

## **A ZAKRZEWSKA-BIELAWSKA**

Department of Management,  
Lodz University of Technology  
ul. Piotrkowska 266, 90-924 Lodz,  
Poland

Tel: 48 604 08 78 78  
Fax: 4842 636 28 24

email:  
agnieszka.zakrzewska-bielawska@p.lodz.pl; a\_bielawka@poczta.onet.pl

# COMPETE OR COOPETE? CATALYSTS AND INHIBITORS OF COOPETITION IN THE HIGH-TECH BUSINESS SECTOR

## ABSTRACT

Coopetition has become a new strategy of achieving competitive advantage in a turbulent environment. It is constituted by two major forces: the competitive pressure and the will to cooperate, so it is defined as the cooperation of entities that at the same time remain in a competitive relationship. This peculiar type of relations is determined by numerous factors which may either enhance or mitigate the intensity of coopetitive activities. The study presents the results of research conducted on a representative group (in terms of size and industry) of high-tech enterprises with respect to factors affecting the strength of coopetition on the mesoeconomic level. The results have revealed that internal factors more strongly influence the initiation and development of coopetitive relations than the external ones, and the major catalysts affecting these relations include: company reputation, market position, flexibility, ability to use opportunities, but also customer requirements, intensity of competition, and technological progress.

**Keywords** : competition, cooperation, coopetition, high-tech

## INTRODUCTION

The process in which market participants compete with each other in making market transactions by presenting a better market offer than other entities in order to achieve their goals is referred to as competition (Stigler, 2008). Such rivalry in pursuit of analogous goals means that actions taken by one entity for the purpose of achieving specific objectives impede (or sometimes even prevent) the attainment of the same objectives by others. Competitive relationships are considered primarily in the field of economics, from the point of view of various market structures (Samuelson, Marks, 2006). They are also the

basic point of reference in strategic management (Porter, 1980; Barney, Hesterly, 2011; Ma, 1999). Competition has been recognised as a common model of organisational behaviour, and competitive advantage is the outcome of the market game.

However, the research conducted over the past 30 years suggest that another possible source of competitive advantage may be the cooperation between organisations, manifested by the creation of characteristic relationships and links in the course of which there occurs the exchange of information, materials and energy, and the parties display increasing mutual commitment (Johnson, Johnson, 1989; Kamensky, Burlin, 2004; Axelrod, 2006). Therefore, cooperation determines the scope to which organisations pursue common interests and thus achieve measurable benefits (Singh, 1997; Chang 2003). The cooperative potential is used primarily in the relational approach, while competitive relations are typical of the transactional approach (Axelsson, Wynstra 2002).

Consequently, atomistic competition that was the central point of 20<sup>th</sup>-century economics has now faded in significance, as strategic co-dependence may not be ignored. The “death of competition” was already announced in 1996 by J.F. Moore, who stated that organisations had entered the era of ecosystems shared by enterprises, clients, suppliers, competitors, etc. (Stańczyk-Hugiet 2013). What is more, growing competition calls for growing cooperation, which is referred to as the great paradox of modern management (Adamik, 2008). This induced the search for new strategies of achieving competitive advantage. The answer was found in coopetition – a combination of competition and cooperation.

A pioneering work on the subject was the monograph by Brandenburger and Nalebuff (1996) entitled “Coopetition”, where the authors described examples of simultaneous relations of competition and cooperation. According to

their postulates, enterprises are in cooperative relations when they cooperate and share the uncertainty stemming from the behaviour of the environment, at the same time remaining competitors in other areas of activity. This way, they are able to develop and maintain competitive advantage resulting both from cooperation and competition. Brandenburger and Nalebuff tried to explain strategic cooperation between competitors on the basis of the game theory. Since then, the concept of cooperation has drawn the attention of researchers around the world. Apart from the game theory, theoretical foundations of cooperation are also rooted in the resource theory (Chen, Su, Tsai, 2007), the social capital theory (Inkpen, Tsang, 2005; Tura, Harmaakorpi, 2005), and inter-organisational dynamics (Tidstrom, 2008). Cooperation is also studied on different levels. One may distinguish the micro-level (cooperation concerns company-internal units, e. g. functional departments, strategic business units) meso-level (companies in industries or clusters), macro-level (clusters, industries, sectors of economy) and the global level (national economies, integration groups) [Dagnino, Padula, 2002]. At the same time, the cooperative relations per se may be vertical (suppliers, clients in the chain of supply), horizontal (between direct competitors) and network-like (combination of vertical and horizontal relations) [Bengtsson, Kock, 2000; Kotzab, Teller, 2003].

The issue of cooperation is particularly important in the sector of high-technology businesses (high-tech). The sector includes innovative, knowledge-based, creative enterprises that can create and absorb innovations, manage knowledge, develop and use intellectual capital, and cooperate effectively to their own advantage and for the benefit of other firms in creative business networks (Zakrzewska–Bielawska, 2010).

The pressure on innovation and creation of new knowledge, particularly new technologies, forces these entities to make high investments in research and development.<sup>1</sup> High costs of R&D, investment risk and a shrinking high-tech product life-cycle are strong premises for engaging in cooperation in the creation of new technologies not only with R&D centres and technology transfer units, but also

<sup>1</sup> Expenses on R&D exceeding 7% of company revenues is a quantitative variable distinguishing the high-tech sector from the medium-high-, medium-low- and low-technology enterprises (*Classification of High-Technology Product and Industries*, 1995).

with competitors (Zakrzewska–Bielawska, 2012). Even though cooperation is a relatively new type of connection between businesses, research shows (Chin, Chan, Lam, 2008; Kitchen, Snow, Hoover, 2004; Mariani, 2007) that it is immensely significant for company growth. Moreover, relations of this kind are determined by numerous factors of both exo- and endogenous nature.

**The goal of the paper** is to determine and evaluate the factors affecting the intensity of cooperation in the high-tech sector. The focus has been placed on the mesoeconomic level of cooperation and its horizontal relations, i.e. links in which cooperation takes place between direct competitors contending for the same final client. The catalysts and inhibitors of cooperation in the high-tech sector were identified on the basis of a PAPI survey conducted in 2012-2013 on a representative sample of 402 enterprises based in Poland that operate either in Poland or in the global marketplace.

