Available online at www.sciencedirect.com

ScienceDirect

Procedia Economics and Finance 34 (2015) 337 – 343

Procedia Economics and Finance

www.elsevier.com/locate/procedia

Business Economics and Management 2015 Conference, BEM2015

Costs Efficiency Evaluation using Life Cycle Costing as Strategic method

Marketa Spickova[a], Renata Myskova[a],*

[a] University of Pardubice, Faculty of Economics and Administration, Studentská 95, Pardubice 532 10, Czech Republic

Abstract

Costs optimization is further developed not only by the pure economic theory but more with practical management. In the context of the economic crisis 2008 and the previous crises we do observe the pressure on the sophisticated cost optimization. Into the important strategic costs tools belong Activity Based Costing, Target Costing, Life Cycle Costing. We use these methods for optimal costs management, observation, and the costs minimization. In the article we applied the concept of Life Cycle Costing (LCC). This is an application of Life Cycle Hypothesis into the practical costs management. We present comprehensive information about the LCC method. In the other words, to provide and present the alternative approach how to achieve long term minimum value of total costs from strategic point of view.

Peer-review under responsibility of the Organizing Committee of BEM2015

Keywords: Costs Efficiency Evaluation; Life Cycle Costing; Net Present Value; Equivalent annual cost;

1. Introduction

The main goal of the Life Cycle Costing approach is to optimize life cycle costs of the assets or investment project without loss their performance. The scope of investments project is dependent on the company size, its investment planning and financial or other resources Havlicek (2014). The evaluation of investments is made on the decisive criteria (rate of return, risk, repayment period, etc.) which can be evaluated by several methods. The investment evaluation can be explored from several points of view. We mainly focus on costs or profit but the widely used criterion is Cash Flow (sum of profit after tax and value of depreciation). If the time factor is used or no

* Corresponding author. Tel.: +420 466 036 510; fax: +420 466 036 010.
E-mail address: renata.myskova@upce.cz

Peer-review under responsibility of the Organizing Committee of BEM2015
doi:10.1016/S2212-5671(15)01638-X

the methods are divided on static or dynamic tools. E.g. The Net Present Value Method (NPV) is considered to be the most widely used method.

The following chapters describe the comparison of the data divergences which provides financial or managerial accounting. By the majority of fixed assets we showed that their operating costs comprise the largest share of the LCC. This is primarily due to the fact that these costs are associated with the longest stage - using - during their life cycle. In the final part of article we have shown the practical comparison of two investment projects with using LCC and NPV.

2. Material and Methods

2.1. Accounting approach of the economic lifecycle and standards

Life cycle costing (LCC) is special kind of accounting which is used in Anglo-Saxon countries as terotechnology Petrik (2009). The using of this approach is suitable for project management, control and evaluation of investment projects. The concept is based on the possibility of show all costs and revenues for the concrete investment project include their all items and time demand. The task of LCC is taken into account the all actual costs and revenues associated with some kind of an asset over its economic life-cycle and at the lowest possible total cost. The important information (as how much and which relevant costs were expended in all period of the economic life cycle for the analyzed asset or investment) are collected through LCC.

This paragraph compares the approach of the traditional finance accounting with the concept Life cycle costing which is involved to strategic management accounting. The finance accounting is focused directly on the acquisition prices, depreciation, asset residual value. These values are collected by using the applicable accounting rules and procedures (GAAP/IFRS/local accounting standards). It is natural that the using of the classical accounting is not suitable for assessment of the actual costs and benefits associated with the asset. The reason is the complexity of investment opportunities. The further different approach is financial accounting - a useful measurement of assets by comparison with the real economic life.

The accountants are assuming a greater role in the strategic management process Bhimani and Keshtvarz (1999); Fern and Tipgos (1988); Palmer (1992). More Chenhall (2008) feels SMA practices have moved management accounting from an emphasis on operational issues to a more strategic orientation through an integration of customers, processes, HR and financials. Some others see the significance of this to be such that a new concept, ‘‘the strategic accountant”, has emerged Cadez and Guilding (2008).

