

INTERACTION BETWEEN HIGHER EDUCATION INSTITUTIONS AND BUSINESS ORGANISATIONS IN THE FIELD OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

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Abstract

The aim of the article is to outline the characteristics of interaction between higher education institutions and business organisations in the field of logistics and supply chain management in Bulgaria in different domains – research, education, and innovation. This article is based on empirical data provided by manufacturing and trading companies and logistics service providers. The research methodology includes variables measuring five aspects of interaction: motivations, barriers, success factors, forms of interaction and outcomes from the collaboration. The results suggest that most business organisations engage with HEIs to obtain knowledge, expertise and talents in order to increase their competitiveness rather than to gain financial and material support. The majority of business organisations use limited channels of interactions or do not interact with HEIs at all. Most of the relationships in the field of logistics and supply chain management are related to education activities and less related to research and innovation. However, with respect to education, the benefits are not fully obtained. While lack of time and lack of awareness what benefits can be obtained from collaboration are identified as main obstacles, higher education institution's experience and commitment are substantial for the collaboration.

Keywords: *higher education institutions, business organisations, forms of interaction, logistics, supply chain management*

1. INTRODUCTION

Over the years, the topic of interaction between higher education institutions (HEIs) and business organisations has been a subject of a great interest for researchers, practitioners, and policymakers. The underlying rationales for this are associated with benefits for the society and business. On the one hand, the business-academia collaboration is seen as a driver of innovation through knowledge exchange leading to competitiveness of business and economic growth. On the other hand, it increases the relevance of research and improves the employability of graduates, preparing them to be better equipped for the labour market. That is the reason why business-academia collaboration, as well as “Knowledge triangle” models have been recently more often in the focus of an increasing number of regional and national policy initiatives. Some examples are the EU's Horizon 2020 programme; the Triple helix Top Consortia for Knowledge and Innovation (TKIs) in Netherlands; the Knowledge Transfer Partnerships (KTPs) in Kingdom, etc. This strategic emphasis on business-academia collaboration has led to a significant body of research in the field. This growing area of research has investigated different aspects of interaction between HEIs and business organisations such as motivations [1], barriers [2], success factors [3], forms of interaction [4], and outcomes from the collaboration [5]. Although, the accumulated knowledge in this area is still fragmented. The majority of the studies focus mainly on particular aspects of the interaction and/or one domain – research, education, and innovation, and they have studied in isolation. Therefore, much attention should be devoted to developing a consolidated framework which will allow to get a complete picture of the state of cooperation, as well as to expand the analysis by looking for relationships between the individual aspects. Thus, it is expected not only to enrich the theory on interaction between HEIs and business organisations but also will offer arguments to justify the solutions for its enhancement. Furthermore, the literature review reveals that the topic of business-academia collaboration in the field of logistics and supply chain management (SCM) has received little attention, as the focus of most studies has been predominantly on technical sciences, examining the collaboration between technical universities and business organisations (generally, technical universities

are oriented towards applied research and technology transfer which suggests that they have closer links with industry).

The aim of the article is to outline the characteristics of interaction between HEIs and business organisations in the field of logistics and SCM in Bulgaria in different domains – research, education, and innovation, by examining five aspects of interaction: motivations, barriers, success factors, forms of interaction and outcomes from the collaboration. The article presents the preliminary results of a survey conducted among Bulgarian manufacturing and trading companies and logistics service providers. The article is organized as follows: Section 2 presents the conceptual framework, data and methods. Section 3 reports the results. In section 4 concluding remarks are made and several directions for future work are indicated.

2. CONCEPTUAL FRAMEWORK, DATA AND METHODS (METHODOLOGY)

2.1. Conceptual framework,

Five research questions are investigated in this article: what motivates business organisations to engage with HEIs? How do they perceive barriers to collaboration? Which collaboration practices are the most frequently used? What are the factors facilitating the collaboration between business organisations and HEIs? What are the outcomes achieved as a result of the company's interaction with HEIs?

The first group of indicators, *motivations*, aims to identify the underlying rationales for companies to collaborate with HEIs. Motivations are assessed through the usage of a scale of 26 items covering a broad spectrum of benefits that can be obtained from the collaboration with HEIs. The motivation items are based on research by Andersen, De Silva and Levy [1], Bishop, D'Este and Neely [6], Lam, Hills and Ng [7], Ankrah and Al-Tabbaa [8], Radas [9], Dutrénit and Arza [10], and measured on a scale ranging from 1 to 5, where the higher the value, the stronger the motive (i.e. the respective item is more likely to be a motive). The assessment of motivations will provide insight into the companies' orientation to cooperate with academia. Thus, based on the identification of main motivations, recommendations can be made regarding policies and incentives for the facilitation of cooperation. For instance, if business seek to exploit research capabilities of HEIs to gain competitive advantage such as direct commercialization of university technologies, policy makers should emphasize on relevant policy measures that aim at encouraging technology transfer collaboration and mitigate or prevent conflicts over intellectual property (IP) rights.

