0.0000 x	1.0000) =	.7718
60	.7867 x (1 –	.0142 –	.0067 –	0.0000 x	1.0000) =	.7557
61	.7557 x (1 –	.0158 –	.0072 –	0.0000 x	1.0000) =	.7383
62	.7383 x (1 –	.0177 –	.0077 –	0.0000 x	1.0000) =	.7195
63	.7196 x (1 –	.0199 –	.0082 –	0.0000 x	1.0000) =	.6993
64	.6993 x (1 –	.0225 –	.0087 –	0.0000 x	1.0000) =	.6775
				First year		11.990
				Complete Economic Life		1.000
						12.990 years

*The cumulative probabilities of survival relate to the probability of starting the subsequent year. Consequently, once a human resource is employed, the probability of them starting the first year is defined as 1.000. Therefore 1.000 must be added to the total of the cumulative probabilities to compute complete economic life.

The third step in the computation of economic life is illustrated in Table 4.4 and the adjustment of complete economic life to economic life for a 50-year-old male at Baps P/L is shown.

Given the probabilities of termination (refer Table 4.1) and multiples of job tenure (refer Table 4.2), the economic life of a male aged 50 at Baps P/L is 12.15 years (refer Table 4.4). Alternatively, his maximum life is 15 years. Using the same probabilities of termination and multiples of job tenure, the economic life of a male aged 30 at Baps P/L is 9.39 years whereas his maximum life is 35 years. Further, the economic life of a male aged 20 at Baps P/L is

6.36 years and his maximum life is 45 years. The use of economic life, instead of maximum life, in the capital budgeting procedures is desirable. Economic life, by its use of empirical data relating to designated contingencies should, for the most part, provide a more realistic indication of actual service life. Accordingly, economic life is less likely to attribute erroneous benefits to an investment proposal and lead to the acceptance of unprofitable proposals.

Clearly, the greater the size of the population the greater the likelihood that the economic life of a human resource will predict his actual service life. The probabilities of death may be based on the community at large and may be adjusted to allow for the fact that there is a definite bias for healthier members of the population to be in the workforce and for unique factors within the occupation and/or organisation. Withdrawal and ill-health rates are drawn from within the occupation in the organisation. However, if the population is too small to be significant, the information is drawn from similar occupations. As stated earlier, 'for homogeneous groups, employee turnover follows predictable patterns' and, therefore, the use of similar occupations, and/or human resources, is expedient.

Adjustments

The probabilities used to compute economic life may be based on either historical data or historical data which is adjusted for future occurrences. The use

Table 4.4
Computing Economic Life
Baps P/L. – Male Aged 60

Economic Life:
= 1/2 (1. 000 + .9428) + 1/2 (.9428 + .9012) + 1/2 (.90124 + .8717) ... + 1/2 (.6993 + .6775)
Expanding the brackets:
= (1/2 x 1/2 x .9428) + (1/2 x .9428 + _ 1/2 x .9012) + (1/2 x .9012 + 1/2 x .8717) + ... + (1/2 x .6993 + 1/2 x .6776)
Grouping like terms:
= 1/2 + .9428 + .9012 + .8717 + . 6993 + 1/2 x .6775
However, from Table 4.3 Complete Economic Life:
= 1 + .9428 + .9012 + .8717 + ...+ .6993 + .6775
Therefore, Economic Life (i.e adjusted Economic Life):
= Complete economic life – 1/2 – (1/2 x .6775)
= ·12.990 – 1/2 – 3388
= 12.15 Years

of the former has the advantage that it is objective. However, it assumes that past experience is indicative of the future. When this assumption cannot be made, historical data is adjusted for future occurrences. Such adjustments should be determined by the organisation on the basis of the anticipated market environment which, amongst other things, will predetermine their staffing needs. For example, resignations may be discouraged or encouraged depending on the organisation's need for staff to meet the anticipated demand for goods and/or services. Whilst this adjustment has the advantage that it may account for future occurrences, it is, nevertheless, based on the subjective bias of the person(s) making the adjustment. Consequently, this approach, unlike the former, is subjective.