The paper's structure is organized around its aim. First, the notion of cooperation was explained and the factors affecting willingness to cooperate with competitors were identified. Second, the research scope and methodology were described. Third, the results were presented and discussed. The paper ends with conclusions and directions of further research.

## FACTORS DETERMINING COOPERATION IN THE HIGH-TECH SECTOR

In general terms, cooperation is defined as simultaneous cooperation and competition between enterprises (Bengtsson, Kock 2000) that, while preserving organisational independence, compete and cooperate repetitively (Zerbini, Castaldo, 2007). Cooperation allows firms to integrate their actions so as to achieve intended mutual benefits, while at the same time acting as rivals striving to attain individual strategic goals. Hence cooperation is not a development of either the theory of competition or the theory of cooperation, but is interpreted as a system of actors acting on the basis of a partial concordance of interests and goals (Dagnino, Yami, Le Roy, Czakon, 2008).

The convergent interests that lie behind parallel competition and cooperation relate primarily to mutual learning and stimulation of innovativeness, improvement of technological solutions, reduction of costs of R&D work, and better coordination of supply chains (Bonel, Rocco, 2007; Gnyawali, Park, 2009; Bengtsson, Ericsson, Wincent, 2010). Coopetition undoubtedly requires a part to be played by knowledge, which is the source of competitive advantage. Knowledge acquired within a framework of cooperation can also be used for competing (Levy, Loebbecke, Powell, 2003). Moreover, coopetitive relations stimulate technological development and firms' innovativeness (Nemeh, Yami, 2012), which is particularly valuable in the high-tech sector.

The high complexity of products, the high level of technological advancement, and the heterogeneity and uniqueness of resources which could not be produced independently within the time necessitated by the dynamics of the environment (Bengtsson et al., 2010) stimulate high-tech firms to enter into cooperation with their competitors. On the other hand, high-tech firms compete for the position of technological leader and for innovative leadership within the industry. Through intensive innovative activity they aim to create new products which satisfy customers' current needs, but also use their products to create new needs. The desire to attain the position of technological leader is conditional on patent policy and intellectual property protection, which provide a guarantee of the ability to profit from new technologies, inventions or research results. Competition in the high-tech sector also results from the need to earn back investment costs through sales over shorter and shorter time frames (Zakrzewska-Bielawska, 2013a).

The intensity of coopetitive activity in the high-tech sector is influenced by many different factors that are at the same time determinants of company growth. They may be roughly divided into external and internal ones. The major external factors affecting the growth of high-tech businesses and the intensity of cooperation with competitors include the following (Zakrzewska-Bielawska, 2013a):

- national R&D potential, including in particular R&D expenditure, the availability of scientific and research staff, and initiatives at central and local

government level;

- R&D infrastructure (clusters, technological incubators, science parks, centres of technology transfer);
- a system for financing R&D activity (EU and domestic programmes, venture capital, business angels, banks, etc.);
- patent policy and protection of intellectual property;
- globalization of the economy;
- the rate of technical and technological development;
- the intensity of competition;
- customer requirements.

On the other hand, the growth of high-tech enterprises is also influenced by numerous internal aspects. In most cases, they are connected with the resources held by companies (Barney, Delwyn, 2009; Sanchez, Heene, 2004) and the capacity for their redundancy (generating surplus resources), the ability to identify and make use of opportunities (Eisenhardt, Sull, 2001) – which affects business flexibility (Zakrzewska-Bielawska, 2011) – as well as with organisational culture (Martins, Terblanche, 2003) and knowledge-management systems (Jashapara, 2004). Other factors conditioning the intention for cooperation with competitors might include a company's market position and reputation (Cygler, 2009) and the size and age of an enterprise (Oliver, 2004).

Individual factors may affect the development of coopetitive relations in various ways. They may either strongly stimulate such relations [e. g. complementariness of resources and the resultant synergy is viewed as the fundamental postulate of coopetition (Dyer, Singh, 1998)], or inhibit them [e. g. the absence of relevant regulations protecting intellectual property of partners may discourage cooperation (Moschini, 2001)]. Although each of these factors separately affects the initiation of coopetition, the intensity of cooperation with competitors is determined by

a combination of different elements. Taking the above into consideration, the following hypotheses were formed:

- H1. *The intensity of competition between high-tech enterprises is largely determined by internal factors.*
- H2. *Among the internal factors, competition is mostly stimulated by the resource structure, ability to use opportunities, and company flexibility, while the strongest barrier is inadequate organisational culture and resource redundancy.*
- H3. *Among the external factors, competition is mostly promoted by competition intensity, customer requirements and technological progress, and hampered by the system of intellectual property protection and the national R&D potential and infrastructure.*

In order to check what factors affect the competition of high-tech companies and verify the above hypothesis, a survey was conducted of 402 companies based in Poland that operate either in Poland or in the global marketplace. The following section describes the methods of data collection.

## RESEARCH METHODOLOGY

The aim of the research was to determine the influence of factors affecting the intensity of competitive activity of high-tech companies. The studies were conducted from October 2012 to the end of January 2013 on a group of 402 entities operating in the high-tech sector. The selection criterion was business activity in the high-tech sector, determined using the sectoral approach (according to OECD) based on the Polish Classification of Businesses (PKD)<sup>2</sup>.

The sample included an overrepresentation (in comparison to the business population structure) of larger enterprises (employing over 50 people) operating in the telecom, computer, aviation and pharmaceutical industries, as according to researchers, this is the type of entities most likely to form competitive relations. Therefore, after data collection, the sample was presented in quota terms<sup>3</sup> by attributing proper weight to each unit, so that the whole sample corresponded to structure of the high-tech sector in Poland, and so that the results may be extrapolated to the entire population (sample representativeness). The quotas were defined in terms of the high-tech industry and company size: small (1 to 49 employees), medium-sized (50 to 249 employees) and large (over 249 employees). The high-tech sector structure was determined on the basis of the data of the Central Statistical Office, and research operator was the “Polskie firmy” database and “Panorama firm”, as their data and addresses are most up-to-date.

