Title: Financial Evaluation of a New Product Development Estimated of Concerned Factors: Procedures and Barrier

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Abstract: The most critical decision in business is the selection of products which the company will develop and possibly market. It is also the most difficult and complex decision to make. Indeed, the company has to evaluate its plans for the future. And, any decision taken today will be related to profit or other benefits in the future. This paper reviews a number of key factors in this allocation.

FINANCIAL EVALUATION OF

A NEW PRODUCT DEVELOPMENT

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ESTIMATION OF CONCERNED FACTORS : procedures and barriers

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TABLE OF CONTENTS

INTRODUCTION

The most critical decision in business is the selection of products which the company will develop and possibly market. It is also the most difficult and complex decision to make. Indeed the company has to evaluate its plan in the future. And any decision taken today will be related to profit or others benefits in the future.

A well-established company can have several proposals of new product opportunities. And its problem is to select which meet all criteria established by the company. In most of the literature, these criteria of evaluation are shared in three areas [1], [3] :

- Technological
- Marketing
- Economic

In this paper, we will focus on the economic criteria. Do the economics of the project indicate that costs, price and total investment justify the project?

A development project either can or not be financially beneficial to the company. We plan to study each kind of indexes allowing to evaluate the financial aspect of a project. We are going to explain how they can be estimated, and how they can justify or not the success of a new project development.

I. ECONOMIC INDEXES

I.1 OVER-ALL CONTRIBUTION

The over-all profit return of a proposed new project is an important determinant of its acceptance or rejection. Indeed, a new project needs to contribute to the growth of the company, otherwise it is unnecessary, or even can destabilize its own objectives.

Actually it has to satisfy several criteria established by the company : its own goals. One of them is to assure a minimum profit of its economy [7].

The main idea of the financial evaluation is to calculate the profit or other benefits of a new project and then, to be able to make a decision of "go" or "not-go" with this proposal.

I.2 RETURN-ON-INVESTMENT

The return-on-investment (ROI) analysis methods are widely used in capital budgeting analysis [3]. It provides the amount of income obtainable from a given investment.

There are two main approaches to compute return-on-investment : the payback and the present value methods.

- Payback Method :

The payback index is based on the amount of time the company requires to payback the original investment outlay from added cash flows.

$$P = \frac{C}{S}$$

where C : investment outlay

S : expected annual net cash flow

This method is probably the most widely used (see survey in [4]), because it is very easy to compute and also easy to understand.

But it is not inclusive enough and not sensitive enough. A manager will prefer an investment back quickly, but it isn't always the best choice. It should look at the rate of return instead of the number of years to pay back the outlay.

- Net Present Value Method :

The present value method is the computation of the present value of cash flows, knowing the time-value of the money. A $1 earned tomorrow doesn't have the same value today.

$$NPV = -C + E_j (1+i)^{-n}$$

where C : cost of investment

E_j : expected cash flow of year j

$E_j > 0$ inflow

$E_j < 0$ outflow

i : cost of capital

n : life of equipment or market

The decision will be : - If NPV > 0, the project should be accepted.

- If NPV < 0, the company is going to lose money, so the project should be refused.

$$\text{Return-on-investment} = \frac{NPV}{C} \quad [4]$$

If the return-on-investment is greater than one, it indicates that the investment would return more than the desired rate of return i. Conversely, a ratio less than one results in a rate of return less than the desired amount.

The most difficult part is to assigne a value of i cost of capital. It will depend on the time value of the money, and on which rate of interest the company can get if it invest its money somewhereelse (in less risky places).

- Internal Rate of Return :

The object is to find that rate of return which equates the net present value of expected future cash flows with the investment outlay.

$$C = \sum_{J} (1 + r)^{n} \quad [1]$$

where all the variables have been defined before.

A correctly computed rate of return approximates a product's profitability and provides comparability [4]. So this interest rate will be used to rank different proposals, and will help for the decision maki

But the life spans of projects are not taken into consideration in both the payback period and the rate of return. So unless the evaluated proposals have equal life spans, the results can be misleading.
A solution may be to specify an account period common to all the proposals.
Another solution could be to argue that a longer project is more risky and should have a higher rate of return.

- Others indexes :

The previous indexes are the more usually used, but we can define few others. Among them, the profitability index which gives a ratio between the present value of expected future returns and the cost of the proposed project ; or the RIO Rating System based on relationships between the degrees of product differentiation, amonut of profit, years required to achieve profit growth and the total investment cost. The list of diverse indexes is really long.

I.3 STATISTICAL INDEXES

These models are noteworthy in that specific probabilities for commercial and technical success are built into the evaluation.