Barriers are those obstacles that restrict or inhibit the ability of business organisation to collaborate with HEIs. Identification of *barriers* that inhibit collaboration enables to make adequate decisions for enhancing it. In order to direct efforts toward overcoming barriers, the information about them is essential. Thus, this study also aim to identify factors that impede collaboration between practitioners and academics. Barriers that are included in the survey questionnaire are based on the work of Galán-Muros and Plewa [2], Tartari, Salter and D'Este [11], and Garcia et al. [12]. Tartari, Salter and D'Este [11] explore and categorize barriers in two groups: orientation- and transaction-related barriers. While the orientation-related barriers (also called “Mertonian” barriers) refer to conflicts about the orientation of both partners, the transaction-related barriers (also called “Williamson” barriers) associate with costs of dealing with the rules and regulations of the university and conflicts over IP with industry partners. Specifically, the group of orientation-related barriers consists of the following barriers: differences in timescales (e.g. short-term orientation of industry research); difficulty in finding partners with appropriate profile; high personnel turnover and lack of continuity in companies' research strategies; the nature of scientific research does not conform to the industry interests or needs; mutual lack of understanding about expectations and working priorities; difficult to reach agreements on the timing of the dissemination of research findings. Galán-Muros and Plewa [2] add to this group as follow: differences in terminology, language, and communication styles. The transaction-related barriers include the following: rules and regulations imposed by university or government funding agencies; policies adopted by the university's technology transfer office; potential conflicts regarding intellectual property rights; absence of established procedures for collaboration; low profile of university's technology transfer offices. Garcia et al. [12] add to this group as follow: geographical distance,

bureaucracy, and costs. The authors grouped “lack of knowledge about universities’ activities”, “lack of knowledge on the needs of firms”, “lack of professionals to dialogue with academic researchers”, “lack of professionals to dialogue with firms”, and “problems on trust” together to construct a new variable called “capabilities barriers”. Lack of absorptive capacity also can be added to this group. Besides these barriers, from the perspective of this study, of particular interest is also to investigate the following: lack of incentive mechanisms; problems related to making contact; absence of a knowledge/technology transfer units; cognitive distance. [13] To capture the barriers business has faced when engaging with academia, respondents are asked to rate the extent to which a set of 38 items acted as a constraint to business involvement in interactions with academia on a five-point Likert scale from “does not impede at all” to “strongly impedes”.

The items used to operationalize *success factors* are based on research by Bruneel, D’Este and Salter [3], Mora-Valentin, Montoro-Sanchez and Guerras-Martin [14], Paunov, Planes-Satorra and Moriguchi [15], and Perkmann et al. [16]. The literature review shows that various factors affect both the collaboration development between HEIs and business organisations, and the success of ongoing joint projects. The topic on factors to develop successful collaboration between business and HEIs in different areas (research, education and innovation) has generated an increasing volume of research literature. As a result, a great diversity of research approaches in the field exists. For instance, some focus on different categories of factors affecting the project development at different stages. Others focus on only one type of organisation – HEIs or business organisation. Mora-Valentin, Montoro-Sanchez and Guerras-Martin [14] in their paper analyse the impact of a number of factors on the success cooperative agreements between companies and research organisations. They examine the degree of impact of three groups of factors – organizational (commitment, communication, interorganizational trust, interorganizational conflict and dependence), contextual (prior cooperative agreement, reputation of the partner organisation, goal setting and proximity between partners) and success factors of the agreement (overall satisfaction and the evolution of the relationship created), measuring the degree of importance of these factors for business and research organisations. In addition, they explore the links between different indicators – for example, between the engagement and the success of the interaction between the surveyed organisations; between the trust and the success of the projects, etc. The study by Bruneel, D’Este and Salter [3] about the critical success factors in university research projects emphasizes on technology transfer between HEI (Technical University of Madrid) and the industry by assessing key success factors in the interaction between them. The authors explore three key categories of factors: experience of collaboration, breadth of interaction channels and inter-organizational trust. They emphasize also on project characteristics, company commitment and relationship between the participants. Furthermore, the review of the literature on this topic reveals that factors varies by sector of activity of the participating business organisation. The research of Paunov, Planes-Satorra and Moriguchi [15] and Perkmann et al. [16] confirm that the mechanisms for knowledge transfer in high-tech industries are quite different from those in low-tech industries and the services sector. As part of the service sector, the field of logistics and SCM should be considered as a specific sector of the economy. This article will analyse and assess the importance of generally accepted factors in the concrete relationship between logistics companies and HEIs offering training in logistics and SCM. Characteristic of the studies that have been carried out so far is that they encompass different types of HEIs and different business organisations and have almost exclusively focused on business-academia collaboration in the field of technical oriented sciences, but none of them in the field of logistics and SCM. Therefore, the present study focuses on the evaluation of factors that facilitate the collaboration between business organisations and HEIs in the field of logistics and SCM. Due to the factors considered in previous studies are related to the topic of the present study, they are adapted to its needs. As a result of the literature review the following factors are identified and researched: 1) experience of HEI, 2) trust, 3) effective communication, 4) commitment, 5) prior cooperation, 6) time to establish and maintain cooperation, 7) financing, 8) human resources and 9) reputation of HEI, which can be defined as internal to the relationship between the HEI and business organisations, because they depend entirely on both parties.

