Innovation Project Lifecycle Prolongation Method

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Abstract

In this article the technique allowing is considered to prolongation of lifecycle of innovation product by its modernisation and release of a new consumer market product. It is reached by time definition and financial resources and also formalistic approach application for base innovation modernisation. The purpose of approach described in article is the innovation project development forecast at the last stage for timely decision-making and reception of additional profit at the limited time and with limited finance.

Keywords: value, chain, co-innovation, value-time curve, modernization, innovation lifecycle

1. Introduction

The survival problem (which goes through all stages of life cycle) and successful innovation problem of development are rather important in all countries, which proclaim innovation way of development. During emergence and development any innovation faces with difficulties. Problems of innovations are rather similar to those that any company faces during its development. Such problems appear because small-scale enterprises have only one or two innovation projects. That is why Adizes theory can be applicable (Fig. 1).

I mean that part of the theory where it is said that any company has its own period of development which is followed by recession. This assumption can be used for this purpose what in due time to identify the period of beginning ageing and to develop operating influence by which consequence will be life cycle prolongation of innovation product or occurrence of a new product which is updated.

2. Objectives

In contrast, for the company innovation advantage is that innovation project steps can be defined and can be evaluated (Fig.2). That is why it is possible to predict further development of the situation, and in case of classification and control action analyze to improve the situation, and to prolong the innovation product existence and the company producing this product as well. So the four stages of innovation project development can be defined unambiguously: market entry, growth, maturity and recession. These stages depend on the size of gain during this or that period of time, beginning from the project realization period[1].

So we have 5 points which can be got rather formally during the innovation project life cycle: the 1st point- the beginning of the project (its coordinates are always $(0,\ t_0 = 0)$; the 2nd point- transfer to the growth period, its coordinate are equal (variable

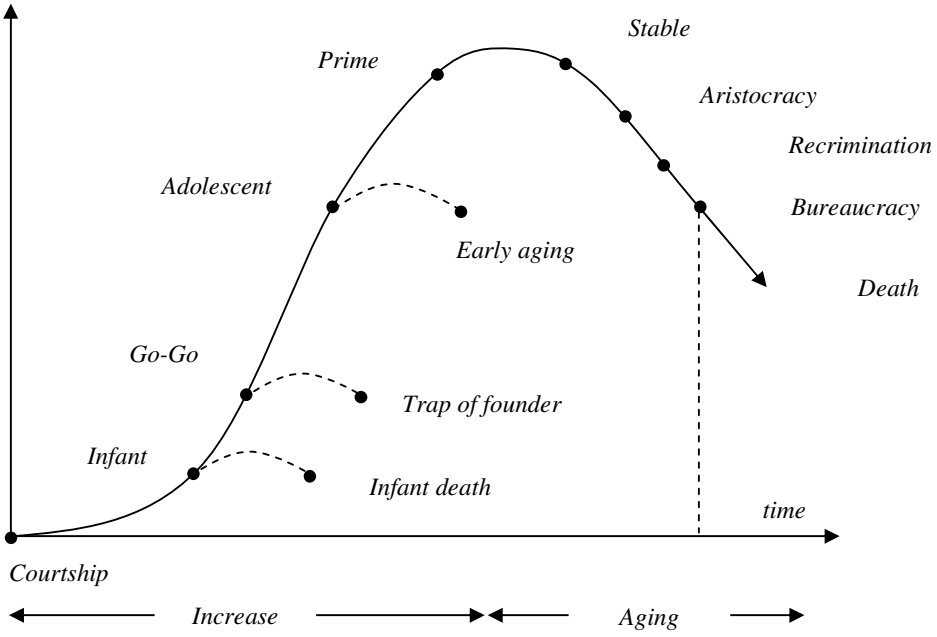

Fig. 1. Adizes`s life cycle graph

[1] Under "beginning of realization the product moment" is meant the period of time when the first sales began

costs for production output and sales, t_1);) ; the 3[d] point- the transfer to maturity stage(all total costs for production output and sales, t_2); the 4[th] point- the point of the top profit(all total costs for production output and sales + profit, t_3);the 5[th] point- the transfer to the recession stage (all total costs for production output and sales, t_4). Managing the innovation project the most important moment for us is to put off the stage of recession and to prolong the product life cycle.