Masztalerz (2006) mentioned the points which are characteristics from traditional approaches to strategic cost management: market orientation and customer focus, price-led costing, strategic dimension, life cycle cost reduction, cross-function teams, value chain involvement, focus on design of products and processes, continuous improvement according to kaizen philosophy.

On the contrary, integrated performance measurement systems and life cycle costing register limited use of LCC Cinquini and Tenucci (2010). No firm uses a fully integrated system of strategic cost management that incorporates all of these approaches. However many large enterprises are using several of these techniques concurrently Spickova (2013). The practice use of LCC is still limited for its complexity assumption.

Here we review some of the standards, guidelines and reports available for the European Union (EU): ISO/DIS 15686-5 Building and constructed assets – service life planning; The Norwegian Standard NS 3454 Life cycle cost for building and civil engineering work – principles and classification; Task Group 4: Life cycle costs in constructions; Procurement guide 07: Whole-life costing and cost management; The Green Book by HM Treasury, UK. The last major initiative is project common European methodology for life cycle costing in building "A common European methodology for Life Cycle Costing" Langdon (2007).

2.2. Assets Cost breakdown and Economic Life

LCC analysis is based on many costs inputs. More it usually requires much different information for the project life cycle phase costs calculation. Economic life cycle total costs are usually considered with the implementation on the market. LCC analysis includes all costs to be evaluated. Costs usually include the tendered sum (purchase

price/investment) and as a minimum the energy cost, but often, also maintenance and other relevant costs that must be defined in the inquiry information Frenning (2001). The review of main categories of Life Cycle Costs is show in the table 1.

Table 1. LIFE CYCLE COSTS of analyzed assets (modified from Langdon (2007)).

Category of Costs:	Costs:
Investment (acquisition) Costs	cost of design and survey works
	project cost (buildings, machinery, land, equipment, etc.)
	cost of operating files
	cost of land or workshop is expanded if these additional Investments are required
	related cost associated with the placement of buildings / machinery / equipment
	other cost
	other investments
	operating costs for the preparation and realization of assets
Operation Costs	cost of energy supply
	cost of water and waste water
	waste disposal cost
	service fees, insurance
	cost for security and safety
	cost of cleaning
	administrative charges
Maintenance Costs	services; general inspection; warranty inspections
	plan of maintenance; downtime; breaktime
Renewal Costs	repair services
	depreciation
Disposal (Retirement) costs	cost of disposal of the building/ machinery / equipment
	cost of recycling materials or raw materials

Assets are assumed to be purchased for a fixed time period. Assets are commonly purchased to serve for a relatively longer period, it is not unusual to utilize asset several times longer than the asset's normal life. When assets are new, their operation and maintenance costs (O&M costs) are usually low, which means that assets are more reliable and vice versa. To solve the problem of the liquidation of the long term asset we have to minimize the corresponding total costs (to find the optimal replacement age). So we have to project the economic life cycle of particular asset. Fixed costs do not affect the economic life of an asset and can be excluded from the calculations. But, these fixed costs need to be included in order to estimate budgetary requirements.

2.3. Methods of economic evaluation

LCC method in inter connection with the evaluation of investments provide integration of the overall concept of managerial accounting. This method is according to many (Eschenbach (2004); Horvath (2004); Cinquini and Tenucci (2010); Synek (2007)) very ambitious measurement. It is useful for efficient managing, monitoring and assessing total cost minimization Potkany and Hitka (2009). LCC method calculates both present and future value of discounted cash flow. In regard of the time value of money and opportunity cost calculation we go into the basis of microeconomic theory. More the fixed costs calculation and the inventories management interconnection we really integrate the pure theory and a present practical experience.