- Alcolac's project number [1], [4] :

$$\text{Index} = [\ P_{tech} * P_{com} * S * (P-C) * L\ ] / TC$$

where P_{tech} : Probability of technical success

Pcom : Probability of commerial success

S : Annual sales volume

P : Price of product

C : Cost of product

L : Life expectancy of the product

TC : Total cost

Specific project numbers are compared with those of successfull projects. A ratio of less than 1 is usually viewed unfavorably.

Modified versions of the Alcolac's equation are prevalent. As an example, if the manager prefers a project which provides a quicker return-on-investment, he will alter the model to put more weight on the firstyear's sales. The larger the number will be, the quicker the payout during the early years of the project will be.

Several other factors exist, but their use isn't so common : as examples, the Dean-Sangupta index [1] or the Cost-outlay-to-ris index [4].

II. RISK CONSIDERATION

The previous indexes methods deal only with the estimated cash flows of the project and don't consider formely the risk problem. Risk analysis must be used to obtain an evaluation of a project to take into account the uncertainties surrounding the inputs.

Often the risk consideration is included in the interpretation of the ROI indexes. A manager who is concerned by risk interpretation, has to require a high rate of return and also a short payback period.

Because of the risk involved in new products, companies like to get their money back in a hurry in case consumer tastes change [6].

Another solution for risk interpretation is to examine closely the factors involved in the cash flows and see what variations are possible [2]. Almost every factor affecting a new project involves uncertainties concerning the future (operating costs, selling price, investment required, useful life of facilities ...) [1].

A survey research [4] indicates that risk can be integrated in calculations in three different ways :

- Risk as an exageneous factor:

Some managers treat risk as an exageneous factor independent from their evaluation indexes. They define a risk factor R and calculate the profitability-to-risk index [4].

$$PAR = \frac{\text{Return on Investment}}{\text{Risk Factor}} \quad) = 40\%$$

The value of the risk factor can vary from 10 to 100 percent according to the new product's compatibility with the production facilities, marketing channels and so on.

- Risk as an "handicap" factor :

The second way is to "handicap" or weight the values involved in the evaluation formulas. In using the discounted cash flow evaluation, some analysts arbitrarily increase the rate of interest i used in discounting the cash inflows to allow for risk [4].

This is the discount factor $1/(1+i)$, where i is the interest rate given by an average of the cost of equity, loans and bonds. We need to

add a new element : a risk discount factor [1]. It is defined by 1/(1+R) , where R is specific for each year and also for each considered item. As an example, operating costs may have a greater risk factor than fixed costs.

So by combining the two factors : cost of capital and risk (maybe inflation factor, if significant), we include the risk consideration in the calculation of discounting cash flows.

- Risk as probability distribution :

The third method is to incorporate specific risk values in the evaluation formulas [4]. For each major factors involved in new product evaluation, we need either to construct a range of estimated values or a probability distribution [3], [1]. Then by combining all these random selections in a ROI equation we can solve for a probable rate of return. We repeat the computation over and over.

In this way, it is possible to obtain a listing of various ROI rates for a single new product proposal and to determine the probability of each of these occuring.

III. ESTIMATION OF MAJOR FACTORS

The major factors of the economic analysis of a new product development are maybe the potentiel market, the price of the product and the whole cost.

III.1 MARKET DEMAND

Thanks to a marketing research, we are allowed to estimate the market demand and so, to obtain data necessary to compute ROI statistics (sales volume, life span ...). A marketing test represents an immediate feedback from the potential customers regarding a proposal product [9]. It brings more objectivity to new product decision.

Informations are usually get with consumer surveys. People are carefully chosen in order to have caracteristics typical to the national population. They have to describe a non-existent product's qualities, to give theirs opinions about the product, to say how much they will be ready to pay for it.

Although these forecasts involve wide margins of errors, they should be made. They don't garantee a success inthe product development, but they are very helpful to limit risk of failure [9]. They allow to reduce risk in a project development and also help to find ways to improve the company's profit [6].

A first problem with market test is to find the adequate population. It's known that there is no typical city which could represent a right sample of the national population.

A second disadvantage with marketing test is that it can cost a lot of money to be correctly done. Its cost is a fraction of the total costs of production introduction. And its amount should not exceed a certain percentage of the estimated future benefits, if the company still wants to improve its growth profit [1].

If a manager tries to reduce the market test's costs, he may misunderstand the customers'needs by a too little field testing. On the other hand, a full test will cost a lot for maybe something unrealisable. A good solution is to develop a market research step by

step following the new product development. A market test has not been made on its own sake, but in order to improve company's profit.

Another disadvantage of test marketing is its timing. It can take up to one year to complete it. Any existing competitors will have time to scoop up the market [6], or the market will have time to change before the product's arrival [8].