Write-off expenses (refer Figure 1.1) relate to the capital expenditure in a human resource which is written off in the current year. It is the written-down-value of the investment and may be determined by deducting the accumulated amortisation of the investment from the capital expenditure in a human resource. These expenses result from the termination, from employment, of a human resource prior to the completion of his economic life. Accordingly, when the economic life of a human resource is the same as his actual service life, the organisation does not incur write-off expenses.

Further, a human resource may not only terminate employment prior to the completion of his economic life but, conversely, he may remain with the organisation beyond his economic life. As such, an organisation is subject to the risk that the economic life of a human resource may vary from his actual service life. In particular, this risk relates to terminations from employment prior to, and post, economic life.

Managerial policy towards this risk may vary depending on, inter alia, the past experience of the organisation. If, for example, the economic lives of past employees are not significantly different from their actual service lives, management may consider the risk minimal. Therefore, management may exclude this risk from the capita1 budgeting procedure calculations. However, when this is not the case, management may include risk in the calculations by, for instance, adjusting economic life. Alternatively, management may assess the risk by, for example, the standard deviation approach and consider the risk factor when selecting the human resource. It should be noted that, although the principles of the standard deviation approach are similar, application of the approach is distinct. The assessment of risk requires, inter alia, that the expected value of the possible annual net cash inflows be calculated.

The assessment of the risk associated with the economic life of a human resource requires, inter alia, that the expected life of a human resource be determined.

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Part 3

September 1982, Vol. 18 No. 3

Estimating net income

The net income from an investment proposal is a prerequisite to the accounting rate of return method. The D.C.F. techniques:- the net present value and internal rate of return methods, are cash models and, as such, net cash inflows are a prerequisite to these techniques. Once estimated over a proposal's economic life, annual net cash inflows are discounted to determine a proposal's net present value and internal rate of return. In this article, various methods to estimate net income are outlined and a means by which net income may be adjusted to annual net cash inflows is proposed.

Of fundamental importance to the use of capital budgeting procedures is the adherence to two management accounting concepts. The National Association of Accountants express the view that 'the term incremental refers to the additional revenue or cost expected from the project.'[1] The Association stresses that 'the term relevant emphasises the idea that a cost or revenue recognised should be causally related to the project in question.'[2] Contravention of these basic tenets of the various capital budgeting procedures may distort estimates of economic worth and lead to an incorrect choice between alternatives.

The estimation of relevant incremental data may be one of the most challenging tasks in the use of capital budgeting procedures. The inability to comply with these criteria may impair, if not prohibit, the inclusion of capital budgeting procedures in the selection process of many human resources (for example, many unskilled and semiskilled human resources). Whilst the use of surrogates may have application in this regard, it is not intended to investigate their use.[3] However, it is possible to estimate relevant incremental data for many human resources seeking employment with professional organisations (for example, accountants, engineers, etc.) and industrial organisations (for example, advertising agents, retailers, salesmen, manufacturers, etc.).

Net income may be estimated by either the contribution method or the comparative – contribution method. The former method involves the preparation of a contribution statement prior to the selection of human resource. The statement contains incremental gross income and incremental costs directly attributable to a human resource investment proposal. Once determined, the latter is deducted from incremental gross earnings to estimate net income.

The comparative – contribution method entails the preparation of a comparative – contribution statement prior to the selection of a human resource. The statement outlines total gross income and costs, prior to the introduction of an investment proposal. It also outlines estimated gross income and costs after the selection of the proposal. The difference in the comparative data is assumed to be incremental and the excess (of incremental income over incremental costs) is said to be the net income attributable to the human resource investment proposal.