Net Present Value is the basic tool for comparison of the money values in the different times. The equation itself is widely known. More difficulties appear when we want to evaluate the particular discount factor. In financial measurement this is involved mainly with the risk free rate and equity premium, which according to modern theory is derived with the covariance of the particular equity share yield and consumption. In the real economy we have to include the installation costs, the fixed cost deal etc. For the real business the LCC method seem to be very useful.

$$NPV = \sum_{t=0}^{T} \frac{C_t}{(1+r)^t} \tag{1}$$

where:

- NPV = Net Present Value of Life Cycle Costs,
- Ct = Sum of all relevant Costs after the reduction of revenues created in period t,
- r = discount rate,
- t = monitored period (usually in years (t e <0;T>),
- T = Life Cycle duration.

The other tool for time value of money in business comparison is the Equivalent Annual Cost

$$EAC_{i'} = \frac{NPV_i}{f_{tai}} \tag{2}$$

where:

- EAC_i = Equivalent annual cost per year of variant i,
- NPV_i = Net Present Value for Life Cycle Cost of variant i,
- ftai = factor for conversion of annual amounts.

$$EAC_{i'} = \frac{(A + C_1 + C_2 + ... + C_n + D - S_n)}{n} \tag{3}$$

where:

- A = acquisition cost or purchasing price of the asset and any expenses for installation,
- C1 = operation costs,
- C2 = maintenance costs,
- Ci = other life cycle costs,
- D = disposal cost,
- Sn = resale value of the asset,
- n = age of the asset.

The previous formula provides a useful information about the annual costs connected with replacing an asset after n years can. Variable n provide simulation of EAC for many replacement policies. The minimum value of EAC is called economic life of the asset.

3. Results and Discussion

3.1. Investment decision making based on LCC and NPV - Case study

The production unit has two offers for Investment. The General manager wants to make the decision making with the using of combination the conception LCC and NPV. Value of WACC is 10%. The team of specialist has collected the data and has created the LCC analysis below (in the table 2.) Based on these data were simulated the next calculations (in the table 3.).

Table 2. LCC Analysis of Investment Project for Acquisition Production Machine.

	Machine A (EUR)	Machine B (EUR)
Acquisition cost	**590 000**	**295 000**
Operation Costs [per 1 hour]:		
Electricity	10	6
Variable Overhead	14	12
Labour costs	3x 5	5x 5
Repair and Maintenance		
Service interval p.a.	6	12
Service Costs 1/i	2000	2500
Unplanned failures	1 p.a.	3 p.a.
Failures Costs	7000	5000
Maximal Capacity		
Operational hours p.a.	2000	1500
Gross operating contribution per hour	100	100
Expected economic life	20	20
Net salvage value	10000	10000

The Table 3 shows the comparison of two Investment Project.

Table 3. Compariosn of Investment Project for Acquisition Production Machine.

	Machine A (EUR)	Machine B (EUR)
Gross Operating Contribution / h	100	100
Operation Costs / h	- 39	- 43
Operational Contribution	61	57
Maximal Capacity h p.a.	2 000	1 500
Overall Contribution p. a.	***122 000***	***85 500***
Service Costs	- 12 000	-30 000
Unplanned Failures	- 7000	- 15 000
Net Contribution p. a.	***103 000***	***40 500***

NPV_Machine A = - 590 000 + (8,5126 x 103 000) + (0,149 x 10 000) = 288 287

NPV_Machine B = - 295 000 + (8,5126 x 40 500) + (0,149 x 10 000) = 51 250

Based on the combination of LCC analysis and NPV calculation we recommend the purchase of Machine A. This machine has both the higher acquisition price and maximal capacity p.a. is higher. More the Service Costs are significantly lower than for Machine B. Finally the Net Present Value of Machine A is higher by 237 037 EUR. The machine A is more cost-efficient throughout the whole economic life cycle. However, the both machines have the same expected resale value (10 000 EUR) after the expected using.

4. Conclusion

This article has described how to choose the most efficient Project based on NPV. The main attention was focused on this most widely used method which is supporting the decision making. However, the authors are going to research the similar consequences of other methods for economic evaluation and investment decision making.