So due to the high costs, the time dependency and the questionable reliability of test market results, some companies prefer using laboratory-type test market, computer simulation models and so on [6]. Moreover these alternatives maintain competitive secrecy and prevent competitors from muddying up test results.

III.2 PRICING STRATEGY

To estimate the price of the new product is also an important decision in the new product financial evaluation. The pricing strategy should be chosen upon its prospective contribution to the firm's long-run goals, not its short-term effect [1]. And a price chosen early in the new product development will change in an advanced stage of the new product life. A variety of traditionnal financial oriented pricing strategies has been established (~~see Annexe 1~~), but they will not affect the price estimated during the early financial evaluation.

The affected price depends on several factors : nature of the product, market demand and competitive factor.

- Nature of the product :

If the product is something unique and different from existing offerings, it will justify a higher price. Because the product is new and no one knows about it, the price needs to support an investment in communication [8].

- Market demand :

The company needs to set the price which the market will bear. In the marketing test, answers to such questions as "Will you buy the product at this price?" or "How much more would you be willing to pay for this product than for you normally buy?" should give us an indication of the price.

But in practice, actual intention to purchase and reach purchasing rates are differents. The consumer tends to answer what the company wants to hear and not what he will really do in the future [2]. The exaggeration factor is difficult to estimate and it can easly vary according to the characteristics of each market.

So it seems to be easy to surestimate the demamd. This can create a vicious profit drop for the company. Indeed it will price the product depending on the projected demand and not the real one. Too much cost investments are made, for a real low sales volume [2].

- Competitive factor :

High price which could be helpfull for the company's growth and profit, may not be the most acceptable solution. Indeed it allows the entry on the market of a competitor at a lower price [2].

In fact, the company should consider a safety margin in its pricing

strategy [6]. There are so many uncertainties at the beginning of a new product development. With this strategy, the firm keeps opportunities to test and adjust the product price in the future [2]. It is always easier to decrease prices than to implement prices increases . So underpricing risk is far greater and more unrecoverable than the overprincing risk [6].

III.3 COSTS ESTIMATION

Several costs are related to the construction of the return-on-investment. We can see on Annexe **2** a chart representing a simplied view of costs and ROI, and on Annexe **1** a suggested check list of specific costs elements [1].

Each item can be estimated by a well-done definition of what it represents, and also thanks to the history of the company. We can compare the new project's costs to similar situations.

But too often companies make the evaluation only once as it is such a major operation. Actually the assumptions can change very frequently as the project develops or, as the time goes. The preliminary estimates would not be so efficient. As some examples: raw material prices may fluctuate; the company who has been in the new market for few years can know how to buy more profitably; the packaging could be changed at the last minute requiring a more expensive material [2].

IV. LIMITES OF ECONOMIC INDEXES

The financial evaluation of a new product gives a company enough procedures or facts in order to characterize a proposal. But as we notice in the previous part, there are several problems of uncertainties. These don't allow to conclude on a proposal only with the financial criteria. A manager needs to create his own judgment on the divers indexes.

- Needs of organization :

As we already notice the estimated values computed at one time are not valable later during the new product development. Most of the assumptions change frequently, and the company need to assess the financial viability of project at each stage [2]. So as the financial evaluation is going to be used very often, it is preferable if it is simple. Its advantages will be :

- Everyone can understand it
- There is less scope for errors
- It is quick to use and so can be done frequently

Maybe the formulas defined in the previous parts seem to be complex and to require a lot of calculations. It is not a problem anymore, a lot of computers are able to do this job. But managers have to know what represents the number given by the computer, what are his assumptions, and how it define a new product evaluation.

- Needs for judgment :

There are many assumptions in the financial evalution thanit is impossible to give an absolute conclusion only with the numbers.

Actually the evaluation represents the facts and the managers who are going to use it represent the judgment [8].

In the literature, we can find several examples of product success whereas the first financial evaluation was not so good. The economic indexes will help you to make a decision, but they are not infallible. An advic could be " Don't kill a good idea too soon, if your heart says it's right and the data say it won't fly ",[8].

CONCLUSION

In summary, this paper studies how companies evaluate the financial aspect of a new product development. We notice that the most used index is the discounted rate-on-return. Then we explain how the different factors existing in the financial criteria are estimated, and which solutions are available for dealing with risk.

The study was essentially focus on the first time of the project development. But we notice that these numbers need to be computed at each stage of the development in order to be closer to the reality.

We could now wonder if these factors used later will be able to indicate a failure of a project. Actually, yes, the financial aspects will give bad indication, but it will probably be too late. So a further study could be to determinate the influence of financial and economic factors on the decision to terminate or continue an ongoing project.