3. Methodology

As we can observe, recession period can be at any stage of the life cycle. According to that we can make a supposition that even the most successful project could go through recession period before. But due to recognition on time and right decision could prolong the life cycle of the product. It goes without saying that the most interesting stage for prolonging the life cycle of the product is the maturity period. During this period the product brings profit and is the most interesting from realization the point of view. Distinguishing features of this period are profit and the presence of recession. 3 out 4 points of innovation project development are already known to us. Moreover if we can predict the recession beginning we can fix 4[th] point, which is not the transfer point to the new stage. It is known that curve is described very well by known functional descriptions for each period [1], [2] (Fig.2):

$$y=\begin{cases} e^{a_0 t} s_0^{\,ta_0}; & t_0 \le t \le t_1 \\ s_1 e^{t}; & t_1 \le t \le t_2 \\ k\dfrac{(t-t_2+a_2)}{(t-t_2+b_2)}; & t_2 \le t \le t_3 \\ a_3+s_3(t-t_3)-c_3(t-t_3)^2; & t_3 \le t \le t_4 \\ a_4-b_4(t-t_4); & t_4 \le t \le \infty \end{cases}$$

where factors $a_0, s_0, k, a_2, b_2, a_3, c_3, s_3, a_4, b_4$ describe growth rate, inclination, steepness of curves and depend on characteristics of the innovation project. Points t_0, t_1, t_2, t_3, t_4 a points of transition from one stage of the innovative project on another.

4. Technology, Descriptions

The beginning of recession will be identified with the beginning of the value reduction y . So we get one more point with known values (y_c , t_c).

Functional description factors $a_0, s_0, k, a_2, b_2, a_3, c_3, s_3, a_4, b_4$ and time t_4 which we have for decision-making are unknown in the component function. We use condition, where it is said, that the value of function must be congruent in the connection point. So we get the next equation set:

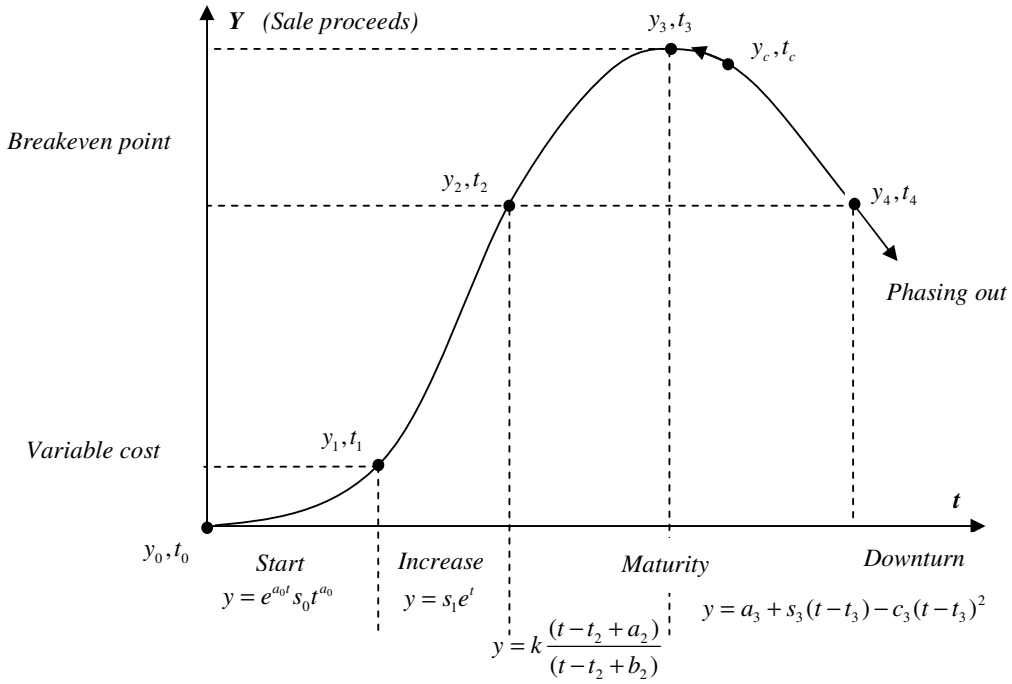

Fig. 2. Development graph of innovation project

$$y=\begin{cases} e^{a_0 t_1} s_0 t_1^{a_0} = s_1 e^{t_1} \\ s_1 e^{t_2} = k\dfrac{(t_2 - t_2 + a_2)}{(t_2 - t_2 + b_2)} \\ k\dfrac{(t - t_2 + a_2)}{(t - t_2 + b_2)} = a_3 + s_3(t_3 - t_3) - c_3(t_3 - t_3)^2 \\ y_1 = e^{a_0 t_1} s_0 t_1^{a_0} \\ y_2 = s_1 e^{t_2} \\ y_3 = k\dfrac{t_3 - t_2 + a_2}{t_3 - t_2 + b_2} \\ y_4 = a_3 + s_3(t_4 - t_3) - c_3(t_4 - t_3)^2 \\ y_c = a_3 + s_3(t_c - t_3) - c_3(t_c - t_3)^2 \end{cases}.$$

Unfortunately, formally this equation set can't be solved, because the data we got are not enough. But we can suppose that the recession period can be identified earlier, and it means that $y_c \to y_3$ and $t_c \to t_3$. Within the limit they will be equal. Using our system and supposition we can find:

$$s_3 = c_3 = \frac{y_c - y_3}{(t_c - t_3) - (t_c - t_3)^2};$$

$$a_3 = y_3.$$

Putting these data in equation for (y_4, t_4) and showing t_4 we get quadratic and two radicals as result:

$$t_4^+ = t_3 + 1 + \sqrt{\frac{y_4}{(y_3 - y_c)}(t_c - t_3)(1 - t_c + t_3)};$$

$$t_4^- = t_3 - \sqrt{\frac{y_4}{(y_3 - y_c)}(t_c - t_3)(1 - t_c + t_3)}.$$

which has lead to recession. We need to analyze the criteria, which were put during the product making. All criteria can be divided into several types:

Functional (they show how well the functions are carried out)
- Productivity
- Exactness
- Reliability

Technological (saving of direct labour)
- Labour-intensiveness production
- Technological opportunity
- Material use
- Ability to divide the product into elements

Economical
- Material consumption
- Energy consumption
- Data ware costs

Anthropological
- Ergonomic (the full of person ability use)
- Beauty
- Safety
- Eco-friendly

Use of these criteria leads to modernisation of existing product. Therefore we will receive a new product which will have an own innovative curve and act in relation to innovative curve of a base product Co-Innovation. Parameters of Co-Innovation curve will have differences with a prime product and will obey rules described in [4], namely to have the maximum income of introduction of this innovation less than a base innovation (Fig. 3).

From now it becomes clear that the most favourable for introduction is development of a new innovation. However, product modernisation can prolong a lifecycle of already existing product and to make additional profit. It is obvious that time spent for

