ALTERNATIVE APPROACH TO DETERMINING THE INNOVATIVE OBSOLESCENCE OF INDUSTRIAL PRODUCTS

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Abstract: *Technological development, nowadays, has entered a crucial stage that gives precedence to the innovative obsolescence over the physical one. To that effect, of utmost importance, therefore, is the accurate identification of the extent, i.e. the degree of innovative obsolescence in an effort to assess the effect of innovation upon the technical-economic performance and social outcomes of the industrial activity. Moreover, in an increasingly globalizing economy, innovations are bound to make a worldwide impact, accelerating the innovative technological obsolescence with the level of technology being utilised is globally lagging further behind the level of today's technology. Prolonged use of obsolete technology and outdated technological processes leads to certain losses, the amount of which is contingent on the extent of the lag range. Advanced in the paper is an alternative approach to determining innovative obsolescence of technological products and the respective solutions in pursuit of a marked reduction in its adverse effects.*

Key words: INNOVATIONS, INNOVATIVE OBSOLESCENCE, INNOVATION STRATEGIES

1. Innovative obsolescence

Innovative obsolescence refers to the underperformance of the currently utilized equipment and technology which is reported to fall well behind the level of recently developed innovative machinery and technology. Accordingly, they become less capable of competing successfully which inevitably results in certain losses.

Innovative obsolescence imposes certain conditions the companies should comply with. This stems from the attitudes towards technology and is significantly influenced by the active consumer interest in new products [3,4,5]. This is the reason why more and more companies have started to apply flexible technological and organisational patterns of behaviour to react to the surrounding industrial and market world in a proper way, namely:

- build their vision of a market and competition on the basis of the innovative development of modern industry on a global scale;
- adjust their own innovation policy to the overall industrial policy throughout the world;
- implement alternative methods and strategies to reduce the adverse effects of rapid innovation obsolescence.
- strive for the solution of high-tech problems and the production of products highly saturated in terms of innovation;
- apply flexible technological forms of production;
- coordinate their activities with flexible information technology;
- adapt to the market through flexible forms of production and product realization;
- confine their production to the area or locality where it is most profitable and where the effect of implementing innovative solutions is greatest.

In essence, this means that a global innovation policy is emerging, the manifestation of which is beginning to assume flexible technological and organizational forms in specific enterprises. This is a policy that readily adapts to the global industrial behaviour of innovations as a resource for their future development.

2.Determining the degree of innovative obsolescence of industrial products

Innovative obsolescence is measured by the degree of depreciation of any of the functions of the old machinery structures, facilities, etc. compared to those of newly produced innovative ones.They are determined in the following sequence, using the formula:

$$M = W.K \qquad (1)$$

where:

M –innovative obsolescence, (devolution of the functions of older machinery) (BGN);

W – initial value of the old machine (BGN);

K – Coefficient that expresses the level (%) of innovative obsolescence (0 ^ 1).

K - in the range $0 < K < 1$, where:

With $K = 1{,}0$ there is no innovative obsolescence (the machine is 100% innovative).

With $K = 0{,}5$ the machine is half-way innovatively outdated or 50%.

With $K = 0{,}0$ the machine is fully innovatively obsolete or 0% innovation.

K - defines innovation only within the range of 0 to 1.

$$K = (1 - E) \qquad (2)$$

where:

E – the degree of innovation of the machine at a given time (at the time of measurement).

Degree of innovation

The degree of innovation (E) determines how much a machine is innovative (%) as compared to the reference machine. It is calculated as follows:

$$E = \frac{D_1}{D_2} \qquad (3)$$

where:

D_1 – the ratio of the value of the new machine to the value of the old one.

Or $$D_1 = \frac{V_1}{V_2} \qquad (4)$$

where:

V_2- value of the new machine.

V_1- value of the old machine.

D_2 – the performance ratio of the new machine to the productivity of the older one.

Or $$D_2 = \frac{Q_2}{Q_1} \qquad (5)$$

where:

Q2- productivity of the new (innovative) machine.

Q1- productivity of the older machine.

Substitute and get the lines: $$K = 1 - \frac{D_1}{D_2} \qquad (6)$$

Further clarification and explanation to the main indicators outlined above;

1.The relation $\frac{D_1}{D_2}$

- should be positive (+), to indicate that;

A) There is innovation, or that the degree of innovation of the machine is growing.

B) With negative relation (-) the conclusion is that the innovation of the machine is reduced or the machine is not innovative.

In short, this means that D2 should have precedence over D1 or the price of the new machine should be in an optimal relation with the price of the older machine. As for the performance of the new machine, it should always be higher than the performance of the older machine.

