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Procedia Economics and Finance 24 (2015) 519 – 522

Procedia
 Economics and Finance

www.elsevier.com/locate/procedia

An Enterprise Flexible Development Model

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Abstract

The paper is devoted to the problem of forming the model for flexible development for improvement of competitiveness of Russian enterprises. What is meant here is flexibility in conditions of strong competition. Flexibility is considered to be a first-order condition for an enterprise innovative development. The authors bring to light the principle ways of estimating the changes and risks reducing, prove the choice of business development growth rate, consider the model of flexible development.

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Selection and/or peer-review under responsibility of the Organizing Committee of ICOAE 2015.

Key words: flexible development, competitiveness, innovative enterprise, growth rate, management of changes.

1. Introduction

The wide range of problems Russian enterprises face today may be adjusted to one reason - the ability to respond to demands on the market quickly and with minimum costs. Enterprises have the task to survive, to develop today and in future and to make an enterprise functioning endless. No matter how we define the process of development, it is normally limited. On drawing near the limit income and sales volume decline, costs escalate, competition influence increases. When one of the competitors approaches to its development limit and other competitors study the alternative processes with higher limits on the basis of previous experience and integration of new knowledge.

Let's consider the directions which allow to estimate the changes and reduce the enterprise risks.

- 1) acceptable growth rate (sales volume and relevant production volume);
- 2) correspondence of costs and assets to sales volume;
- 3) relationship between own and borrowed funds;
- 4) net profit value which is necessary to pay to innovations providing financing all stages of their assimilation;
- 5) duration of production periods and periods of items assimilation;
- 6) parameters defining the amount of items for research-and-development and assimilation.

2. Method

The research methods are theory and research problem analysis, reasoning the author's hypothesis, determining the principle model of an enterprise flexible development.

3. Theory

We consider the choice of an enterprise development growth rate. The following works are devoted to investigating the question: Safiullin M.R., Bagautdinova N.G., Ulesov D.V. and others[1,2,3]. In terms of maintaining credit worthiness quick growth is not always advantageous. Moreover quick growth can even be more dangerous for an enterprise than slow growth. Quick sales growth rate may cause considerable financial problems or even bankruptcy. Sales growth mean additional investment to operating and fixed capital. This makes a company increase debt financing. Only in case of highly profitable business the need for additional financing may be completely defrayed by gained profit. The increasing volume of borrowing enlarges the risk of losing credit worthiness and control over an enterprise. As a consequence there is a problem of reasoning the sales growth rate which answers the purpose of strategic objectives of an enterprise development could not bring to risk of creditworthiness failure. This in its turn makes it necessary to answer the question, what resource increase may be provided without additional outside financing. The only source may be net profit left after dividend payment or undistributed profit. The owned capital gain out of

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undistributed profit is determined by relation of gained undistributed profit over the period to the amount of internal capital at the beginning of the period. This rate is designated by "g".

At the same time one should remember that the amount of undistributed profit depends on profit plowback ratio r , which characterizes a part of net profit reinvested to assets. This coefficient is related to the payout ratio which, in its turn, shows the part of net profit paid in form of dividends. The sum of these 2 coefficients is 1 or 100%.

The increase of owned capital due to undistributed profit is:

$$g = NP \times r : E, (1)$$

where NP is net profit over a period;

E is company's owned capital at the beginning of the period;

r is saving ratio (a part of undistributed profit after dividend payment).

Thus economic substance of calculating g lies in the fact that it defines the add-on sale which can be provided due to own internal sources of financing.

Stable growth rate may be calculated according to the formula:

$$g' = NP/S \times S/A \times A/E \times r (2)$$

This allows identifying the influence of the following significant financial factors on the growth rate:

- 1) return on sales,
- 2) asset turnover,
- 3) liability structure,
- 4) net profit distribution proportion.

g value derived from the given formula is of a calculatory and recommendatory nature. In practice the growth rate can be either more or less than this value. One should understand and assess the effects of variance of real growth rate from g.