Another critical area follows Maidique and Zinger ideas. They said that while financial return is one of the most easily quantifiable indus parameters, it is far from the only important one. As an example, a new product could achieve a mediocre financial return, yet be considered a

great success because it made a major impact on the market, or because it opened up new windows of opportunities to the firm in terms of new markets or new technologies. These are a few examples, but we can wonder how a financial evaluation can meet the company's goals.

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David S. Hopkins.

ANNEXE 1

THE COST ELEMENTS

New Product Venture Management by D.W. Karger

1. Pre-production enginneering
2. Product support engineering
3. Facility cost
4. Equipment cost
5. Tool, jig, fixture and miscellaneous materials handling equipment cost
6. Purchase material cost
7. Direct labor cost
8. Shrinkage
9. Scrap
10. Transportation
11. Overhead
12. Selling expense
13. General and administrative expense
14. Patent licence costs
15. Special taxes

ANNEXE 2

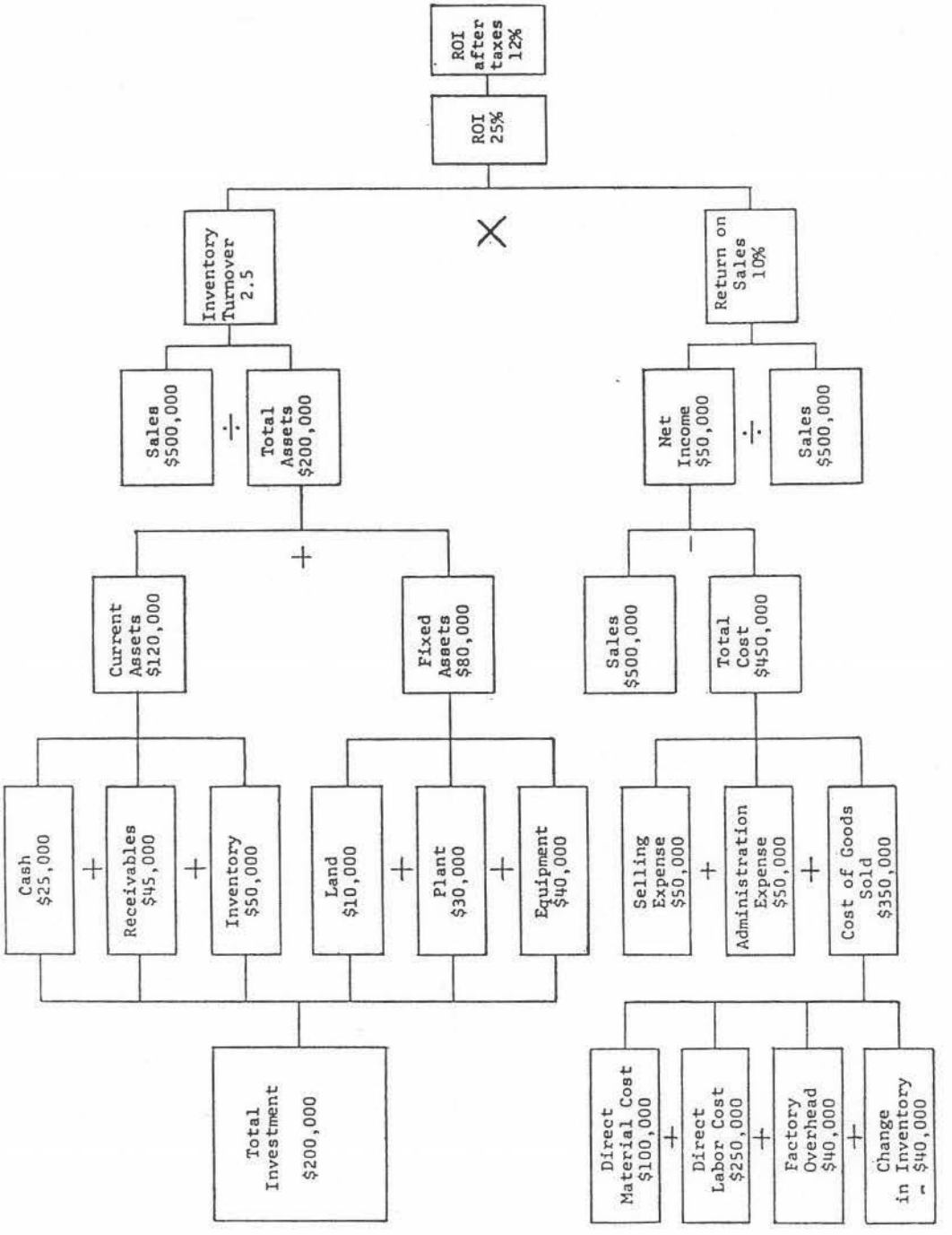

Figure 11-5 Costs and ROI, a simplified view