Forms of interactions are assessed through the usage of a scale of 39 items representing various collaboration practices in education, research, and innovation. The selected practices are based on

research by Andersen, De Silva and Levy [1], Galan-Muros and Davey [17]. The aim is to assess frequency of interaction with HEIs via each of the surveyed practices. Respondents are asked to indicate the frequency of use of each channel on a five-point rating scale, where: 1 – never; 2 – very rarely; 3 – rarely; 4 – often; 5 – very often. Based on this indicator, we could determine what are the typical channels of interaction, the degree of formalization of joint activities (formal or informal interactions), and the intensity of interaction with respect to domain of activity (education, research and innovation).

The *results* of the interactions between HEIs and business organisations in Bulgaria in the field of logistics and SCM were studied in three groups, as follows: education, research and innovation. These groups cover a total of 15 indicators. The first group presents the learning outcomes and includes the following indicators: improving the practical training of students in the field of logistics and SCM; placement of students-interns in the field of logistics and SCM; placement of graduates in the field of logistics and SCM; placement of doctoral students in the field of logistics and SCM, placement of post-doctoral students in the field of logistics and SCM, and improving the qualification of the employees in the organisation through postgraduate trainings in logistics and SCM. The scope of the second group reveals the research outputs and involves the indicators: new research contracts with HEIs in the field of logistics and SCM; creation of new equipment in the field of logistics and SCM as a result of interaction with HEIs; creation of software products in the field of logistics and SCM as a result of interaction with HEIs; creation of new processes in the field of logistics and SCM as a result of interaction with HEIs, and new consulting contracts with HEIs in the field of logistics and SCM. The third group presents innovation based outputs and includes the following set of indicators: growth of issued patents for inventions from research with HEIs in the field of logistics and SCM; number of licenses received for research products with HEIs in the field of logistics and SCM; growth in the acquired high technologies in the field of logistics and SCM from organisations for high-tech transfer of technologies and knowledge (spin-off), and acquisition of shares in start-ups in the field of logistics and SCM, founded by students. The question asked to the respondents is: “To what extent the following results from the interaction with HEIs in the field of logistics and SCM were achieved during the last 3 years?” The answers to each indicator were registered on a 5-point scale, in which: 1 – not achieved; 2 – low achieved; 3 – moderately achieved; 4 – relatively high achieved and 5 – highly achieved.

2.2. Data and methods

This article uses data on Bulgarian manufacturing and trading companies, and logistics service providers to generate empirical evidence to assess the state of business-academia collaboration in the field of logistics and SCM based on five group of indicators: motivations, barriers, success factors, forms of interaction and outcomes from the collaboration. An online questionnaire has been sent in May 2020 to 103 business organisations operating in Bulgaria, of which 26 have responded so far (25% response rate). The sample comprises manufacturing companies (27%), wholesalers (12%), retailers (35%), logistics service provides (19%) and the rest are representatives of software and construction industries. In relation to the size of the company, 50% are large businesses (more than 250 employees), 19% – medium-sized enterprises (from 50 to 250 employees) and the rest are small and micro enterprises. Both collaborating and non-collaborating companies were included in the survey, representing 46% and 54% of the sample, respectively.

The questionnaire consists of five parts. Part 1 focuses on organisational characteristics, including organisational type, size, ownership, as well as some aspects related to the interactions between company and HEIs, such as prior experience in collaboration with HEIs in logistics and SCM areas. The next four parts focus on the study’s research questions. The variables used to measure the studied aspects (motivations, barriers, success factors, forms of interaction and outcomes from the collaboration) are gauged on a five-point Likert scale. Since the purpose of the present study is to outline the characteristics of interaction between HEIs and business organisations in the field of logistics and SCM in Bulgaria in different domains – research, education, and innovation, data analysis is based on descriptive statistics and on mean comparisons. However, due to the small sample size, statistical significance analyses are not possible.

3. RESULTS AND DISCUSSION

In this section we present the descriptive results based on the data collected from 26 manufacturing and trading companies and logistics service providers operating in Bulgaria. The study initially assessed the motivations to engage in collaborative activity with academia. Evidence from the respondents suggests that companies seek collaboration in the field of logistics and SCM with HEIs for various reasons (Figure 1). Main motives for interaction with academia, ranked in a decreasing order based on their average scores, are: “employee training and development”, “opportunity to recruit students”, “opportunity to improve the competitiveness”, “access to knowledge”, “opportunity to increase visibility and popularity of the company's products/ services”, and “obtaining information about the trends related to the sector and the environment in which the company operates” (all mean scores are around 4). These results indicate that business organisations are motivated to engage in collaborative activities with HEIs in order to increase competitiveness, rather than for receiving financial and material support. These results support findings of prior studies on this issue [1] and [9]. Besides, the results show that collaboration with HEIs is seen as enhancing prestige and reputation. The item “company’s image improvement” has one of the highest score (mean score 4) among all the other tested options.

The assessment across industry categories indicates that there are some differences in how companies from various sectors assess these benefits as a motivational drivers for business-academia relations. For instance, while the manufacturing companies are the ones that have a largest proportion of companies assessing most of the items as a motives, the logistics service providers assess just three of the items as significant prerequisites for interaction with HEIs. These are: “employee training and development”, “opportunity to recruit students”, and “company’s image improvement”. However, these results should be taken with precaution due to the small sample size, especially in the subgroup analyses.