Implicit in the contribution method is the assumption that the selection of a human resource will not alter the gross income and costs attributable to existing organisational members. The comparative – contribution method does not make this assumption. However, unlike the contribution method, its use involves estimating data pertaining to groups rather than individuals and, consequently, caution must be exercised to ensure maintenance of the relevant and incremental criteria. One safeguard is to ensure that data contained in the comparative – contribution statement applies to subgroups within the organisation. For example, an appropriate subgroup for a sales manager may be the sales department, whereas that of a salesman may be the sales team (as distinct from the department) in which he is intended to work.

Incremental gross income

Incremental gross income for the contribution method may be calculated by the price-quantity method. Flamholtz suggests that this '... involves determining the product of the price per unit of human services.' Accountants' services, for example, are charged on a time basis and, consequently, the estimation of gross income is obtained by multiplying, as Flamholtz points out, a person's 'net chargeable hours' to clients ... by ... his applicable billing rate.' Similarly, the gross income of an insurance salesman may be estimated by multiplying the number of policies that he is expected to sell by the selling price of each policy. Further, the price-quantity method may be extended to apply to subgroups (instead of individuals) to estimate total gross income for the comparative – contribution method.

The National Association of Accountants assert that 'since decision making is the main purpose of project analysis the development of information about projects should be directed at revealing differences between alternatives.' Similarly, information contained in the contribution and comparative-contribution statements is aimed at disclosing differences between alternate proposals. Fixed expenses do not usually differ between proposals and, consequently, may be

excluded from the calculation of net income. However, product costs vary with sales and, as these may vary between alternate proposals, they are included in the calculation of net income and, therefore, may be shown on the statements.

Further examples of costs that may be included in the calculation of net income include two components of Figure 1.1 – current expenses and amortisation expense. Current expenses are costs incurred, the benefit from which is expected to be derived within one accounting period. Expenses such as wages/ salaries, workers compensation, payroll tax, etc., to the extent that they are incurred after the investment period, are examples of human resource current costs. The term amortisation is generally used to describe the process of allocation, whereby the capital cost of a non-physical asset is apportioned by means of periodic charges against revenue.[4]

It is advisable, for the purpose of capital budgeting procedures, to regard tax payable as an expense rather than an appropriation of profit and, therefore, tax payable should be included in the calculation of net income. Tax payable is a function of, inter alia, income and, as the latter may vary between proposals, so too may tax payable. Consequently, the taxation effect of each proposal may be different and, as such, the exclusion of tax payable from the calculation of net income may result in an incorrect decision between proposals. It should be noted that the present Australia taxation laws do not allow a tax deduction for the amortisation of the investment in human resources. Therefore, amortisation should not be included in the estimation of taxable income, calculated for the purpose of determining tax payable. Conversely, the present Australian taxation laws, for the most part, allow a tax deduction for the components of investment expenditure. This taxation saving on investment expenditure is included in the various capital budgeting procedure computations.

Amortisation

The method of amortisation, and the period of time over which the investment is amortised, may also affect net income estimated for application to the accounting rate of return method. Two methods that may be employed, to amortise the investment in human resources, are the straight-line and reducing-balance methods. Like the basis (the time period) utilised to amortise the investment, the method of amortisation is subject to the convention of matching costs with revenues and the method selected should be that which best complies with the matching process. The reducing-balance method, for example, may be used when the investment is expected to accrue greater benefits in the proposal's earlier years. Once selected, compliance with the doctrine of consistency demands that the basis, and method, of amortisation are not changed, irrespective of their effects on profitability.

