

Flexibility of Strategy in High-Tech Enterprises

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Abstract. The paper is an attempt to define the flexibility of strategy in the modern and dynamically developing high-technology sector. Assuming that, for high-tech companies, the most important factors are the development of technology, innovation, and knowledge, as well as the fast identification and exploitation of opportunities, a synthetic measure of the flexibility of strategy was proposed and verified. Qualitative research was conducted in 61 medium and large high-technology companies based in Poland which operate either in Poland or in the global marketplace. The study's results confirmed that the more companies try to become innovative and technological leaders, the more flexible their strategy should be.

Keywords: flexibility, strategy, high-tech enterprises, resources, opportunities

1. Introduction

Flexibility, next to efficiency and quality, is the fundamental measure of a modern organization management paradigm [1]. It also becomes a key requirement for the survival of the firm [2] because it helps the company adapt to this constantly changing environment [3] and it is an important source of competitive advantage for the firm [4]. This is a multidimensional concept and, therefore, it is difficult to name one, commonly approved definition [3]. According to the opinions from the literature, flexibility is the opposite of stability [5] and rigidity [6], and it is synonymous with the concept of adaptation, which is often regarded as adjustment, permanent in its effects and flexibility as agility, mobility, extensibility, i.e. the feature connected with a short response time [7]. It seems, however, that flexibility includes these two space and time dimensions, i.e. both reaction (or creation) time and the degree of adjustment in each separate element and the whole organizational system [8]. Flexibility certainly requires agility, versatility, and robustness [9], simultaneously being an important feature of an organization, which conditions its existence, functioning, and continued development. The polymorphic nature of flexibility is manifested in its different types [8], [10], [11]. It can refer to an enterprise as a whole or its separate elements.

One of the basic measures of a company's flexibility, which considerably influences its further development, is the flexibility of the strategy. However, due to the ambiguity of the concept of strategy [12] and the specific nature of high-tech enterprises (high demand for scientific research and the intensity of R&D expenditure, high level of innovativeness and the fast diffusion of technological innovations, high level of employment of scientific and technical staff and the fast process of obsolescence of the prepared products and technologies [13]), the question arises as to how one should understand the flexibility of the strategy in this type of enterprises and what it depends on.

This article is an attempt to answer this question, and its main objective is to propose a measure of high-tech companies' flexibility of the strategy, based on the analysis of 61 companies based in Poland which operate either in Poland or in the global marketplace. The proposed measure allows to assess the flexibility of the company's strategy. It can be useful not only to high-tech companies but also other firms based on knowledge and highly innovation.

2. The concept of strategic flexibility for a high-tech company

High technology company is defined as a business enterprise operating on the border of economy and science, in the sector regarded as high-technology¹ and/or making products classified as high technology

¹ According to NACE Rev.2 high-tech industries are: manufacture of basic pharmaceutical products and pharmaceutical

items [15]. Creating new technological knowledge and its implication in the form of numerous patent rights and licenses, identifying and using opportunities and creating new production and market space – these are the key characteristics of high-tech companies [16], which require a flexible approach in strategic decision (choice) making. The strategy creation and implementation stages are interactively integrated. To a company, the most important element is the development of technology, innovativeness, and knowledge as a resource [17] as well as the fast use of opportunities, which stimulate the generation of strategies in product-market categories, defined by: (1) specialization or diversification, (2) external and/or internal way of growth, (3) vertical integration [18]. Flexible strategy should include competition between the various development directions of an enterprise, as long as possible.

Managers of high-tech companies have to decide which resources of an organization are essential and unique and then decide about the competitive advantage of the company, how to develop, acquire, and protect them. The key resources in high-tech companies are knowledge and skills, in particular competences and talents of staff, technological knowledge, know-how, patents and relations with the environment. The redundancy of these resources creates a specific potential of an enterprise that supports the taking advantage of opportunities. According to K.M. Eisenhardt and D.N. Sull [19], the fast use of ephemeral opportunities is supported by a strategy composed of simple rules (principles). The results of the research carried out by K. Oblój's team [20] show that market leaders (high-tech companies should aim at technological leadership) to not have an unambiguous operation strategy but rather to use a few simple rules, such as: positive orientation toward the environment, innovativeness and experimentation, as well as prompt and flexible actions.