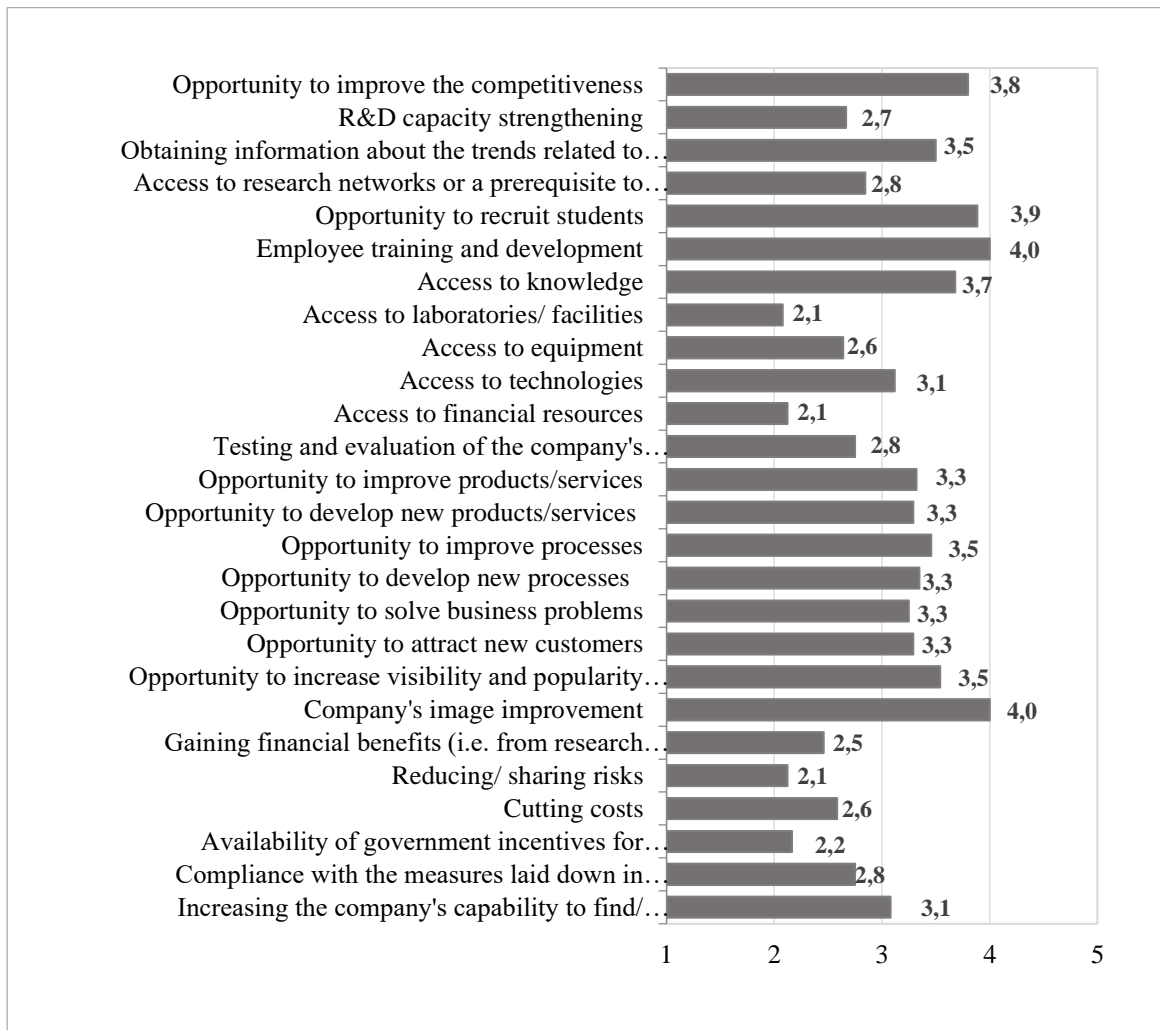


Fig. 1. Firms' motivations for collaboration with HEIs
(mean scores, 1 – not a motive at all; 5 – a very strong motive)

The analysis of barriers shows that companies perceive one main factor that reduces business-academia collaboration in the field of logistics and SCM. This is the lack of time, having an impact only in two of the domains – research and innovation (mean score around 4). Surprisingly, all other items receive an average score below the 3.5 cut off point, so they cannot be determined as relevant. The mean scores are shown in Table 1 in the Appendix. An interesting finding is that companies who not collaborated with HEIs partners perceived more barriers compared to collaborating companies. These include: lack of incentive mechanisms in terms of collaboration in research (mean score 3.75), and confidentiality of information in terms of collaboration in innovation projects (mean score around 3.67). On the one hand, this result can be interpreted as evidence that even if business organisations recognize that there are barriers to collaborating with HEIs, these obstacles do not matter once the company has accumulated collaboration experience with academia. On the other hand, based on the argument of Tartari and Breschi [18], strong motivations can reduce the effect of barriers to cooperation. However, further research is needed to provide convincing results on this point.

If we break down the analysis by sectors, we observe that there are differences in perceptions of barriers. For instance, logistics service providers perceive the most barriers, while the least barriers are perceived by manufacturing companies and retailers. Despite different groups have different perception of what factors affect their intention to engage in business-academia collaboration activities, there is a consensus

between wholesalers and logistics service providers that lack of awareness of opportunities arising from collaboration with HEIs and lack of incentive mechanisms impede interaction with HEIs.