The survey was conducted using a questionnaire by the PAPI (Pen and Paper Interview) method, namely personal interviews conducted by a researcher.<sup>4</sup> The research tool was a structured and standardized paper questionnaire. The respondents were owners (53.7%) and chief executive officers (CEOs) of firms (46.3%), these being the people who take firms’ strategic decisions, including decisions to undertake cooperation with competitors and determining the scope and nature of that cooperation.

Competition was reported by 52.3% of businesses, which supports the statement that high-tech companies quite often cooperate with competitors due to their characteristics. Absence of such relations was found in 47.7% of enterprises, mostly small and operating nationally.

2 The Polish business classification system PKD (Polska Klasyfikacja Działalności) corresponds to the European statistical business classification NACE Rev. 2, introduced by Regulation (EC) No. 1893/2006 of the European Parliament and Council. According to NACE Rev. 2 (sectoral approach), high-tech industries include manufacturers of basic pharmaceutical products and pharmaceutical preparations, manufacturers of computers, electronic and optical products, and manufacturers of air, spacecraft and related machinery, while high-tech knowledge-intensive services include telecommunications, computer programming, consultancy and related activities, information service activities, and scientific R&D (high-technology and knowledge-based services aggregations based on NACE Rev.2, 2012).

3 A quota-based sample consists in going out of a known structure of the studied population and searching for units for analysis that correspond to significant population parameters.

4 The carrying out of the survey was outsourced to one of the largest research firms in Poland with qualified interviewers, TNS Poland.

As concerns the characteristics of the companies involved in cooperation, they were mostly ones operating nationally (24.5% operated on international markets) dealing with the manufacture of computers, electronics and optical equipment (38.8%) and providing IT and telecom services (37.7%). 73.9% of them were small businesses, 18.1% were medium-sized, and 7.3% were large.

In terms of the area of cooperation, it was most frequent in production or services (68.03% of cooperators), sale and distribution (56.5%), supply (53.3%), and R&D (38.7%). The analysis of cooperation determinants, presented in the further part of the paper, concerns both the weight of

individual factors as affecting the initiation of cooperation with competition, and their status as catalysts or inhibitors of such relations.

## RESULTS AND DISCUSSION

First of all, respondents were asked to evaluate the importance of particular factors from the point of view of cooperation. The respondents were supposed to make the assessment on a scale of 1 to 5, where 1 signified the unimportance to cooperation, and 5 implied a great importance for it. The obtained results – with reference to cooperators and non-cooperators – are shown in Table 1.

TABLE 1: EVALUATION OF THE IMPORTANCE OF FACTORS IN TERMS OF THEIR INFLUENCE ON COOPERATION IN THE HIGH-TECH SECTOR

| Factor   | Cooperators<br>N=210 |   |     | Non-cooperators<br>N=192 |   |     |
|--|----------------------|---|-----|--------------------------|---|-----|
|  | $\bar{x}$            | M | IQR | $\bar{x}$                | M | IQR |
| Domestic R&D potential   | 3.50                 | 3 | 2   | 2,12                     | 2 | 2   |
| R&D infrastructure   | 3.61                 | 3 | 2   | 2,20                     | 2 | 2   |
| System for financing R&D activity  | 3.90                 | 3 | 2   | 2,37                     | 2 | 2   |
| Patent policy and intellectual property protection   | 3.78                 | 3 | 2   | 2.40                     | 3 | 2   |
| Globalization of the economy   | 4.02                 | 3 | 2   | 2.76                     | 3 | 2   |
| Rate of technological development  | 4.39                 | 4 | 1   | 3.16                     | 3 | 2   |
| Intensity of competition   | 4.60                 | 4 | 1   | 3.40                     | 4 | 1   |
| Customer requirements  | 4.81                 | 4 | 2   | 3.54                     | 4 | 2   |
| Resources held   | 4.47                 | 4 | 1   | 3.21                     | 3 | 1   |
| Redundancy of resources (creating an excess of resources)  | 3.85                 | 3 | 2   | 2.65                     | 3 | 1   |
| Ability to identify opportunities  | 4.55                 | 4 | 2   | 3.34                     | 3 | 1   |
| Ability to use opportunities   | 4.70                 | 4 | 2   | 3.36                     | 3 | 1   |
| Firm's flexibility   | 4.75                 | 4 | 2   | 3.46                     | 4 | 2   |
| Market position of the company   | 4.60                 | 4 | 2   | 3.50                     | 4 | 2   |
| Organizational culture   | 4.42                 | 4 | 1   | 3.18                     | 3 | 1   |
| System of knowledge management (acquisition, creation, sharing, use, preservation and transfer of knowledge) | 3.73                 | 4 | 1   | 3.19                     | 3 | 1   |
| Firm's reputation  | 4.43                 | 4 | 2   | 3.55                     | 4 | 2   |
| Firm's size  | 3.46                 | 3 | 1   | 2.72                     | 3 | 2   |
| Firm's age   | 3.39                 | 3 | 1   | 2.57                     | 3 | 1   |

N = no. of firms     $\bar{x}$  = mean    M = median    IQR = interquartile range

According to the respondents, internal factors were more important for undertaking cooperative activity, both in the opinion of the cooperating and non-cooperating enterprises. This fact is evident both in the median, and mean values, and it supports the H1 hypothesis. Among the cooperators, internal factors of greatest importance included business flexibility (mean value: 4.75), ability to use opportunities (4.70) and market position (4.60). Other considerable factors listed by these companies were the ability to identify opportunities, resources held, organisational culture, and company reputation. The median value indicated with respect to all these factors was 4, meaning that for 50% of respondents they were important or very important in terms of affecting cooperation. However, it should be noted that responses were quite varied, as for some companies these factors were of key importance, while for others they were less significant (IQR=2).