If real value of sales growth rate is higher than rated value g, a company should raise additional outside financial resources for financing related to sales growth assets increase. Maintaining this balance is one of the principles of forming anti-recessionary enterprise potential.

To form the model of enterprise flexible development we consider the relationship in rated amount of items mastered.

The basic element in the theory of flexible development of an enterprise of V.N. Samochkin, V.I. Barchanov, V.P. Kuznetsov [4.] is the relationship in rated amount of items mastered as these are the main elements:

- time of mastering (T_m) - internal factor of an enterprise flexibility determining the cycle, which consists of three stages: 1) R&D; 2) preproduction; 3) production assimilation;

- time of production and realization of new product (T_{pr} - external factor of enterprise flexibility determining the product cycle as time-varying process, which has the stage of creation, development, maturity, falldown all having some time parameters;

- coefficient of renewal (Cr) which characterizes the work of all basic departments, services and workshops of an enterprise, its equipment stock, technologies, working staff, the law of supply and demand, shows the ability to rearrange for new goods production and thus meet market needs and provide high competitiveness. On the other hand Cr allows quantitatively assessing technical flexibility of an enterprise and that's why it is considered to be the key factor in the theory of enterprise flexibility.

$$Cr = T_m : T_{pr} (3)$$

As Cr doesn't let us fully reveal the process of renewal by means of mathematical relations, the hypothesis for relationships in rated amount of enterprise's products in mastering was proved. This hypothesis is fundamental in the theory of flexible development.

The principle in rated amount of products in mastering or the hypothesis "of principle of mastering" is stated in the following way: the rated amount of enterprise's products in mastering (N) equals product of coefficient of renewal (Cr) by nomenclature of output n in market demand

$$N = Cr \times n. (4)$$

We will prove the hypothesis of regular amount of enterprise's products in mastering as follows.

We consider the necessity in mastering a new product in exchange for some old product being manufactured as an accidental event (A) which can happen with some probability (P_a). Ideal cycles of production and mastering for four products where time of production (T_{pri}) ($i = 1, 2, \dots$) includes time for mastering (T_{mi}) ($i = 1, 2, \dots$) are presented in Fig. 1. If we consider P_a as geometric probability, then T_{mi} corresponds to the sum total of cases favouring the event A and T_{pri} to the total number of combined cases. Then

$$P_a = T_{mi} / T_{pri} (5)$$

Average probability of necessity for mastering corresponds to nomenclature in n products:

$$P_a = Cr = T_{mi} / T_{pri} = \sum T_{mi} / \sum T_{pri} (i=1, n) (6)$$

Alternatively $P_a = N/n$, i.e. the hypothesis is proved.

If mastering a new product instead of an old one comes after the period of production and realization, the relation of rated amount of enterprise's products in mastering remains unchanged provided that

$$Cr = T_{mi} / T_{pri} (7)$$

The proof for the hypothesis of regular amount of products in mastering as follows is identical to the foregoing, given that T_{pri} is changed for $T_{pri} + T_{mi}$.

The given formula allows performing scientifically grounded direction of products' renewal process.

4. Results

Fig. 1 demonstrates visualization of the proved hypothesis for four products. The first diagram (fig. 1a) demonstrates consequent cycles of mastering and production for each of four products. Time of mastering T_m corresponds to the fact of certain product being in mastering. Every new product mastering starts during production of the old version and finishes with its closure. The sum of products in mastering for every time point is shown in fig. 1b. In this case the hypothesis of regularity of mastering is accurate:

$$N = n \times Cr = 4 \times 0.5 = 2 \text{ ea. (8)}$$

Life cycles of one type of product

Mastering	Production and realization		Mastering	Production and realization			Mastering
$T_1+t_2+t_3$	T_{pr}		$T_1+t_2+t_3$	T_{pr}			$T_1+t_2+t_3$
	Mastering	Production and realization		Mastering	Production and realization		
	$T_1+t_2+t_3$	T_{pr}		$T_1+t_2+t_3$	T_{pr}		