Considering the above, the flexibility of the strategy in a high-tech company (F_s) was defined as the function of:²

- the ability to identify opportunities (c_{io}) – establishing an environment monitoring system, which enables the fast identification of events that the company ex ante defined as potential opportunities;
- the ability to experiment and generate ideas, innovations (c_{ei}) – providing for conditions that support creativity and the generation of ideas; establishing an internal monitoring system in order to quickly identify events that the company ex ante defined as value innovation ideas;
- the ability to make key resources redundant (c_{tr}) – identification of key resources (own and access to external resources) and defining the intended redundancy, which will enable the use of opportunities;
- the ability to use opportunities (c_{uo}) – solutions for the “organization on the move”, in particular the efficiency of information and decision-making processes, tendency to take risks, flexibility of the organization processes and structure, various systems of procedures, simulation systems;

which can be summarized as:

$$F_s = f \{ c_{io}, c_{ei}, c_{tr}, c_{uo} \}$$

Strategic flexibility (F_s) is greater if the ability to identify opportunities (c_{io}), experiment and generate ideas (c_{ei}), make key resources redundant (c_{tr}), and use opportunities (c_{uo}) is greater, which results from the fact that the proposed function is multidimensional and unidirectional. For the purpose of simplification, the flexibility of the strategy function can be reduced to a synthetic measure, as follows:³

$$F_{sj} = w_1 c_{iouj} + w_2 c_{eiu j} + w_3 c_{rruj} + w_4 c_{uouj}$$

where:

F_{sj} – flexibility of the strategy synthetic standard

preparations, manufacture of computer, electronic and optical products, manufacture of air and spacecraft and related machinery and high-tech knowledge-intensive services are: telecommunications, computer programming, consultancy and related activities, information service activities, scientific research and development [14].

² The proposed approach to high-tech companies' flexibility of the strategy is the result of inspiration from the work of the valued strategy theoretician, Professor Rafał Krupski [8].

³ The proposed synthetic standard was prepared on the basis of a variables transformation method – standardization, in order to bring all the variables to the range $<0,1>$.

$$c_{ioij} = \frac{c_{ioj} - \min_j(c_{ioj})}{\max_j(c_{ioj}) - \min_j(c_{ioj})} - \text{standardized value of the ability to identify opportunities};$$

$$c_{eij} = \frac{c_{eij} - \min_j(c_{eij})}{\max_j(c_{eij}) - \min_j(c_{eij})} - \text{standardized value of the ability to experiment and generate ideas};$$

$$c_{rrj} = \frac{c_{rrj} - \min_j(c_{rrj})}{\max_j(c_{rrj}) - \min_j(c_{rrj})} - \text{standardized value of the ability to make key resources redundant};$$

$$c_{uoj} = \frac{c_{uoj} - \min_j(c_{uoj})}{\max_j(c_{uoj}) - \min_j(c_{uoj})} - \text{standardized value of the ability to use opportunities};$$

$j = 1, \dots, n$ – number of items,

$w_1 + w_2 + w_3 + w_4 = 1$, $w_1, w_2, w_3, w_4 \in (0;1)$ – weights of the individual abilities.

Assuming, after W. Ostasiewicz [21], the standard classification thresholds of variable values from the range $<0.1>$, the following flexibility classes were defined:

- from 0 to 0.2 – scarce flexibility (often assumed as non-existent),
- from 0.2 to 0.4 – low flexibility,
- from 0.4 to 0.7 – moderate flexibility,
- from 0.7 to 0.9 – high flexibility,
- from 0.9 to 1 – perfect flexibility.

With such a measure, an attempt was made to assess the flexibility of strategy in high-tech companies.

3. Methodology

The study was carried out on a selected sample of 61 high-tech companies in 2010. The companies were selected on the basis of two criteria: high technology sector (according to the OECD classification – sectoral approach) and the size of the enterprise (measured by the number of employees – over 50). The monographic method was applied with the standardized interview technique⁴; the respondents were representatives of the chief executive officers (CEOs).

The studied companies primarily represented the IT and telecommunication sector (24), pharmaceutical (13) and in other cases (24) other different sectors within high-tech. There were 47 medium-sized companies (from 50 to 249 employees) and 14 large companies (over 249 employees). 29 companies operated in Poland and 32 operated in global marketplace. R&D Departments are present in all the studied companies. In addition, most of the companies (43) tend to achieve innovation leadership, i.e. become technological leaders by creating new technologies and launching new products onto the market. Innovation followership was identified in the remaining 18 companies, which aims at launching products based on imitation and learning from the experience of technological leaders.