In the group of companies not involved in cooperation, the most important factors were company reputation, market position and flexibility. Good position and reputation enables the elimination of unreliable enterprises, while flexibility (i. e. speed and ease of reaction to changes) ensures more harmonious cooperation. In both groups of respondents, the factors least influencing cooperation were the size and age of an enterprise, which means that the formation and durability of cooperative relations are hardly affected by the size and age of the partners, but rather by their market positions and reputations.

As far as external factors are concerned, respondents decided that customer requirements and intensity of competition (M=4) were of key importance to cooperation. Rapidly changing tastes, preferences and expectations of clients encourage businesses to cooperate, also with competitors, in order to satisfy these new needs as fast as possible (faster than the competitors outside the arrangement). Similarly, there is a quite strong correlation between the intensity of competitive struggle and companies' tendency to cooperate. It primarily stems from increasing costs and risk of operation, quick erosion of market position and competitive advantage, as well as diminishing possibility to predict situations in long-term perspective. Another important determinant of cooperation was also the rate of technological progress (M=4). It seems particularly important in high-tech businesses,

characterised by the highest technological development. The tendency to form cooperative arrangements arises from the necessity to launch extensive investments in R&D works that often exceed the possibilities of individual firms. The least significance among external cooperation determinants is attributed to the national R&D potential and R&D infrastructure. This fact is quite unsettling, as cluster initiatives, efficient technology parks, access to R&D personnel, and state and local government initiatives and programmes in favour of the high-tech sector are fundamental conditions for its growth. In order to find out if there were statistically significant differences ( $p < 0.05$ ) in the evaluation of individual factors determining cooperation depending on the high-tech industry, company size and innovativeness, and the number of cooperators, the Kruskal–Wallis test was performed. Its results produced the following conclusions:

- evaluation of the importance of individual factors differs significantly depending on the industry, though all factors except R&D infrastructure, company size and knowledge-management system were evaluated as more important in the computer, electronics and optical equipment production industry, and in R&D businesses; the larger the company, the higher the assessed importance of individual factors for undertaking cooperation with competitors;
- highly and poorly innovative firms evaluated the importance of individual factors as lower than enterprises with a moderate level of innovation;
- a company's market position and customer requirements were of key importance to the cooperation of those enterprises that cooperated with 4–10 competitors, whereas the importance of these factors was lower for entities collaborating with less than 4 and more than 10 rival companies.

The studied factors may affect the formation of cooperative relations in a positive way, intensifying these activities, or in a negative way, thus impeding and obstructing the initiation and development of cooperation with competitors. Therefore, respondents were asked to assess the said factors from the point of view of their influence on cooperation intensity. The evaluation was made on a

scale of “-2” to “+2”, with positive values (“+1”- weak influence, to “+2”- strong influence) referring to positive influence (promotion of cooperation), and negative values (“-1”- weak influence, to “-2”- strong influence) referring to negative influence (obstruction of cooperation). The zero (“0”) value signified the lack of influence of a given factor on the intensity of cooperative activities. Table 2 presents the results of respondent evaluations. A considerable group of respondents stated that individual factors had no influence whatsoever on the intensity of cooperation. This opinion was expressed mostly by the companies

that had claimed that the individual factors were unimportant or marginal to the initiation of cooperation. Moreover, positive influence of individual factors was more frequently reported than negative influence, which means that they were more stimulating than inhibiting to cooperation.

As the strongest barrier to cooperative relations, companies with experience in cooperation named the state patent policy and the Polish solutions in intellectual property protection (19.1% of firms).

TABLE 2: INFLUENCE OF INDIVIDUAL FACTORS ON THE INTENSITY OF COOPERATION IN THE HIGH-TECH SECTOR <sup>5</sup>

| Factor   | Coopetitors<br>N=210  |          |                  |                      |            | Non-coopetitors<br>N=192 |          |                  |                      |            |
|--|-----------------------|----------|------------------|----------------------|------------|--------------------------|----------|------------------|----------------------|------------|
|  | cooperation inhibitor |          | no influence [%] | cooperation catalyst |            | cooperation inhibitor    |          | no influence [%] | cooperation catalyst |            |
|  | strong [%]            | weak [%] |                  | weak [%]             | strong [%] | strong [%]               | weak [%] |                  | weak [%]             | strong [%] |
| Domestic R&D potential   | 1.3                   | 7.8      | 62.1             | 19.7                 | 8.1        | 1.8                      | 6.0      | 68.6             | 18.1                 | 5.4        |
| R&D infrastructure   | 1.3                   | 8.1      | 51.0             | 24.5                 | 14.1       | 1.0                      | 4.8      | 68.7             | 17.4                 | 8.1        |
| System for financing R&D activity  | 2.2                   | 7.1      | 41.0             | 34.6                 | 14.1       | 1.0                      | 5.0      | 61.8             | 19.3                 | 12.8       |
| Patent policy and intellectual property protection   | 3.8                   | 15.3     | 42.5             | 25.8                 | 11.5       | 1.0                      | 6.0      | 73.8             | 11.5                 | 7.6        |
| Globalization of the economy   | 1.7                   | 7.1      | 34.8             | 37.5                 | 17.8       | 1.6                      | 5.3      | 56.1             | 29.3                 | 7.6        |
| Rate of technological development  | 1.5                   | 7.0      | 22.5             | 42.8                 | 25.2       | 0.9                      | 5.4      | 45.1             | 30.1                 | 18.4       |
| Intensity of competition   | 2.1                   | 0.8      | 20.2             | 43.8                 | 22.2       | 7.3                      | 11.5     | 33.3             | 24.2                 | 23.7       |
| Customer requirements  | 1.6                   | 4.3      | 25.6             | 32.6                 | 34.7       | 3.3                      | 3.9      | 31.6             | 29.1                 | 32.1       |
| Resources held   | 1.4                   | 5.0      | 31.3             | 43.6                 | 17.5       | 1.1                      | 3.7      | 48.2             | 25.8                 | 21.1       |
| Redundancy of resources (creating an excess of resources)  | 1.4                   | 7.9      | 51.7             | 28.0                 | 10.0       | 0.9                      | 4.3      | 67.5             | 17.8                 | 9.3        |
| Ability to identify opportunities  | 2.1                   | 4.3      | 26.2             | 36.0                 | 29.6       | 1.0                      | 3.5      | 42.7             | 21.9                 | 30.7       |
| Ability to use opportunities   | 1.4                   | 6.1      | 24.2             | 35.2                 | 32.1       | 0.9                      | 1.7      | 41.6             | 24.8                 | 30.9       |
| Firm's flexibility   | 1.4                   | 7.8      | 18.0             | 37.4                 | 34.3       | 0.9                      | 3.7      | 34.4             | 28.7                 | 32.2       |
| Market position of the company   | 0.9                   | 3.8      | 28.2             | 39.1                 | 27.7       | 1.9                      | 2.4      | 38.4             | 21.2                 | 36.0       |
| Organizational culture   | 0.8                   | 6.5      | 33.5             | 33.0                 | 25.2       | 1.9                      | 3.6      | 45.8             | 32.0                 | 16.7       |
| System of knowledge management (acquisition, creation, sharing, use, preservation and transfer of knowledge) | 0.7                   | 6.8      | 30.7             | 40.2                 | 20.6       | 2.7                      | 3.6      | 45.9             | 28.5                 | 19.2       |
| Firm's reputation  | 2.3                   | 5.8      | 22.9             | 39.5                 | 29.2       | 1.9                      | 1.2      | 31.5             | 28.2                 | 37.0       |
| Firm's size  | 0.6                   | 6.7      | 37.5             | 36.4                 | 17.7       | 3.5                      | 4.1      | 62.9             | 21.0                 | 8.4        |
| Firm's age   | 1.3                   | 3.7      | 47.2             | 28.3                 | 19.3       | 2.8                      | 5.8      | 63.5             | 17.9                 | 9.9        |

