ISSN 1392-3110
Socialiniai tyrimai / Social Research. 2011. Nr. 3 (24), 130–140

Forms of collaboration between science and business organisations: approach of Šiauliai University students as one of the stakeholders

Rigita Tijunaitienė, Jurgita Bersėnaitė, Ina Matuzienė
Šiauliai University, Architektu str. 1, LT-78366 Šiauliai, Lithuania
E-mail: rigita@smf.su.lt, jurgitabersenaite@gmail.com, i.matuziene@gmail.com

Abstract

With reference to the attitude of Šiauliai University students as one of the stakeholders, possible forms of collaboration between science and business have been identified, activities the students would like to participate in have been determined and specific actions to be taken in order to reconcile business needs and competences acquired by the students have been named in this article.

The main forms of collaboration as identified by students are practice, participation of employees of the representative organisations in university events, non-formal relations with lecturers, joint projects with the university, consultations by lecturers to employees of organisations, work activities of members of the representative organisations at university as well as search for potential employees at university. Meanwhile activities the students would like to participate in while developing different forms of collaboration include informal contacts, commercialisation of research results, and consolidation of strong interaction with business sector.

Keywords: science-business collaboration, forms of collaboration, university, business, students.

Introduction

Research novelty and relevance. "Today it is widely accepted that long-term economic growth is closely linked to industrial renewal as new industries emerge and old industries renew their technological and product base" (Freeman, 1993 cited by Wallin, Lindholm Dahlstrand, 2005). "Successful securing of such links between economic growth, industrial renewal and technological innovations requires availability of results of the latest research on specific areas of scientific and practical activities to industry, which becomes possible when another link – between science institutions and business companies – is efficient" (Kiškienė, 2009, p. 31). It must be noted that state auditors who assessed how science-business interaction is stimulated in Lithuania in general found that no adequate preconditions to develop entrepreneurship and innovations have been created in the country. Approximately 2.9 billion LTL from the budgets of the EU and Lithuania are planned to allocate for stimulation of science-business collaboration for years 2008-2015 (Putinaitė: mokslo ir verslo..., 2011). Linkages between science and business as well as between high technologies and economic growth increasingly more often become the object of scientific research and public discussion (Carayol, 2003; Schiller, Diez, 2007; Etzkowitz, 2008; Spithoven, Vandecandelaere, 2009; Ciegis, Gineitienė, 2006). Therefore, relations between the mentioned organisations, their balance, necessity and timeliness are no longer questioned by anyone, but the range of forms and ways to ensure that in a particular region among the stakeholders still needs deeper studies. In the process of collaboration the stakeholders are not only the organisations (science and business) themselves, but also researchers, scientists, businesspersons, students, municipal organisations, and the public of city, region, and country.

Overall, science-business collaboration may take various forms that are influenced by different factors. Relations are often maintained through various relation mechanisms, for example, research collaboration, contribution of industry to improvement of study programs, support for and employment of students, and research personnel exchanges (Lam, 2007).

Current level of research on this subject. Deeper scientific insights into forms of collaboration between business and university can be found in research works by foreign authors (Santoro, Chakrabarti, 2002; Schmoch, 2003; Arvanitis, Kubli, Worter, 2008; Perkmann, Walsh, 2008; Wright, Clarysse, Lockett, Knockaert, 2008). Meanwhile in works by Lithuanian authors these aspects are rarely met (e.g., Kiškiene (2009) analysed the process of transfer of knowledge and technologies and investigated the peculiarities of transfer of technologies from science institutions to business companies). Therefore the authors of the article did not find any deeper studies on forms of collaboration. Though this article is not intended to provide the general conclusions on this issue, it aims at presentation of analysis of opinions of one of the stakeholders (the students), which can be considered a foundation for further and deeper analysis of this issue.

Research problem can be defined by the following question: what forms of collaboration and specific activities the students would like to participate in should be covered by collaboration between universities and business companies?