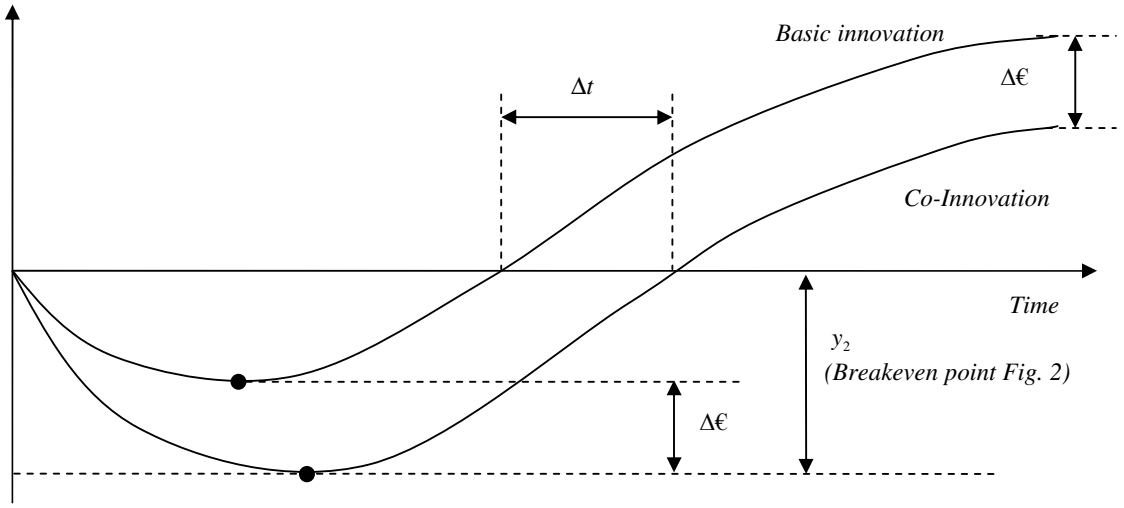

Fig. 3. Innovation curve for start up stage

5. Developments

After we identified the time we have for decision-making, it is necessary to analyze the situation [3] introduction of a new product Δt (till the moment of reception of profit on it) should take less time which remains till the release of the basic product will stop to be favourable $t_4 - t_c$ (Fig. 2), and also the volume

of means spent for start of new production Δ € should take less volume of means which company has received in the form of profit on realisation of a base innovation. Moreover as we see from [4], value Δ € on which the innovative curve will pass that value below base one and it helps to make possible calculation profit which is received from realisation of a new product. Value of Δ € and Δt can be calculated from the chosen way of modernisation. Each variant of modernisation is estimated on a number of criteria. It is possible to answer the question about cost of a new product and the price of its introduction in manufacture, and also a question about necessary time for the market entry and manufacture start, if these criteria will be put in that set of criteria on which will be made the decision.

For formation of a new product on the basis of the analysis of criteria it is possible to use the approach based on use of a method of morphological synthesis. For the features which describe the project characteristics, specific meanings are chosen. So we get the product (project), which is evaluated according to criteria. A new decision is made and evaluated. A lot of new products and decision can be created. And this procedure continues till the optimal decision is found. Let's have a look at the Figure 3 where we can see variants of such procedure. On this three black circles mean AND and white circles mean OR.

After creating the table for searching decision, it is necessary to make up a list of requirements, divided into obligatory requirements (limitation) and additional requirements (criteria) (Fig. 4).

The next stage is reduction of activities. Only requirement "AND" must be cut down. This process can be held by different methods: sum (for example, product mass- the sum of all elements), minimal (example, productivity is a minimum out of maximum productivity of product elements), average weight (the time of water heat in the teapot is 0.3 of time of capacity heat +0.7 time of water heat), classification gives back 0 or 1 depending on requirements implementation (for example the shape must be elliptic).