Whilst the amortisation process generally occurs throughout the economic life of the human resource investment, there may be exceptions to this rule. In describing the human resource accounting system established at the R.G. Barry Corporation, Woodruff proposes that 'human resource account balances are amortised annually based upon the expected working life of the person or, in the case of training and development accounts on a fixed shorter period.'[5] Michael Alexander, a partner of Touche Ross &

Table 5.1
Contribution Statement
Estimating Net Income and
Annual Net Cash Inflow

Incremental Gross Income	$30,000
Less Incremental Costs	(14,000)
Taxable Income	$16,000
Less Tax Payable *	(7,200)
Less Amortisation Expense	(2,000)
Net Income	$6,800
Plus Amortisation Expense	2,000
Annual Net Cash Inflow	$8,800

Table 5.2
Comparative – Contribution Statement
Estimating Net Income and Annual Net Cash Inflow

	Status Quo $	With Investment $	Increment $
Gross Income	40,000	80,000	40,000
Less Costs Taxable	(15,000)	(28,000)	(13,000)
Tasable Income	26;000	52,000	27,000
Less Tax Payable* Less	(11,250)	(23,400)	(12,150)
Amortization Expense	(7,090)	(10,000)	(3000)
Net Income	6;750	18.600	11,850
Plus Amortisation Annual Expense	7,000	10,000	3000
Annual Net Cash Inflow	13,750	28,600	14,850

Co., whose Montreal office has developed a human resource accounting system, asserts that 'amortisation for any investment category is based on the lesser of the individual's expected life with the firm, or the useful life of the investment. For example, when an individual has a four year expected life ... an investment in a training course which only stands to benefit this individual for two years, will be amortised over the two year period...'[6]

Net income is calculated on an accrual basis. Irrespective of which method is employed to estimate net income, the adjustment to a cash basis is similar. Firstly, non-cash items, such as amortisation expense, are added back to net income. Secondly, non-cash items, such as accounts receivable and accounts payable, are included in the calculation in the year the cash transaction takes place, as distinct from when the accrual arises. That is, annual adjustments are made to net income to compensate for the inclusion of accrual items. Similarly, Middleton observes that 'the conversion to a cash flow would require the kind of calculations which the accountant makes when he develops a cash budget from a set of operating budgets...'

Contribution method

In Table 5.1, the use of the contribution method to estimate net income and the annual net cash inflow for an accountant given the following hypothetically data is illustrated. Incremental gross income per annum is estimated at $14,000, tax rate is assumed to be 45% and amortisation is assumed to be $2,000 per annum.

Comparative – contribution method

In Table 5.2, the use of the comparative – contribution method to estimate net income, and annual net cash inflows for a salesman, given the following hypothetical information, is illustrated. It is estimated that the new salesman will make sales of $30,000 per annum and he will induce the existing salesmen to increase their sales with the result that total estimated gross income of the sales team will be $80,000 per annum. Costs are estimated at $38,000 per annum, which includes amortisation of $10,000. The tax rate is assumed to be 45%. All data in the table relates to the sales team in which he is to work, and the actual financial data pertaining to the team (prior to the selection of the new salesman) is assumed to be that outlined in the column titled 'Status Quo.'

Other models

The contribution method and the comparative – contribution method are two models that may be employed to estimate net income. However, it should be noted that these models may not have application in all circumstances. For example, there are situations which encompass a sequential or reciprocal interdependent workflow. Accordingly, it may be necessary for an organisation to utilise and/or develop other models to estimate net income. Irrespective of which model is adopted, precautions should be taken to ensure that it complies with the relevant and incremental criteria. In principle, Middleton states a broad approach to satisfy this criteria and estimate net income and annual net cash inflows when he asserts that 'since the relevant cash flows are incremental they must be developed against the alternative of what would happen without the investment. For the purely expansionary proposal the alternative is simply the continuance of the status quo.'

Assessing risk

Block and Hirt state that 'risk may be defined in terms of the variability of possible outcomes from a given investment.'[7] Weston and Brigham assert that 'sometimes a distinction is made between risk and uncertainty.'[8] Pierson and Bird affirm that 'risk involves situations in which 'a probability can be assigned to each of the possible outcomes, whereas in the case of uncertainty no such probability can be assigned to the possible outcomes.'[9] In this chapter a method to assess risk is outlined.