In terms of domains in which collaboration can take place, less barriers are seen in education. Among the studied variables, only the following high scores (mean score 4 and above) are reported in education by different business organisations: confidentiality of information (reported by more than half of the wholesalers), problems related to making contact with academics/HEIs, lack of time, and lack of incentive mechanisms (reported by more than half of the logistics service providers). In research domain, the barriers include: misalignment of research and the industry needs (reported by 72% of the manufacturers), lack of awareness of opportunities arising from collaboration with HEIs, lack of incentive mechanisms, lack of time, and HEIs' research is fundamental oriented (reported by 2/3 of the wholesalers), and lack of financial incentives, lack of financial resources of the business, and lack of time (reported by all the logistics service providers). In innovation domain, the main barriers for the cooperation, viewed by the different companies, are connected with: lack of interest among academics to collaborate with industry, lack of time, lack of awareness of opportunities arising from collaboration with HEIs, misalignment of research and the industry needs, and lack of professionals to dialogue with academic researchers/business (reported by more than 2/3 of the wholesalers). All the logistics service providers have consensus that most of the items may hinder the collaboration, pointing out more than 20 barriers.

Figure 2 presents the results in the domain of education for the factors influencing the interaction between HEIs and business organisations in the field of logistics and SCM. In this figure we present only the domain of education. The results for the other two dimensions of research and innovation are similar but with lower values which means that the factors have the greatest impact in the domain of education. The weighted average, where 1 – the factor does not have influence, 5 – the factor has a high influence, in the figure shows that the experience of higher education institution and the commitment are the most important factors for the studied business organisations. The other influencing factors with values greater than 3.5 are: trust, effective communication and human resources. All the other factors have less significant influence on the interaction between HEIs and business organisations with values around the neutral 3. In many research studies, especially in the technical field, the financing is a very important factor. It seems that in the Bulgarian business organisations this factor is less important than the entire researched factors. This result can be explained by the service nature of logistics and SCM where the other factors could have a greater impact for building a relationship of cooperation between HEIs and business organizations.

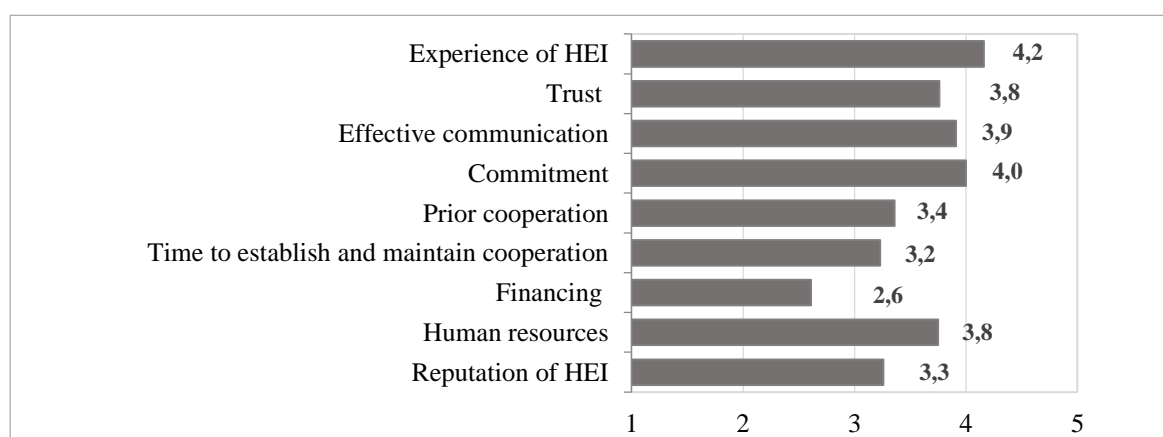


Fig. 2. Factors influencing the interaction between HEIs and business organisations in the domain of education (mean scores, 1 – not at all; 5 – to a great extent)

In terms of forms of interactions between business organisations and HEIs, the analysis is based on the responses of the companies that interact with HEIs, the rest of the respondents (non-collaborating companies) are excluded from the analysis. Figure 3 reports the frequency of use of particular collaboration practices, as well as the share of „frequently used practices“ (i.e. „often“ or „very often“), and share of „rarely used practices“ (i.e. practices received scores below 3). The survey’s results show that business organisations are involved in limited forms of interactions with HEIs in the field of logistics and SCM. Company visits by students (72%) and student internship programs (63%) are the most frequently used channels of interaction with HEIs. Training of company employees, cooperation with career centres of HEIs, and providing career information/organizing career days follow in frequency. Contract research, buying patents or licences from HEIs, involvement in the generation of spin-offs/start-ups, and participation in business incubators and joint ventures with HEIs receive the lowest ratings overall. Furthermore, the results show that the intensity of links varies in some degree across types of companies. While logistics service providers provide give guest lectures on specific topics, participate in or organize conferences, roundtables, and workshops jointly with HEIs, and sponsor scientific/scientific-practical conferences more intensively, manufacturing companies rest more on personal contacts via membership of professional organisations and participate frequently in HEI’s management board. Retailers tend to collaborate with HEIs to training of company employees. Based on these results, it can be concluded that business organisations are heavily engaged with HEIs in activities related to education and less related to commercialization and entrepreneurship. Despite this, the study indicates generally low levels of collaboration between business and academia. One possible reason for the reported infrequent and non-intensive interactions is that, as was highlighted in the previous subsection related to barriers, most of the companies see the lack of time as a main obstacle to interact with HEIs. Another explanation of this result, could be that they have not realized yet the benefits of such an engagement in collaboration agreements with HEIs or do not have plausible reasons for that. However, in order to better explain the reasons behind the observed limited engagement (especially with regard to the research and the innovation) other information must also be taken into account. One such indicator that can give us more insight into the collaboration is the importance of the channel for obtaining benefits. Thus, more appropriate strategies and policies can be developed.