6. Conclusion

If we look at the example which proves the approach described, it is possible to take any product which was started as innovation. We will consider an example on a cellular phone. It is considered that the first cellular telephone was developed in 1973 by company Motorola, and in 1984 it was sold at the price of 3995 dollars thus on acquisition of this

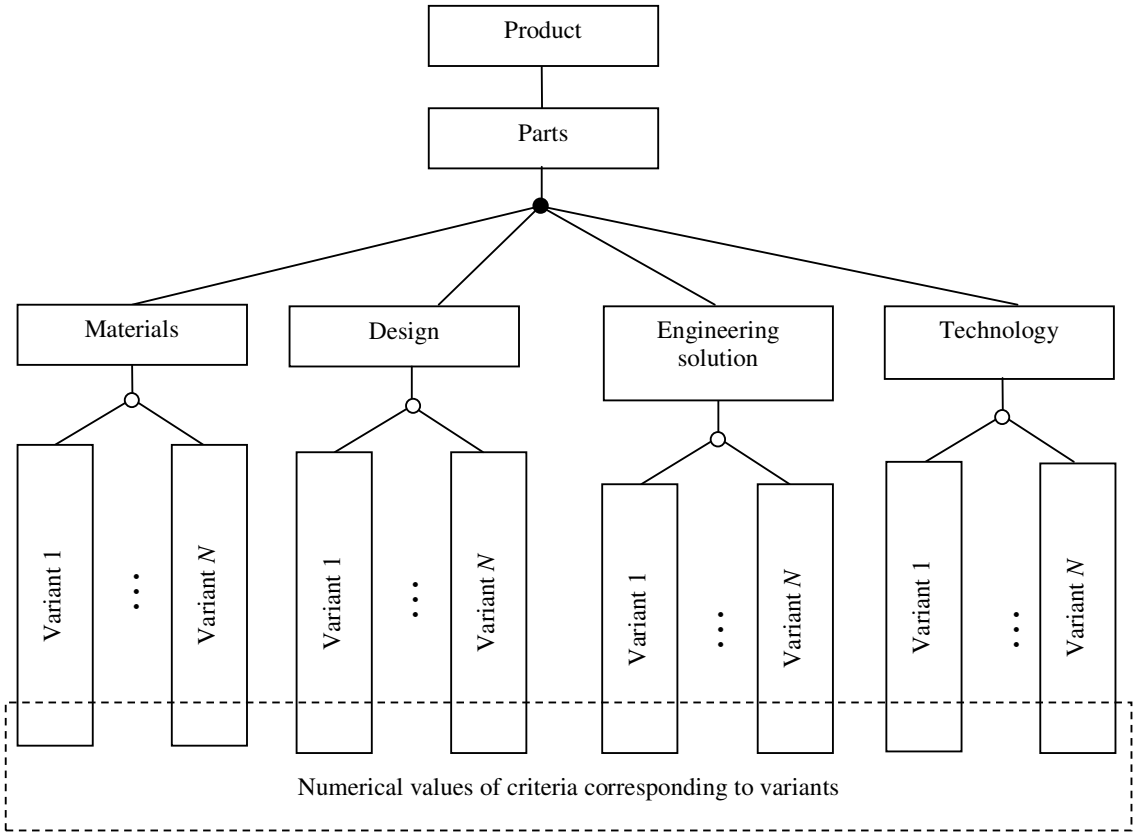

Fig. 4. Morphological tree for formation of a new product

device there was a turn from thousand persons. [6]. Now cellular phones are made of various materials, have additional functions and additional design features and factors. The release of the phones increases annually from the moment of its origin at this market in 1990 years. Level of supply breaks all records, but the growth doesn't bring profit[2] [7], moreover the time company is pressed for time for making new models.

As a result the use of described algorithms allows receiving concrete recommendations about management of innovation projects, and also to analyze possible decisions for prolongation of a life of the innovation project and to increase return beginning from idea or working out, which were taken as a principle of a product.

7. References

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[7] Sales of cellular phones is high, but profits of manufacturers is low. AlgoNet. Retrived October 8, 2008, from http://algonet.ru/?ID=617937

[2] Motorolla, the second manufacturer of cellular phones in the world, has informed that in the third quarter 2005 she has sold 53,7 million handy — on 39 % more than one year ago. Thus the company income has grown on 17 %, but the profit was reduced to 45 %. The similar tendency is traced in all years about the considered two years.