Middleton observes that almost all proposals have an element of risk although the degree of risk may vary significantly between proposals. He suggests that 'in the evaluation of single ... [proposals] ... and in choosing between [proposals] ... some measure of risk is desirable.' Further, the failure to consider risk implies that the organisation is indifferent to it. This implication is contrary to a basic assumption in financial theory. In reference to this assumption, Block and Hirt state '... that most investors and managers are risk averse – that is, for a given situation, they would prefer relative certainty to uncertainty.'

Various factors may affect a proposal's annual net cash inflows. Should these inflows vary from those estimated at the commencement of the proposal's economic life, so too will the outcome of the proposal and, as such, these factors give rise to risk. Trends in the economy and, in the organisation, organisational trends compared with similar organisations (for example, labour relations, share of market and technological advancement) and consumer preferences are some factors which may influence the annual cash inflows and outflows of a human resource investment proposal. Accordingly, investment in any given proposal is, to a greater or lesser degree, risky in

that its outcome may vary from that calculated at the commencement of the proposal's economic life.

Various methods

Prominent writers in the area of capital budgeting procedures suggest numerous methods to adjust for risk. These methods include, inter alia, the payback period, adjusting the discount rate and adjusting the cash flow estimates. Peirson and Bird point to various weaknesses of these methods. Firstly, they emphasise that the methods '... are essentially conservative adjustments which are more a means of avoiding risk than methods of evaluating the impact of risk on a proposal.' Secondly, they stress that 'these methods fail to allow for the fact that events may turn out to be more favourable than originally expected.' Thirdly, they assert that 'these methods involve adjustments to allow for risk which are essentially arbitrary ... [and that] ... they ... do not provide a specific measure of the risk associated with an investment proposal.'

Peirson and Bird suggest that a solution to such criticism is to use a probability distribution approach which aims at providing management with a better indication of the risk associated with a specific proposal. Conceptually, this approach may be illustrated by a comparison of two investment proposals. Assume, for example, that both executive A and executive B require the same cash investment and both have an economic life of one year. Furthermore, each proposal has several possible annual net cash inflows, (that is, several possible outcomes) and each possibility (that is, outcome) has an assigned probability of occurrence. Moreover, the expected value of the probability distribution of the possible annual net cash inflows for each executive is the same and is such to form a normal distribution.

Block and Hirt state that 'the expected value is a weighted average of the ... [possible] ... outcomes times their probabilities.'[10] In the above illustration, the probability distribution of the possible annual net cash inflows, for each executive, may be determined by multiplying each possible outcome (that is, each possible annual net cash inflow relating to the executive) by its probability of occurrence. Further, the expected value may be calculated by adding the probability distribution. Yamane suggests that 'a normal distribution is a symmetric distribution about the mean, with a frequency curve that is bell-shaped ...'[11] Shown graphically, the expected value and the normal distribution of the possible outcomes of the annual net cash inflow from each executive may appear as shown in Figure 6.1.

Dispersion

It is submitted that dispersion may be defined as the spread or variability of possible outcomes around the expected value. Similarly, Peirson and Bird suggest that 'dispersion refers to the degree to which possible outcomes deviate from the expected value.' Peirson and Bird observe that 'the wider the dispersion, the riskier the proposal is said to be.' This is explained by Weston and Brigham when they state that 'in general, the tighter the probability distribution, or alternatively stated, the more peaked the distribution, the more likely it is that the actual outcome will be close to the expected value.' It is illustrated in Figure 6.1 that executive A has a tighter dispersion than executives B and, therefore, the former is less risky. As such, assuming management is risk averse and assuming that all other variables are held constant, executive A is preferable.