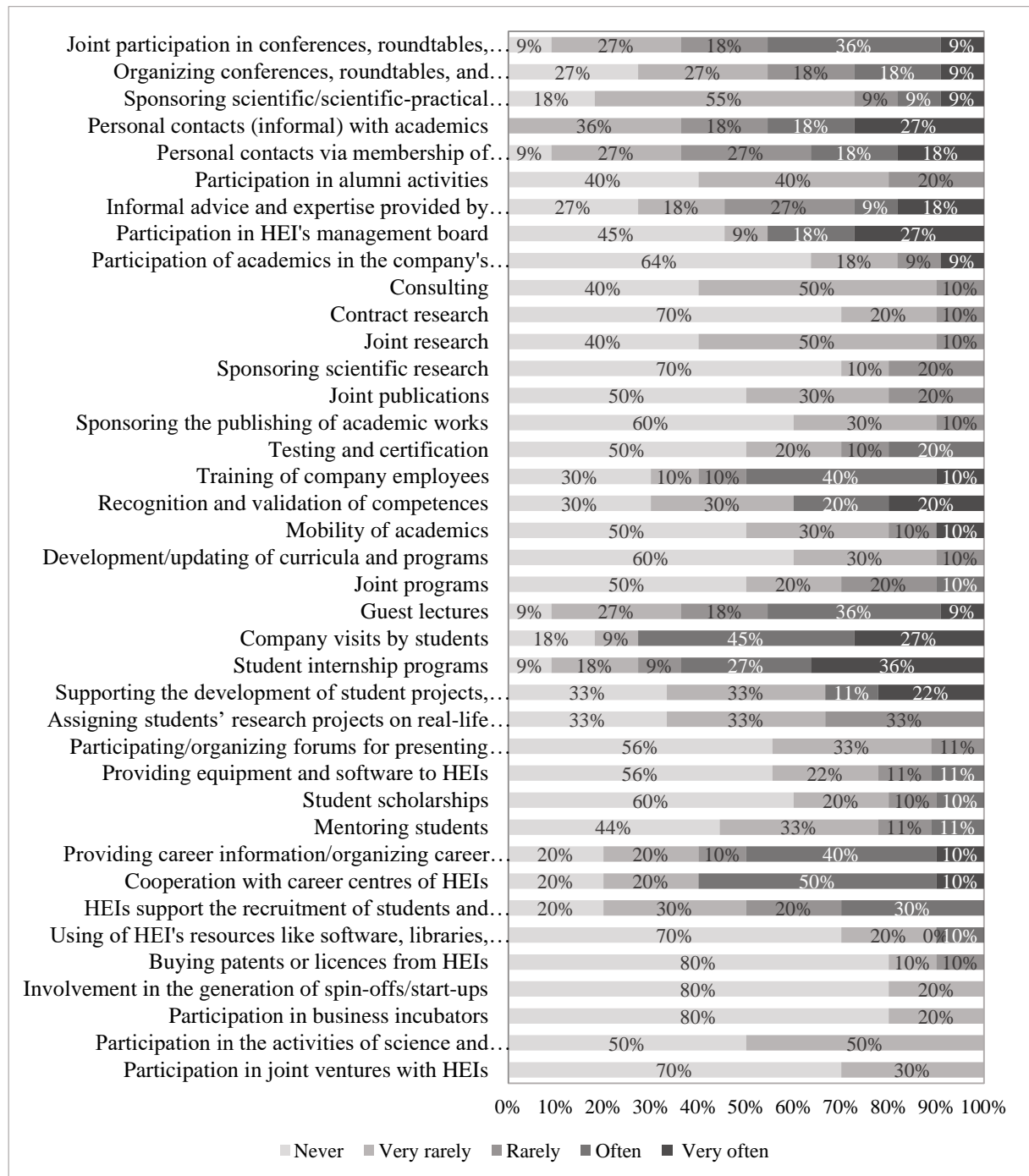


Fig. 3. Frequency of interaction between HEIs and business organisations
(mean scores, 1 – never; 5 – very often)

In terms of outcomes achieved from the collaboration, the analysis of the results from Figure 4 allows the following conclusions to be drawn. First, for the last 3 years the surveyed business organizations indicate that they have partially achieved outcomes from their interaction with HEIs in the field of logistics and SCM in the group of education. These outcomes are achieved in traditional areas such as: hiring students-interns during the training, improving the qualification of employees through postgraduate trainings in logistics and SCM, placement of graduates and assistance of better practical training of students. The average scores show that there is potential for these practices to be improved in the future if the joint cooperation with HEIs in the field of logistics and SCM is deepened. Apart from

that, the analysis of the average scores shows that the potential for joint cooperation with HEIs in terms of hiring doctoral and post-doctoral students has not been used. Second, the level of average scores of all indicators in the research and innovation groups shows a low level of achievement of outputs of the joint cooperation with HEIs. This means that Bulgarian business organizations do not cooperate with HEIs in the field of research and innovation in logistics and SCM. This fact puts the logistics industry in Bulgaria at greater risk of low efficiency compared to other countries where cooperation with HEIs is more extensively developed. In addition, it determines the need of import of innovative equipment and software for the management of logistics activities from abroad. All this adversely affects the logistics competitiveness of business organizations in Bulgaria internationally.