<sup>5</sup> As not all respondents provided answers about all factors, individual percentages do not sum up to 100%.



Among the factors favouring the development of coopetition, the prime answers were: customer requirements (34.7% of respondents viewed it as a strong stimulant), business flexibility (34.3%) and ability to use opportunities (32.1%). Other factors that had a weaker, but still positive influence on the intensity of coopetition included strong competition (43.8%), resources held (43.6%), technological progress (42.8%), and knowledge management system (40.2%). According to non-coopetitors, the biggest barrier to coopetition was the intensity of competition (7.3% viewed it as a strong inhibitor, and 11.5% as a weak inhibitor of cooperation between rivals), though on the other hand, this factor was indicated by a larger group of respondents as a coopetition catalyst (24.2% assessed it as a weak, and 23.7% as a strong catalyst).

Thus, at this point, the opinions were quite diverse. Strong competition was regarded as a coopetition stimulant primarily by larger companies operating on international markets in industries where hyper-competition is typical. Research shows that in industries characterised by the highest level of struggle between rivals (hypercompetitive), the tendency for cooperation between competitors is much stronger (Cygler, 2009). Furthermore, factors promoting the development of coopetition included (as in the group of coopeating enterprises): company reputation and market position, customer requirements and business flexibility, but also organisational culture and globalisation of economy.

When considering the opinions of all respondents, one should note that internal factors more strongly affect the initiation and development of coooperative relations than the external ones (with reference to the latter, respondents more frequently reported zero influence), which again corroborates the H1 hypothesis. Furthermore, according to the majority of respondents, the above-listed factors are more favourable towards coopetition than they inhibit it, which suggests that coopetition will increasingly replace atomistic competition, especially in technologically-advanced, innovative and knowledge-based industries. Among the internal factors, the development of coopetition is most favourably affected by company reputation, flexibility, market position and ability to use opportunities. For more than a half of high-tech enterprises (54.4%), resource structure stimulates coooperative activity, but

according to 39.4%, it does not affect it. On the other hand, obstacles to cooperation with competitors include resource redundancy (the inability to generate excess resources), organisational culture (lack of agreement as to the values and principles, which reduces trust), as well as knowledge management system, company age and size. It should be marked that these factors' negative impact on coopetition is much weaker than their positive influence. In view of the presented results, the H2 hypothesis is also confirmed.

Similarly, the H3 hypothesis has also been verified in the course of research. Customer requirements, intensity of competition and technological progress promote coopetition, while the national solutions in patent policy and protection of intellectual property are its strongest inhibitors, followed by shortages in the national R&D potential and infrastructure.

In order to examine if there are any significant relationships between the importance of particular factors and the direction of their influence on the development of coopetition, Spearman's ranks were correlated (Table 3). The results of the analysis show that almost all relationships are significant ( $p < 0.05$ ) and positively correlative, meaning that the higher the importance of a factor from the point of view of undertaking coooperative relations, the more favourable the influence of its correlated factors on the development of coopetition. The strongest correlation has been found between the ability to identify opportunities as a coopetition catalyst ( $R=0.64$ ) with the assessment of the ability to use opportunities ( $R=0.64$ ) and company flexibility ( $R=0.59$ ). It means that the higher the importance of the ability to use opportunities as a factor promoting the initiation of cooperation with competitors, the stronger the positive influence of the ability to identify opportunities and business flexibility on the intensity of coopetition.

In the high-tech sector, coopetition stimulates business growth. When asked if entering coooperative relations was a stimulant, catalyst, inhibitor or barrier for company growth, 61.0% viewed them as a catalyst (accelerator of business growth), and 26.7% as a stimulant, i.e. a factor that as much as triggered development. Only in a few enterprises coopetition was regarded as an inhibitor (3.3%) that slowed down the process of company growth, or barrier

(2.4%) that stopped it. Coopetition positively affects company growth in the phases of inception and decline – i.e. at times when a small and simple entity is struggling for survival on the market, or when a company is threatened by crisis, endangering its market position or sometimes its very existence – which stimulates the revision of strategy. On the other hand, in the phases of growth and maturity, coopetition usually accelerates company growth, but might sometimes – though rarely – hamper it and slow it down (Zakrzewska-Bielawska, 2013b).