Van Horne states '... that the conventional measure of dispersion is the standard deviation ...'[12] In particular, Block and Hirt suggest that the standard deviation is a '... measure of dispersion of variability around the expected value.' Assessment of the risk associated with a human resource investment proposal by the standard deviation approach involves four steps. Firstly, the expected value of the possible annual net cash inflows in each year of a proposal's economic life is calculated. Secondly, the standard deviation around the expected value of the probability distribution of the possible annual net cash inflows, in each year, is determined. Thirdly, the expected value of the net present value of the proposal is computed. Fourthly, the standard deviation around the expected value of the net present value of the proposal is ascertained.

Standard deviation approach

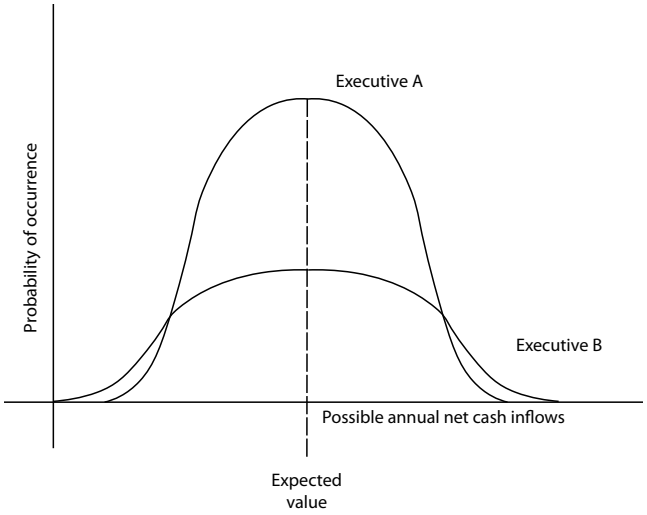

Figure 6.1 Comparison of probability distributions of annual net cash inflows

Application of the standard deviation approach may be illustrated by the following example. Assume that management is considering the appointment of an additional executive. It may choose between executive A and executive B. Both executives have an economic life of two years. The cash investment for each executive is the same and is estimated at $12,000; comprising a four month acquisition period with acquisition costs of $1000 per month incurred at the end of each month and $8000 developments costs incurred throughout the first year of each proposal's economic life. The required rate of return of the organisation is 12% per annum and the possible annual net cash inflows and their assigned probabilities of occurrence for the first year, for each executive, is shown in Table 6.1. Further, for each executive, the possible annual net cash inflows and their assigned probabilities of occurrence are the same in year two as those relating to him in the first year.

Net cash inflows

The first step to assess risk is the calculation of the expected value of the possible annual net cash inflows in each year of the proposal's economic life. Having established the possible annual net cash inflows and their assigned probabilities of occurrence over the economic life of each executive, the expected value of the possible annual net cash inflows in each of the two years for executive A is calculated.

Table 6.1

Executive A		Executive B	
Probability of Occurrence	Possible Annual Net Cash Inflow $	Probability of Occurrence	Possible Annual Net Cash Inflow $
.10	8 ,000	.15	6,000
.80	10,000	.70	10,000
.10	12.000	.15	14,000
1.00		1.00	

Assessment of risk

Once the expected value of the possible annual net cash inflows is calculated for each year, the second step to assess risk may be commenced. This step is the determination of the standard deviation around the expected value of the probability distribution of the possible annual net cash inflows in each year.

Net present value

The third step in the process of assessing risk is the computation of the expected value of the net present value of the proposal. Assuming independent annual net cash inflows, this may be computed by substitution in the formula to calculate the net present value. In particular, the annual net cash inflows are substituted by the expected value of the possible annual net cash inflows generated by the proposal. As such, the expected value of the net present value of a human resource investment proposal is then computed.

After performing the necessary calculations, the expected value of the net present value of both proposals is as follows:

Table 6.2 Computing the Expected Value of the Net Present Value of Executive A and/or B

Year	Net Cash Flow (1) $	Present Value Factor at 12% (2)	Present Value (1) x (2) (3) $
0	(4,057) (i)	1.00000	(4,057)
1	2,000	.89286	1,786
2	(ii] 10,000	.79719	7,972
Expected Value of the Net Present Value (Positive)			$5,701

(i) $4,057 is the accumulated value of the $, 4000 acquisition costs, accumulated at 12% per annum

(ii) $2,000 net cash flow is calculated by subtracting the $8,000 development costs from the expected value of the possible annual net cash inflow of $10,000

Once the expected value of the net present value of the proposals is computed, management is then able to ascertain the standard deviation around the expected value of the net present value of each proposal. This is the fourth step in the process to assess risk.