Life cycles graphic presentation

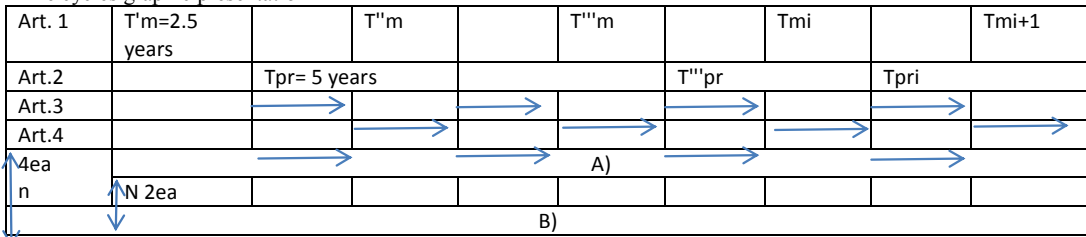


Figure 1 Graphic presentation for life cycles of ideal cycles of 4 products production and mastering

- a) - consequent cycles of mastering and production provided that mastering comes at the end of T_{pr} ;
 - b) - the sum of products in mastering for every time point
- For example, stable economic situation in current period allows mastering new products. This helps the enterprise to have stable economic situation in the following period which makes it possible to master new products etc [5,6]. So, we have a range of cycles, each of them consists of 2 parts:
- the first part is result, i.e. the degree of stability of enterprise's economic status;
 - the second is ability (with a certain degree of economic stability) for renewal processes.
- The scheme of flexible development has three parts and lets carrying out diagnostics and assessment of enterprise flexible development in the current period, long-term and strategic planning for the following periods.

Cycle 1		Cycle 2	
The result today Sr_1	The ability to master today the products which will be in demand tomorrow Φ_{K1}	The result tomorrow Sr_1 .	The ability to master tomorrow the products in demand Φ_{K2}
Current period			
		Long-run period	
		Strategic planning	

Figure 2. The scheme of enterprise's flexible development

In accordance with this scheme the enterprise's flexibility is enterprise's ability to obtain wanted result, which allows it to carry out all development stages (pre-Project preparation and R&D) and put into production (mastering and technical upgrading) in in specified time regular amount of products, which may be in demand in the market and in its turn in future period will allow to obtain necessary result, able to provide enterprise's survival and development.

In more general version enterprise's flexibility is its ability to obtain the necessary result due to products manufactured in current period for the purpose of carrying out technological progress (technology and R&D) (cycle 1) which will allow in future period (cycle 2) obtain necessary result again etc, i.e. tend to endless cycles.

As is seen in fig. 2 and fundamental rules of economic practice, there are two main criteria, allowing to determine the enterprise flexibility:

- for estimation the results of an enterprise activity in current period, i.e. ensure necessary technical-and-economic ratio (result for renewal);
- for determining relation between an enterprise and external environment, i.e. the enterprise's ability to plan and predict the process of its development (growth rate, ability to renewal).

In general sense the task to estimate enterprise's flexibility can be presented with a scheme as a transfer function of the system of automatic control, which has mathematic relation between stability (result) for renewal (Sri) and the ability for renewal (Ari) in different cycles and provides analysis and diagnostics of current state, long-term and strategic planning.

Generally the model of enterprise flexible development is as follows:

Input - $F_i = f(Sr_i, Ari_i); f(T_i)$ - Output (9),

where F_i is index of estimation of enterprise's flexibility, which allows to realize current and long-term (fig. 2);

Sr - stability (result) for renewal in different i-cycles;

Ari - ability for renewal in different i-cycles.

T_i - technical upgrading in i-th developmental cycle.

Hence, flexibility is a first-order condition for innovative development of an enterprise. And planned growth rate provides anti-recessionary potential of an enterprise.

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