## CONCLUSION

In recent years, research on coopetition has been expanding rapidly. The simultaneity of cooperation and competition is particularly typical of high-tech sectors operating in network-oriented and hypercompetitive conditions. Because of the fast technological progress, strong competition and ever-growing customer requirements, coopetition has become the strategy of success for these enterprises.

TABLE 3. CORRELATIONS BETWEEN THE EVALUATION OF THE IMPORTANCE OF INDIVIDUAL FACTORS IN TERMS OF THEIR INFLUENCE ON COMPETITION IN THE HIGH-TECH SECTOR

| Factor | A    | B    | C    | D    | E    | F    | G    | H    | I    | J    | K    | L    | M    | N    | O    | P    | Q    | R    | S    |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1      | 0,39 | 0,39 | 0,40 | 0,19 | 0,22 | 0,23 | 0,17 | 0,05 | 0,09 | 0,25 | 0,06 | 0,10 | 0,08 | 0,10 | 0,13 | 0,15 | 0,08 | 0,18 | 0,14 |
| 2      | 0,39 | 0,47 | 0,44 | 0,18 | 0,24 | 0,26 | 0,19 | 0,12 | 0,13 | 0,25 | 0,09 | 0,15 | 0,13 | 0,15 | 0,19 | 0,19 | 0,13 | 0,22 | 0,21 |
| 3      | 0,37 | 0,41 | 0,49 | 0,18 | 0,23 | 0,21 | 0,14 | 0,12 | 0,12 | 0,23 | 0,09 | 0,20 | 0,12 | 0,11 | 0,18 | 0,17 | 0,13 | 0,15 | 0,14 |
| 4      | 0,28 | 0,25 | 0,26 | 0,20 | 0,23 | 0,26 | 0,21 | 0,12 | 0,14 | 0,22 | 0,10 | 0,13 | 0,06 | 0,16 | 0,21 | 0,22 | 0,17 | 0,22 | 0,20 |
| 5      | 0,22 | 0,26 | 0,24 | 0,22 | 0,47 | 0,29 | 0,23 | 0,26 | 0,29 | 0,28 | 0,27 | 0,28 | 0,20 | 0,27 | 0,30 | 0,27 | 0,23 | 0,20 | 0,17 |
| 6      | 0,29 | 0,28 | 0,29 | 0,15 | 0,35 | 0,45 | 0,29 | 0,40 | 0,37 | 0,30 | 0,39 | 0,45 | 0,36 | 0,38 | 0,38 | 0,40 | 0,40 | 0,29 | 0,27 |
| 7      | 0,26 | 0,25 | 0,25 | 0,08 | 0,28 | 0,37 | 0,26 | 0,40 | 0,39 | 0,24 | 0,39 | 0,48 | 0,46 | 0,43 | 0,41 | 0,43 | 0,46 | 0,26 | 0,27 |
| 8      | 0,19 | 0,20 | 0,21 | 0,07 | 0,28 | 0,41 | 0,32 | 0,45 | 0,43 | 0,26 | 0,51 | 0,51 | 0,52 | 0,52 | 0,47 | 0,49 | 0,52 | 0,31 | 0,32 |
| 9      | 0,25 | 0,25 | 0,25 | 0,14 | 0,26 | 0,34 | 0,27 | 0,38 | 0,48 | 0,39 | 0,43 | 0,46 | 0,44 | 0,45 | 0,43 | 0,46 | 0,45 | 0,32 | 0,32 |
| 10     | 0,30 | 0,22 | 0,22 | 0,11 | 0,21 | 0,27 | 0,26 | 0,22 | 0,33 | 0,38 | 0,27 | 0,27 | 0,28 | 0,36 | 0,26 | 0,29 | 0,36 | 0,24 | 0,26 |
| 11     | 0,27 | 0,23 | 0,18 | 0,11 | 0,29 | 0,34 | 0,29 | 0,52 | 0,50 | 0,36 | 0,59 | 0,64 | 0,58 | 0,49 | 0,45 | 0,49 | 0,54 | 0,30 | 0,28 |
| 12     | 0,25 | 0,25 | 0,20 | 0,12 | 0,27 | 0,38 | 0,29 | 0,46 | 0,53 | 0,37 | 0,60 | 0,64 | 0,60 | 0,51 | 0,47 | 0,50 | 0,53 | 0,32 | 0,33 |
| 13     | 0,22 | 0,24 | 0,18 | 0,09 | 0,26 | 0,40 | 0,30 | 0,45 | 0,46 | 0,34 | 0,57 | 0,59 | 0,59 | 0,53 | 0,46 | 0,51 | 0,53 | 0,33 | 0,36 |
| 14     | 0,21 | 0,21 | 0,21 | 0,07 | 0,21 | 0,32 | 0,27 | 0,39 | 0,46 | 0,32 | 0,47 | 0,50 | 0,48 | 0,53 | 0,40 | 0,47 | 0,53 | 0,33 | 0,35 |
| 15     | 0,18 | 0,20 | 0,19 | 0,11 | 0,18 | 0,30 | 0,26 | 0,40 | 0,41 | 0,31 | 0,46 | 0,50 | 0,45 | 0,47 | 0,49 | 0,51 | 0,46 | 0,34 | 0,34 |
| 16     | 0,25 | 0,25 | 0,20 | 0,08 | 0,27 | 0,37 | 0,31 | 0,41 | 0,45 | 0,36 | 0,44 | 0,49 | 0,44 | 0,47 | 0,51 | 0,55 | 0,50 | 0,29 | 0,31 |
| 17     | 0,26 | 0,24 | 0,22 | 0,06 | 0,24 | 0,28 | 0,26 | 0,40 | 0,43 | 0,35 | 0,45 | 0,49 | 0,45 | 0,51 | 0,40 | 0,42 | 0,54 | 0,25 | 0,28 |
| 18     | 0,18 | 0,20 | 0,21 | 0,14 | 0,12 | 0,17 | 0,20 | 0,24 | 0,25 | 0,24 | 0,26 | 0,30 | 0,21 | 0,24 | 0,23 | 0,28 | 0,25 | 0,54 | 0,51 |
| 19     | 0,21 | 0,23 | 0,23 | 0,15 | 0,04 | 0,10 | 0,15 | 0,17 | 0,18 | 0,20 | 0,20 | 0,22 | 0,15 | 0,20 | 0,21 | 0,23 | 0,20 | 0,45 | 0,50 |