3. Determining the length of the operational (service life) period of the types of machine structures as:

- Conventional or Class A, these are the traditional machines and Class A1, these are machines where the indicators reliability/warranty period/service life are the same at each time.
- Mechatronics (Modular principle). They have an optimal relation of reliability/warranty period/service life.
- Cyber-system machinery.

4.The relation (1- E) can be to the n-th degree when we follow the development of the innovation process in case of innovations with global degree of novelty.

n I – just another consecutive innovation against which it is measured (serves as reference base).

h – scale factor (from 0,5 to 1,00) Range of manifestation.

h=1 , when n=1 , then, it refers only to technologies with global degree of novelty.

h=0,5, when n= 0,5 , then, it refers only to innovations with regional scale of the impact of innovation implementation.

Then:

$$K = (1 - E); \quad (7)$$

$$E = \frac{D_1}{D_2} \quad (8)$$

3. Alternatives to rapid innovative obsolescence of products and processes

The main directions ensuring an effective way out of the constraints imposed by the rapid innovative obsolescence in the creation of competitive innovative products are being actively applied by a number of companies in the automotive industry and electronics. This new approach, readily adopted by industrial companies, offers a clear advantage in the following directions:

- application of the modular principle of construction and production of innovative products;
- design and production of modules with a different technological purposes;
- design and production of innovative products with the highest possible reliability and short service lifetime;
- considering the design and production cycle as a continuous process of occurrence and employment of methods of competitive engineering, simulation, virtual representation, etc. with the aim of shortening the cycle as much as possible;
- the shortest possible cycle from conception of a given idea to the production of innovative product.

The swift innovative obsolescence of products and services poses to humanity the issue of addressing and coming up with feasible solutions to the problem of eliminating the harmful effects of its profound impact [1,2,8,9]. This is particularly imperative when issuing protective documents, such as patents, where the deadline/time limit for their issuance takes longer than that for the emergence of a new innovative solution. Alternatively, the innovative product innovatively obsolescent even before it has entered into operation. With the current development of computer and information technology this problem can be solved with the creation of a European or Global information centre with open access to the database. Patents should be granted only for those products and technologies that have a proven long-term innovation lives. As for all other inventions, a fee-based open access shall be provided to them [6,7,10].

Innovative development of companies

Innovative development and innovative obsolescence can also be viewed as a process of solving problems or shaping the company's innovation policy. Every problem-solving process begins with specifying and identifying the main problem or framing the company's innovation policy. If the problem is precisely and clearly defined, it can be formulated and presented clearly, that is, the company has an effective policy.

Innovative development as a problem-solving process can be presented graphically as shown in Fig. 1.

Basically, innovative development and innovative obsolescence refer also to the company's policy as part of its corporate policy and is an integral part of the overall technique-economic development of the company itself.

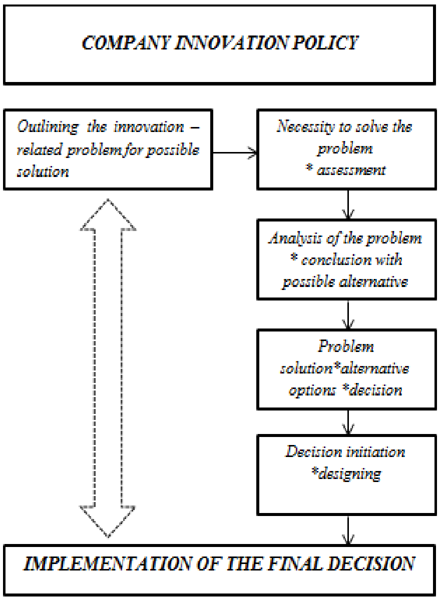

Fig.1.*Innovative development*

The strategic policy of the industrial company is inconceivable without a well-established, well-judged (i.e. correctly estimated) and well-designed innovation development policy making adequate provisions for the imminent innovative obsolescence as the main factor for the development. Innovation policy is believed to form the very concept of the economic performance indicators of the company and is a key factor for its prosperity.

Global trends in innovation development

The immediate technological progress and fast-track development has enormous impact on core activities such as energy, communications, biotechnology, nanotechnology, etc. It follows, therefore, that the biggest innovation boom will be expected in these areas. In principle, this is also associated with sharp development of innovative activities related to the servicing and maintenance of major priority axes in accelerating progress around the world. The complete attention of scientists worldwide will be directed to innovative development of: information technologies; biotechnology, creating and using new materials, nanotechnologies, alternative energy sources, space resource exploration and utilization, environmental protection.

Conclusion

In closing it can be concluded that innovative development and innovative obsolescence are interconnected manifestations of one and the same process. Furthermore, innovative obsolescence is open to close examination, harnessed and kept under proper control. To that effect, advanced in the paper is a new approach and alternative method for determining the magnitude and calculating the degree of innovative obsolescence of products and processes. Proposed is a set of tools for practical utilization and deployment.

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