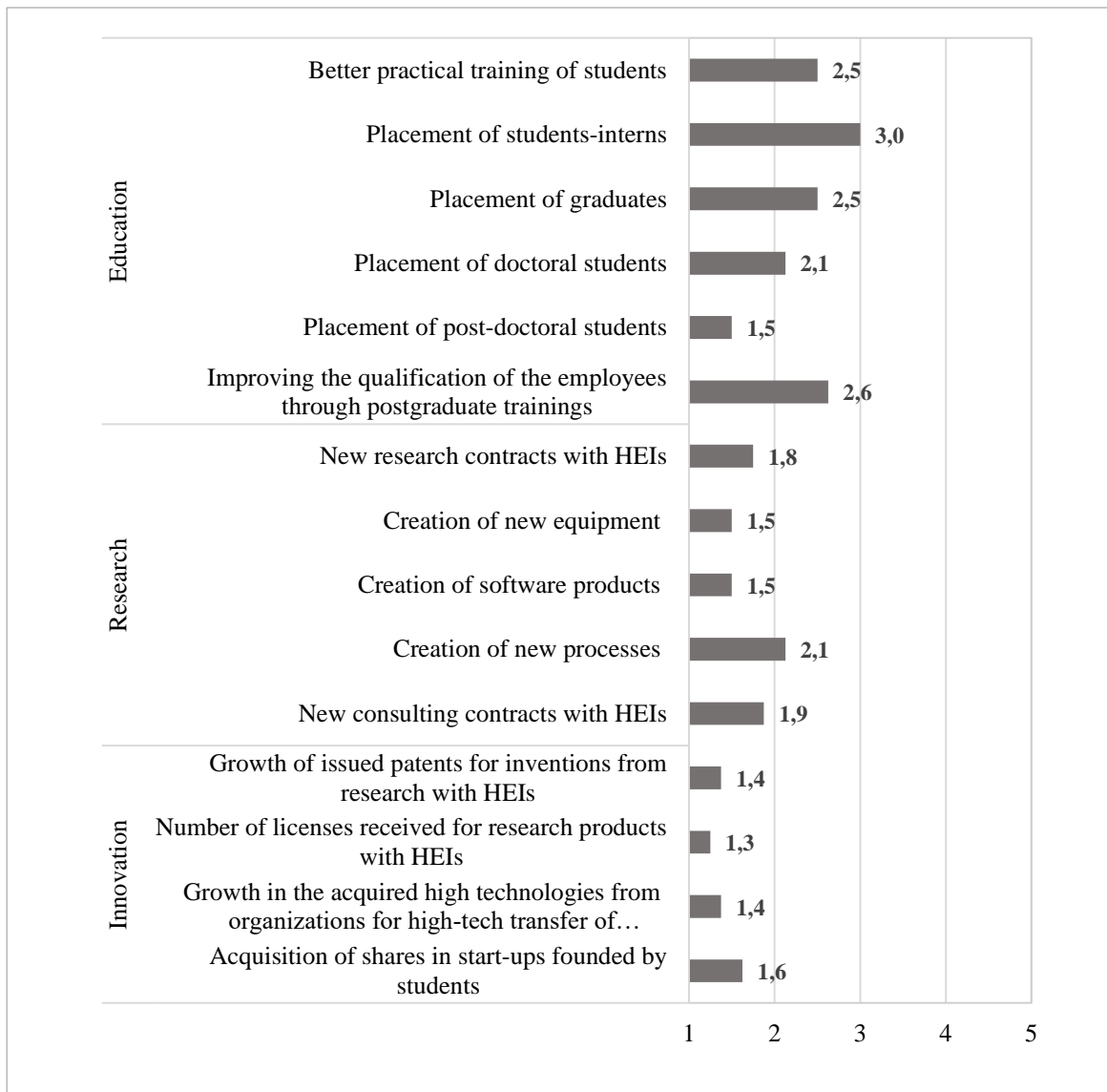


Fig. 4. Outcomes achieved from the interaction with HEIs in the field of logistics and SCM during the last 3 years (mean scores, 1 – not achieved; 5 – highly achieved)

4. CONCLUSIONS

Much research has been devoted to the investigation of different aspects of interaction between HEIs and business organisations, but little is known about them in the field of logistics and SCM. This article attempted to shed some light into this topic, presenting the preliminary results of the empirical study which was aimed to reveal the intensity and the forms of interaction between HEIs and business organisations in logistics and SCM, the motivations to engagement, the barriers that hinder collaboration, the success factors, and the outcomes achieved from the collaboration.