Note:  $R \geq 0,9$  is essential with min.  $p < 0,05$

| Evaluation of importance | Direction of influence | Factor  | Evaluation of importance | Direction of influence | Factor                            |
|--------------------------|------------------------|---|--------------------------|------------------------|-----------------------------------|
| 1                        | A                      | Domestic R&D potential                                    | 11                       | K                      | Ability to identify opportunities |
| 2                        | B                      | R&D infrastructure  | 12                       | L                      | Ability to use opportunities      |
| 3                        | C                      | System for financing R&D activity                         | 13                       | M                      | Firm's flexibility                |
| 4                        | D                      | Patent policy and intellectual property protection        | 14                       | N                      | Market position of the company    |
| 5                        | E                      | Globalization of the economy                              | 15                       | O                      | Organizational culture            |
| 6                        | F                      | Rate of technological development                         | 16                       | P                      | System of knowledge management    |
| 7                        | G                      | Intensity of competition                                  | 17                       | Q                      | Firm's reputation                 |
| 8                        | H                      | Customer requirements                                     | 18                       | R                      | Firm's size                       |
| 9                        | I                      | Resources held  | 19                       | S                      | Firm's age                        |
| 10                       | J                      | Redundancy of resources (creating an excess of resources) |                          |                        |                                   |

Turbulences in the environment force high-tech companies to depart from the classic model of competition in favour of cooperation, also with rivals. Moreover, cooperative relations are strongly determined by internal factors, mostly market position and company reputation, its flexibility and ability to use opportunities, as well as resource-based circumstances. Therefore, in answer to the question asked in the title of this paper: compete or cooperate?

It should be stated that modern enterprises – which surely include the high-tech sector – should rather cooperate than compete, which is also corroborated by studies conducted by other researchers (Gnyawali, Park, 2009; Bigliardi, Dormio, Galati, 2011; Nemeš, Yami, 2012). Cooperation offers its participants numerous benefits but it is not free of risk and threats that should be identified and eliminated.

Due to the significance of cooperation for the growth of contemporary businesses, it seems reasonable to continue studies on its essence and dynamics. The research conducted so far was focused on the identification of the concept of cooperation, its forms, advantages and disadvantages, but lacked depth of analysis of the areas, motives and determinants of initiating cooperation with reference to the size and developmental phase of competitors, which might constitute an interesting subject of further study.

## REFERENCES

- Adamik, A. (2008), *Creating of Competitive Advantage Based on Cooperation*, Łódź: Wydawnictwo Politechniki Łódzkiej.
- Axelrod, R. (2006), *The Evolution of Cooperation* (Revised ed.), New York: Perseus Books Group.
- Axelsson, B., Wynstra, F. (2002), *Buying Business Services*, Chichester: Wiley.
- Barney, J.B., Delwyn, N.C. (2009), *Resource-based theory: creating and sustaining competitive advantage*, New York: Oxford University Press.
- Barney, J.B., Hesterly, W.S. (2011), *Strategic Management and Competitive Advantage*, New York: Prentice Hall.
- Bengtsson, M., Kock, S. (2000), Cooperation in business networks: to cooperate and compete simultaneously, *Industrial Marketing Management*, Vol. 29, No.5, pp. 411–427.
- Bengtsson, M., Ericsson, J., Wincent, J. (2010), *Coopetition: new ideas for a new paradigm*, Yami, S., Castaldo, S., Dagnino, G.B., Le Roy, F. (eds.), *Coopetition. Winning strategies for the 21st Century*, Cheltenham: Edward Elgar.
- Bigliardi B., Dormio A.I., Galati F., (2011), Successful cooperation strategy: evidence from an Italian consortium, “*International Journal of Business, Management and Social Sciences*”, Vol. 2, No 4, pp. 1-8.
- Bonel, E., Rocco, E. (2007), Cooperating to survive. Surviving cooperation, *International Studies of Management & Organization*, Vol. 37, No. 2, pp. 70–96.
- Chang, Y.C. (2003), Benefits of co-operation on innovative performance: evidence from integrated circuits and biotechnology firms in the UK and Taiwan, *R&D Management*, Vol. 33, No. 4, pp. 425-437.
- Chen, M.J., Su, K.H., Tsai, W. (2007), Competitive tension: the awareness-motivation-capability perspective, *Academy of Management Journal*, Vol. 50, No.1, pp. 101-118.
- Chin, K.S., Chan, B.L., Lam, P.K. (2008), Identifying and prioritizing critical success factors for cooperation strategy, *Industrial Management & Data System*, Vol. 108, No.4, pp. 437-454.
- *Classification of High – Technology Product and Industries* (1995), Working Party No.9, Industry Committee on Industrial Statistics, OECD.
- Cygler, J. (2009), *Kooperencja przedsiębiorstw. Czynniki sektorowe i korporacyjne*, Warszawa: Oficyna Wydawnicza SGH