Having computed the expected value of the net present value and the standard deviation around that expected value for each executive and given that in this example the expected value relating to each proposal is the same, management is then in a position to assess the risk associated with the selection of each executive. Once assessed, management may compare the results and assuming all other variables held constant and that it is risk averse it may select that

proposal which is less risky. The risk associated with each proposal is shown diagrammatically in Figure 6.2 and 6.3.

It is illustrated in Figures 6.2 and 6.3 that the expected value of the net present value of both investment proposals is $5,701. That is, management's expected return on an investment in either executive A or executive B is $5,701. However, the figures also show that executive A has a standard deviation of $1071 whereas executive B has a higher standard deviation, viz., $2622. This suggests that executive B has a wider dispersion of possible outcomes. Therefore, although an investment in either executive A or executive B has the same expected return, an investment in the latter has a greater number of possible returns and, as such, a greater degree of risk is associated with it. Accordingly, assuming management is risk averse and assuming all other variables held constant, management would prefer executive A.

It should be noted that, in the above illustrative example, the expected value of the net present value of both investment proposals is the same and, as such, the standard deviation which is a measure of dispersion is also used as a measure of relative dispersion. However, when the expected value of the net present value of alternate human resource investment proposals are different, the standard deviation should not be used as a measure of relative dispersion. When this is the case, the coefficient of variation may be used. In reference to the coefficient of variation, Peirson and Bird suggest that it is '... a measure of the relative dispersion about the expected value, that is a measure which expresses the magnitude of the dispersion relative to the expected net present value.' Block and Hirt state that the coefficient of variation may be obtained by 'dividing the standard deviation from an investment by the expected value.' They observe that 'generally, the larger the coefficient of variation, the greater the risk.'

Further, when 'the standard deviation approach is used to assess risk, the risk-free rate of return should be used as the discount rate. Similarly, Van Horne states that 'for discounting the dispersion of the distribution ... we use the risk-free rate ...' To include risk premium in the discount rate – viz., a risk adjusted discount rate – when the standard deviation approach is used is tantamount to double counting. That is, the risk adjusted discounted rate includes a premium, or an adjustment for risk, in the discounting process. Accordingly, the risk-free rate of return is used as the discount rate to include the time value of money in the computations.

The various methods to estimate net income and its adjustment to annual net cash inflows which are outlined above may be used to obtain a single best estimate of the annual net cash inflows over a proposal's economic life. Alternatively, these methods may be applied to isolate several possible annual net cash inflows, each with a different subjective probability of occurrence. Moreover, application of the standard deviation approach to assess the risk associated with a human resource investment proposal requires the latter circumstance. Levin asserts that '... subjective probability can be defined as the probability assigned to an event by an individual, based on whatever evidence is available.' Factors that may be considered by the acquirer when assigning probabilities include trends in the economy and organisational trends compared with similar organisations. However, it should be remembered that a very real problem is that different people are likely to express different subjective probability distributions for the same outcome. The probability distribution of net cash inflows will therefore reflect the personal bias of the 'estimation'.

Conclusion

The method outlined in this article to assess the risk of human resource investment proposal is the standard deviation approach. This approach presumes that several possible annual net cash inflows can be isolated in each period of the proposal's economic life and that a subjective probability can be assigned to each possibility. To minimise the personal bias of the acquirer and, therefore, enhance the expediency of the assessment of the risk of the proposal, it may be desirable to maximise the number of possibilities and use a computer to decrease the time spent on lengthy and complex computations. However, precautions should be taken to maximise the propriety of the assessment or risk.