The results revealed that business organisations view HEIs not only as a source of valuable knowledge and expertise that can contribute to their competitiveness, but also as a source of talents. However, financial gains and material support were found that do not affect the company's decision to cooperate with HEIs. The majority of business organisations use limited channels of interactions or do not interact with HEIs at all. Most of the relationships in the field of logistics and SCM are related to education activities and less related to research and innovation. That is why the benefits experienced by business organisations are related to traditional areas such as: hiring students-interns during the training, improving the qualification of employees through postgraduate trainings in logistics and SCM, placement of graduates and assistance of better practical training of students. In regard to limited industry involvement in HEIs activities or relationships with them, lack of time and lack of awareness what benefits can be obtained from collaboration were identified as main obstacles. With respect to success factors, higher education institution's experience and commitment were pointed out as substantial for the collaboration.

The study contributes to the literature in several ways. First, it examines the state of business-academia collaboration in the field of logistics and SCM. Highlighting main motivations, perceived barriers, key success factors, common channels of interactions, and achieved results could help identifying the opportunities for improvement. Second, by encompassing different dimensions and measures of the interaction between HEIs and business organisations, we develop a more comprehensive understanding of it, which will be useful for scholars in their research. Third, a limitation of most of the studies reviewed is that they have analysed only organisations that are engaged in business-academia collaborations. In this regard, the present study will be very helpful in providing valuable information for real and perceived barriers, differentiating companies that have previously engaged in cooperation with HEIs from those that have not.

While this study contributes to knowledge on interaction between HEIs and business organisations in the field of logistics and SCM, there are some limitations. The first one concerns the sample size. This study has a relatively small sample size, limiting the generalization of the findings on a larger scale, as well as the statistical analysis. Considering this, the results should be more cautiously interpreted, especially when comparing the differences between groups. However, it should be noted that the aim of this article was to present the preliminary results. Second, we only analysed business-academia collaboration from the point of view of business organisations. Therefore, further research could be focussed on investigating the studied aspects from the perspective of HEIs. Finally, in order to explore more deeply the interaction between HEIs and business organisations, it is needed to investigate how characteristics of companies affect their involvement in collaboration with HEIs.

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Appendix

Table 1. Relevance rating for the surveyed barriers

Nº	Barriers	Education	Research	Innovation
1	Problems related to making contact with academics/HEIs	2.29	2.52	2.68
2	Difficulty in finding HEIs with appropriate profile	2.56	2.61	2.59
3	Geographical distance	1.92	2.00	1.95
4	HEIs are not interested to collaborate with business	2.52	2.43	2.41
5	The company is not interested to collaborate with HEIs	2.52	2.78	2.91
6	The company lack of awareness of opportunities arising from collaboration with HEIs	2.84	3.04	2.73
7	Universities lack of awareness of opportunities arising from collaboration with business	2.54	2.61	2.48
8	Lack of financial incentives	2.83	2.74	3.00
9	Lack of financial resources of the business	2.21	2.65	2.73
10	Lack of financial resources of the HEI	2.17	2.22	2.41
11	Lack of time	3.36	3.87	3.73
12	Bureaucratic procedures within HEIs	2.80	2.68	2.59
13	Bureaucratic procedures within the company	2.48	2.74	2.55
14	Lack of incentive mechanisms	3.08	3.27	2.95
15	Rules and regulations imposed by HEIs/ government	2.43	2.52	2.59
16	Policies adopted by the HEIs for knowledge and technology transfer	2.58	2.39	2.36
17	Absence of established procedures for collaboration with HEIs	2.88	2.91	2.91
18	Lack of experience in collaboration with HEIs	2.83	2.91	2.95
19	Absence of a knowledge/technology transfer units	2.96	2.96	2.86
20	Lack of awareness of opportunities which knowledge/technology transfer units offer	2.92	3.13	3.14
21	Differing time horizons between university and business	2.61	2.39	2.41
22	Short-term orientation of industry research	2.04	1.91	2.05
23	Long-term orientation of university research	2.36	2.48	2.41

24	The nature of scientific research does not conform to the industry interests or needs	2.96	3.13	2.77
25	HEIs' research is fundamental oriented	2.76	3.00	2.73
26	Business' research is applications-oriented	2.48	2.55	2.57
27	Mutual lack of understanding about expectations and working priorities;	2.68	2.57	2.82
28	HEIs are not familiar with industry's actual needs	2.96	3.04	2.86
29	Diversity in research methodologies and in the use and interpretation of knowledge	2.75	2.86	2.64
30	Limited ability of business to absorb knowledge transferred	2.52	2.57	2.68
31	Differences in terminology, language and communication styles and channels	2.63	2.43	2.68
32	Lack of professionals to dialogue with academic researchers/business	2.54	2.78	2.86
33	High personnel turnover and lack of continuity in companies' research strategies;	2.25	2.43	2.36
34	Confidentiality of information	2.96	2.91	3.23
35	Potential conflicts regarding intellectual property rights	2.12	2.22	2.41
36	Lack of trust	2.24	2.04	2.18
37	Joint activities do not contribute directly to the firm's competitiveness	2.54	2.43	2.50
38	Results from university research are not applicable	2.50	2.09	2.14

Note: The table represents mean scores – a value of 1 is not relevant and a value of 5 is extremely relevant