- Dagnino, G.B., Padula, G. (2002), Coopetition strategy – A new kind of interfirm dynamics for value creation, *EURAM – The European Academy of Management Second Annual Conference* “Innovative Research in Management”, Stockholm, 9–11 May.
- Dagnino, G.B., Yami, S., Le Roy, F., Czakon, W. (2008), Strategie kooperacji – nowa forma dynamiki międzyorganizacyjnej?, *Przegląd Organizacji*, No.16, pp. 3-7.
- Dyer J.H., Singh H. (1998), The Rational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage, *Academy of Management Review*, Vol. 23, No.4, pp. 660-679.
- Eisenhardt K.M., Sull D.N. (2001), Strategy as Simple Rules, *Harvard Business Review*, Vol. 79, No.1, pp. 107 -116.
- Gnyawali, D.R., Park, R. (2009), Coopetition and technological innovation in small and medium-sized enterprises: a multilevel conceptual model, *Journal of Small Business Management*, Vol. 47, No.3, pp. 308–330.
- *High-technology and knowledge based services aggregations based on NACE Rev.2.* (2009), Available at: [http://epp.eurostat.ec.europa.eu/cache/ITY\\_SDDS/Annexes/htec\\_esms\\_an3.pdf](http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/htec_esms_an3.pdf) (10October 2012).
- Inkpen, A.C., Tsang, E. (2005) Social capital networks and knowledge transfer, *Academy of Management Review*, Vol. 30, No.1, pp. 146-165.
- Jashapara, A. (2004), *Knowledge Management: An Integrated Approach*, Pearson Education Limited.
- Johnson, D.W., Johnson, R.T. (1989) *Cooperation and competition: theory and research*, Edina, MN: Interaction Book Co.
- Kamensky, J.M., Burlin, J.J. (eds.) (2004) *Collaboration. Using Networks and Partnerships*, Oxford: Rowman and Littlefield Publishing Group.
- Kitchen, D. Jr, Snow, Ch. C., Hoover, V.L. (2004), Research on competitive dynamics: recent accomplishments and future challenges, *Journal of Management*, Vol. 30, No.6, pp. 779-804.
- Kotzab, H., Teller, C. (2003), Value-adding partnerships and coopetition models in the grocery industry, *International Journal of Physical Distribution & Logistics Management*, Vol. 33, No.3, pp. 268-281.
- Ma, H. (1999), Constellation of Competitive Advantage: components and dynamics, *Management Decision*, Vol. 37, No. 4, pp.348-355.
- Mariani, M.M. (2007), Coopetition as an emergent strategy. Empirical evidence from an Italian consortium of opera houses, *International Studies of Management & Organization*, Vol.37, No.2, pp. 97-126.
- Martins, E.C., Terblanche, F. (2003), Building organizational culture that stimulates creativity and innovation, *European Journal of Innovation Management*, Vol. 6, No.1, pp. 64-74.
- Moschini, G., *Patents and Other Intellectual Property Rights*, Working Paper 01-WP 275, May 2001.
- Nemeh, A., Yami, S. (2012), *Coopetition strategies and innovation in pre-competitive R&D programs: the case of wireless telecommunication sector*, Druid 2012, CBS, Copenhagen, Denmark. Available at: [http://druid8.sit.aau.dk/acc\\_papers/v9e0l8pfuphhurs9khda84edn30.i.pdf](http://druid8.sit.aau.dk/acc_papers/v9e0l8pfuphhurs9khda84edn30.i.pdf).
- Oliver, A.L. (2004), On the Duality of Competition and Collaboration: Network-based Knowledge Relations in the Biotechnology Industry, *Scandinavian Journal of Management*, Vol. 20, No. 1/2, pp.151-171.
- Porter, M.E. (1980), *Competitive Strategy*, New York: Free Press.
- Samuelson, W.F., Marks, S.G. (2006), *Managerial Economics*, Hoboken, New York: John Wiley & Sons.
- Sanchez, R., Heene, A. (2004), *The new strategic management. Organization, competition and*

- competence*, New York: John Wiley & Sons.
- Singh, K. (1997), The Impact of Technological Complexity and Interfirm Cooperation on Business Survival, *Academy of Management Journal*, Vol. 40, No. 2, pp. 339-367.
  - Stańczyk – Hugię, E.I. (2013), *Dynamika strategiczna w ujęciu ewolucyjnym*, Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu.
  - Stigler, G.J. (2008), *The New Palgrave Dictionary of Economics*. Second Edition, Durlauf S.N., Lawrence E.B. (eds.), Palgrave Macmillan.
  - Tidstrom, A. (2008), Perspectives on coopetition on actor and operational levels, *Management Research*, Vol. 6, No.3, pp. 207 – 218.
  - Tura, T., Harmaakorpi, V. (2005) Social capital in building innovative regional capability, *Regional Studies*, Vol. 39, No. 8, pp. 1111-1125.
  - Zakrzewska-Bielawska, A. (2010), *High technology company – concept, nature, characteristics*, Mastorakis, N., Mladenov, V., Zaharim, A., Aida Bulucea, C. (eds.), *Recent advances in management, marketing, finances. Proceedings of the 8<sup>th</sup> WSEAS International Conference on Management, Marketing and Finance*, Penang, Malaysia: WSEAS Press, pp. 93 – 98.
  - Zakrzewska – Bielawska, A. (2011), Flexibility of Strategy in High-Tech Enterprises, M. Zhang (ed.), *Economics, Business and Management. International Proceedings of Economics Development and Research*, Vol. 22, Singapore: IACSIT Press, pp. 107 – 111
  - Zakrzewska-Bielawska, A. (2012), Kooperencja a wybory strategiczne innowacyjnych przedsiębiorstw na przykładzie doświadczeń firm high-tech, *Studia Ekonomiczne Regionu Łódzkiego*, Łódź: PTE Oddział w Łodzi, pp. 203-214.
  - Zakrzewska – Bielawska, A. (2013a), *Coopetition as a factor in the development of innovative and technologically advanced firms: an example of the high-tech sector*, *Proceedings of the International Symposium on Business and Management*, Kitakyushu, Japan: Publisher Knowledge Association of Taiwan.
  - Zakrzewska – Bielawska A. (2013b), *Koopetycja a rozwój przedsiębiorstwa w opinii kadry kierowniczej firm high-tech*, Łódź: Zeszyty Naukowe Politechniki Łódzkiej: Organizacja i zarządzanie, No. 52, pp. 135-146.
  - Zerbini, F., Castaldo, S. (2007), Stay in or get out the Janus? The maintenance of multiplex relationships between buyers and sellers, *Industrial Marketing Management*, 2007, Vol. 36, No.7, pp. 941-954.