The fact that this article is to be submitted for a publication and a conference, the essential aim of which is discussion of practical aspects of collaboration, having been taken into consideration, the theoretical analysis of the issue will receive minimum attention from the authors, with the main focus being on the empirical aspects.

Research subject: university students' opinions on forms of collaboration between science and business.

Research aim: by referring to opinions of Šiauliai University students as one of the stakeholders to identify the possible forms of collaboration between science and business.

Research objectives:

1. To determine what forms of science-business interaction could be taken by collaboration between a university and business companies.
2. To identify the activities of science-business interaction that students would like to engage and participate in.

Research methods: analysis of scientific literature, written questionnaire survey of Šiauliai University students. Empirical data were processed by using a spreadsheet available in SPSS.11 computational statistics software by using methods of descriptive statistics (frequencies and cluster analysis).

Forms of collaboration between science and business

In order to avoid repetition of scientific material, we will leave out here the broad description of theoretical aspects of forms of collaboration between business and science organisations, which have been studied extensively in publications by Cibulskienė, Tijunaitienė, Bersėnaitė, Budvytytė-Gudienė, Steponavičiūtė, Dargis (2010), Bersėnaitė, Tijunaitienė, Cibulskienė, Budvytytė-Gudienė (2010), where typology of forms of science-business interaction, roles, expectations and commitments of participants in the interaction, collaboration levels and other aspects have been presented slightly differently.

Supporting the position of the authors of the study (Cibulskienė et al., 2010) that "it is rather complicated to find the most suitable and most accurate typology and use the proper concept", the terms *methods*, *types*, *forms*, *directions*, *activities*, *mechanisms* and *processes* are treated as synonyms in this article as well, i.e., they are used concurrently. Citing Link, Tassey (1989), the authors of the above-mentioned study state that "interaction between university and industry may vary from unidirectional transfer of information to complex and long-term collaboration". This necessitates creation of conditions for variety of directions of collaboration (Bekkers, Bodas Freitas, 2008, cited by Cibulskienė et al., 2010). Therefore the forms of linkages between a university and industry may differ greatly. Each of these forms may take different directions of interaction (see Table 1).

Table 1

Directions of university-business interaction

Types/forms of directions (University – U; Business – V)		Sample forms (activities)
Unidirectional interaction	U → V	• Consulting (professors / university teachers consult employees of the organisation; reports are given to business sector).
	U ← V	• Financial support of business for universities (funding and provision of equipment for renewal of university laboratories).
Bidirectional interaction (close collaboration)	U ↔ V	• Research (collaboration based on agreements/contracts; cooperative research). • Joint projects. • Practice (Cooperative Studies / Service Learning). • Non-formal contacts/information exchange (non-formal personal contacts with graduates and former employees; conferences, seminars; brief encounters, visits to companies, getting familiar with work environment). • Training (joint courses or programs; temporary employee exchange). • Improvement of study programmes.

Source: drawn by the authors of the article with reference to Cibulskienė et al. (2010, p. 46-57).

Directions of university-business interaction may vary from unidirectional interaction from *university* or *business* to bidirectional interaction, i.e., collaboration.

As mentioned before, individual forms of interaction between science and business organisations (*consulting*, *research* (contractual and cooperated), *mobility of graduates and researchers*, *intermedia-*

ries and *financial support*) have been extensively analysed by a team of researchers (Cibulskienė et al., 2010). The forms that have not been sufficiently analysed in that research will be extensively discussed in this article.

Joint research/projects. Peculiarity of joint research by science institutions and stakeholders is that they are carried out with efforts and resources of both science institutions and enterprises the results of scientific research will be transferred to. Joint scientific research is usually defined in special legal agreements that define the distribution of human resources, equipment, and intellectual property among the parties signing the agreement. Such research may also be called *joint projects of science institutions and business companies*, these projects may have different levels of formality, ranging from joint scientific research companies to partnership formalized by the mentioned legal agreements (Rogers, Takegami, Yin, 2003; Peerbaye, Mengematin, 2005, cited by Kiškienė, 2009). Although the above-mentioned authors attribute contractual research to joint projects of different sectors, but the authors of this article are of opinion that joint projects and research are different activities of collaboration between science and business organisations.