In general, we say that the using of mentioned methods is very helpful in practice. But there is a small paradox, because of the companies have not used them often and regularly. It is caused by a few existing limitations for instance the complexity of information and the difficulties of data collecting.

We must require having a lot of expert experiences for creation of evaluating analysis etc. Cadez and Guilding (2008) mention the need to get a new concept "the strategic Accountant", which has emerged through the evolutions in this area. The results of these researching recommendations, that the strategic accountants should be more employed and for further strategic approach of management accounting techniques and practice.

The not only conceptual but also partial using of Strategic Management Accounting (SMA) (more Benchmarking) can help to improve economic efficiency of investment or costs. More we recommend further cost optimization in order to increase competitiveness. These tools are also suitable for support long-term strategic decisions. Nevertheless the big disadvantage remains the fact, that these tools and techniques require a lot of expert experiences. This information complexity is not easy. By opinion of authors the companies which have the specialized controlling department, they use SMA techniques, have the big competitive advantage. The usage of the life cycle perspective is good since it takes into account the system boundaries and incorporates some costs that incur in the future.

Acknowledgements

This article was written as part of the Student Grant Competition, project no. SGS FES 2015001 Economic and social development in private and public sector. The authors thank for financial support.

References

Bhimani, A., & Keshtvarz, M. H., 1999. British management accountants: Strategically oriented. Journal of Cost Management, 13, 25–31.

Cadez S., Guilding, Ch., 2008. An exploratory investigation of an integrated contingency model of strategic management accounting. Accounting, Organizations and Society 33, pp. 836-863. Available from: www.elsevier.com/locate/aos.

Cinquini, L., Tenucci, A., 2010. Strategic management accounting and business strategy: a loose coupling? Journal of Accounting & Organizational Change Vol. 6 No. 2, pp. 228-259

Chenhall, R. H., 2008. Accounting for the horizontal organization: A review essay. Accounting, Organizations and Society, 33, 517–550.

Eschenbach, R., 2004. Controlling. Vyd. 2. Praha: ASPI, 814 s. ISBN 80-735-7035-1.

Fern, R. H., & Tipgos, M. A., 1988. Controlers as business strategists: A progress report. Management Accounting, 69, 25–29.

Frenning, L., 2001. Pump life cycle costs: a guide to LCC analysis for pumping systems. Hydraulic Institute and Europump, pp. 194.

Havlicek, K., 2014. Small Business Management & Controlling. Kyjev: Open International University of Human Development Ukraine, 178 pp. ISBN 978-966-388-494-3.

Horvath, P., 2004. Nová koncepce controllingu: cesta k účinnému controllingu. 1. české vyd. Praha: Profess Consulting, 288 s. Poradce controllingu. ISBN 80-725-9002-2.

Langdon, D., 2007. Towards a common European methodology for Life Cycle Costing (LCC). Literature Review: Management Consulting.

Masztalerz, M., 2006. The nature of target costing: historical and conceptual approach. Development of intellectual capital of employees in the process of vocation training and in-service education. Pp. 155 –169.

Palmer, R. J., 1992. Strategic goals and objectives and the design of strategic management accounting systems. Advances in Management Accounting, 1, 179–204.

Petrik, T., 2009. Ekonomické a finanční řízení firmy: manažerské účetnictví v praxi. 2., výrazně rozš. a aktualiz. vyd. Praha: Grada, 735 s. ISBN 978-80-247-3024-0.

Potkany, M., Hitka, M., 2009. Utilisation of contribution margin in the costing system in the production of components for wood-working machines. In Drvna industrija. 2/2009, 60(2). p. 101-110. ISSN 0012-6776

Synek, M., 2007. Manažerská ekonomika: manažerské účetnictví v praxi. 4., aktualiz. a rozš. vyd. Praha: Grada, 452 s. ISBN 978-80-247-1992-4.

Spickova, M., 2013. The use of cost management techniques as a strategic weapon in SME´s. Scientific papers of the University of Pardubice, pp. 122-133.