4. Results and discussion

In order to carry out an assessment of the flexibility of strategy in the studied companies with the use of the proposed measure, it was first necessary to define the weight for individual abilities. For this purpose, the respondents were asked about the importance of the flexibility of strategy. The results are shown in Table I.

According to the respondents, the most important of these is the ability to use opportunities – 32 persons declared that it was very important and 24 – important for the flexibility of strategy. The ability to identify opportunities was important and very important according to 58 persons, and the ability to experiment and generate innovations was important and very important according to 57 persons. The respondents' opinions varied as regards the assessment of the ability to make key resources redundant. The majority (42 persons) declared that it was important and very important, 18 persons as quite important, and in one company as not

⁴ The interview technique made it possible for the researcher and survey participants to come to an agreement as to the understanding of the elements of the flexible of strategy.

very important. This was the company that frequently relies on technology transfer. Therefore, the company quite rarely created redundant key resources.

Table I. Assessment of the ability to identify and use opportunities, the ability to experiment and make resources redundant for the flexibility of strategy in the studied companies

Description	Total (all companies)			
	not very important	quite important	important	very important
the ability to identify opportunities	-	3	29	29
the ability to experiment, generate ideas, and innovate	-	4	33	24
the ability to make (create excess) key resources redundant	1	18	25	17
the ability to use opportunities	-	5	24	32

Source: Own study

Based on the respondents' opinions on the importance of individual abilities, their weights⁵ in the synthetic measure of the flexibility of strategy were specified. The measure took the following form:

$$F_{sj} = 0,23c_{iouj} + 0,23c_{eiuuj} + 0,23c_{rruj} + 0,31c_{uouj}$$

Next, based on the value⁶ prescribed by the respondents to an individual ability, the standardized value of each was calculated. By applying the obtained values to the synthetic measure F_{sj} , the assessment of the flexibility of strategy for each of the studied companies was obtained. Table II contains the results, grouped by the identified flexibility thresholds.

Table II. Flexibility of strategy in the studied enterprises

Flexibility classes	Total (all companies)	Innovation strategy	
		innovation leadership	innovation followership
from 0 to 0.2 – minute flexibility	4	2	2
from 0.2 to 0.4 – low flexibility	7	3	4
from 0.4 to 0.7 – moderate flexibility	24	15	9
from 0.7 to 0.9 – high flexibility	17	15	2
from 0.9 to 1 – perfect flexibility	9	8	1
Total	61	43	18

Source: Own study

26 out of 61 studied companies showed high flexibility of strategy, including 9 with perfect flexibility. 24 enterprises showed moderate flexibility and 11 – low flexibility, including 4 companies with minute flexibility. While carrying out the Kruskal–Wallis one-way analysis of variance tests for the flexibility of strategy, depending on the trade, company size, range of operations, and innovation strategy, a one, statistically relevant difference, was found. The companies that aimed at innovative leadership showed much higher flexibility of strategy than those that focused on innovative imitation. The data in Table II confirm this statement. Out of 43 enterprises aiming at technological leadership, 23 had high and 15 moderate flexibility of strategy. Only 5 companies showed a low level of flexibility. Whereas out of 18 companies that applied the imitation innovation strategy, half showed a moderate level of flexibility, 6 – low and only 3 – high (those that focused on creative imitation, i.e. using a new product of an innovator in order to launch their own, improved products).

5. Conclusion

Flexibility is an important and required feature of modern enterprises, flexibility of strategy in particular. In high-tech companies it should be viewed as the function of the ability to identify and use opportunities, the ability to experiment and make key resources redundant. The results of the carried out research indicate that the more often a company's aim is to achieve the leader's position in the sector, by developing new technologies and launching new products, the more flexible its strategy should be, i.e. the company should have a higher level of individual abilities. This tendency dominated regardless of the sector, size, or range of a company operation.

⁵ The average value of the respondents' opinions was applied for defining the weights.

⁶ The respondents gave marks to each ability within their company strategy, using the 1-5 scale, whereas 1 means very low ability and 5 – very high ability.

The author realizes that the proposed measure of flexibility of strategy is of a general nature and it has been based on the subjective opinions of the respondents. The measure should be further analyzed in order to propose a more unbiased measure that could be the objective of continued research.

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