For illustrative purposes, the standard deviation approach is applied to the net present value method. The procedure to apply this approach to the net present value method involves four steps. Firstly, the expected value of the possible annual net cash inflows in each year of a proposal's economic life is calculated. Secondly, the standard deviation around the expected value of the probability distribution of the possible annual net cash inflows, in each year is determined. Thirdly, the expected value of the net present value of the proposal is computed. Fourthly, the standard deviation around the expected value of the net present value of the proposal is ascertained.

It should be noted that the standard deviation approach may also be applied to the internal rate of

return method. The procedure to apply this approach to the internal rate of return method, although similar, is not the same as the net present value method. The first two steps in the procedure are similar. However, the third step entails the computation of the expected value of the internal rate of return of the proposal. Fourthly, the standard deviation around the expected value of the internal rate of return of the proposal is ascertained. Further, like the net present value method, when the expected value of the internal rate of return of alternate investment proposals are different, the coefficient of variation is used as a measure of relative dispersion.

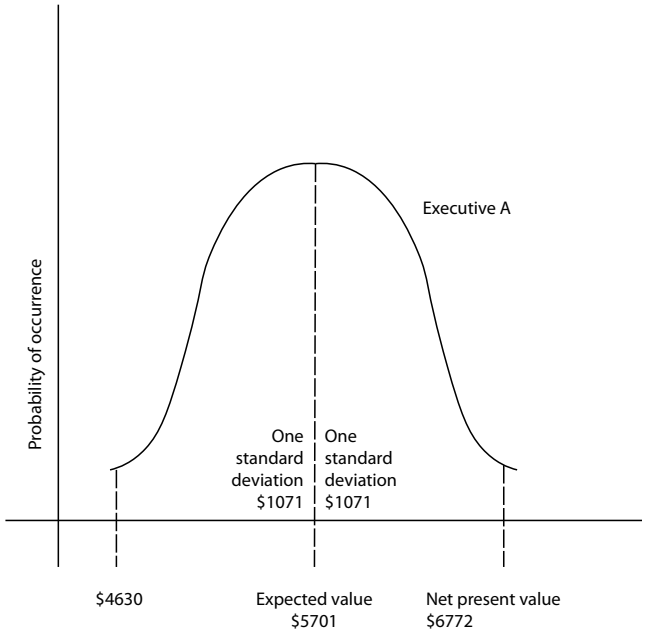

Figure 6.2

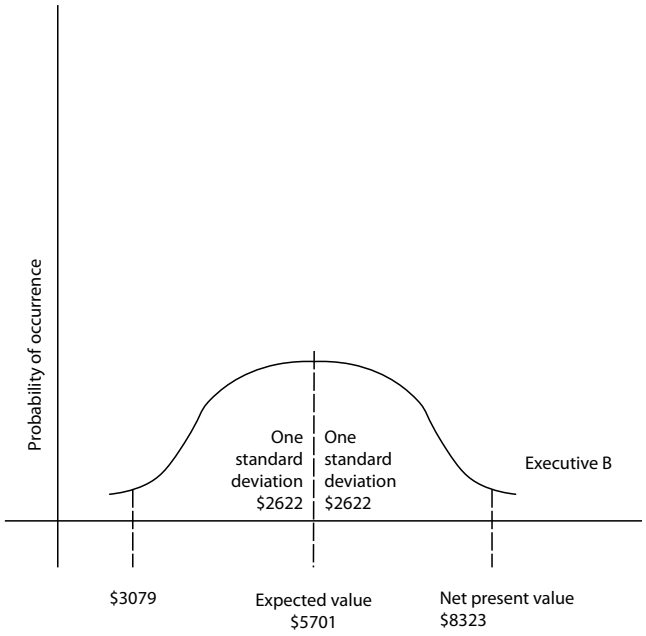

Figure 6.3

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