Informal contacts / information exchange. Informal social relations are primarily based on social contacts, personal informal relations, which link science and business communities. Despite the difficulty to analyse such relations and assess them quantitatively and qualitatively, they are highly important for successful process of transfer of knowledge and technologies, and often they serve as a catalyst of formal transfer of technologies (Debackere, Veugelers, 2003, cited by Kiškienė, 2009).

The previously discussed interaction form (*informal contacts / information exchange*) also includes *brief encounters*, *visits to companies*, *getting familiar with work environment*. Using such opportunities students go beyond academics, where they can develop insights, critical minds and obtain practical knowledge as well as theoretical applications. Furthermore, students are able to improve on the cognitive complexity, intrapersonal/interpersonal relationship and practical competence (Barnett, Coate, 2005, cited by Markom et al., 2011). These authors (Markom et al., 2011) touch an important aspect of interaction – social responsibility of companies, which, in their opinion, also covers visits of students to business and public sector organisations.

Although the authors of the study (Cibulskienė et al., 2010) cited in this article attribute contacts with graduates now employed in business sector, contacts with former employees now employed in business sector, joint training or study programmes and training tasks to business sector employees, and courses and programmes at institutes which are delivered by business sector employees to ***training activity***, but in the opinion of the authors of this article *contacts with graduates employed in business sector* and *contacts with former employees employed in business sector* should be attributed to ***informal contacts***. Therefore this approach will be used in this article.

When discussing training activities, other authors (Slaughter, Campbell, Holleman, Morgan, 2002; Lee, Win, 2004 and Debackere, Veugelers, 2005 cited by Kiškienė, 2009) emphasize joint programmes of education and training, which they describe as indirect method of transfer of knowledge and technologies, where science institutions (educational establishments such as universities in the first place) collaborate with business companies in preparation of higher education programmes and educating students and also participate in preparation of business companies' personnel training programmes and provide the training itself. Education and training programmes may be oriented towards provision of practical knowledge necessary for work in specific branches of industry. Such training may also include application of a new technology or work method at an enterprise and training of employees.

Practice, Cooperative Studies (Service Learning). By accepting students according to Cooperative Studies or for a longer practice a public or business sector organisation "not only helps to expand students' and lecturers' social ties, strengthens dialogue between employers and university, but also forces employers to think about a role and importance of higher education for non-governmental organizations, enterprises, communities" (Vandzinskaitė, Ruškus, 2008, p. 34). According to these authors, practice as a form of collaboration brings benefit not only to students, but also to lecturers, because "it is a great opportunity to avoid repetitions of tasks that are formulated taking into account real needs of community and practically implemented along". Furthermore, practical experience also gives stimulus to lecturers to update and improve study modules, develop didactic competences. So lecturers have a possibility to see gaps in students' knowledge and at the same time to evaluate contents of the taught course and improve it with regard to practical character of applicability of theoretical knowledge. Representatives of companies acknowledge the direct benefit of students' practice (and Cooperative Studies) for business organisations as well, because positive organisational changes occur, members of the organisation are activated, innovations in activities are created and tested.

As to the aspect of interaction between a university and business, it can be said that Cooperative Studies are closely related to practice, because during them "students improve their knowledge in the subject, competences in certain academic areas" (Mažeikienė, 2008) and gain "practical skills, interpersonal skills, citizenship skills and personal responsibility skills" (ibid.).

Review of scientific literature on the topic analysed having been done, it can be said that there are many directions (forms) of interaction between universities and business companies; they usually supplement each other rather than being completely separate. All the forms of science-business collaboration must take various directions; there should not be one particular form that receives special attention, because not only those bringing the greatest economic benefit make influence on the creation of a knowledge region.

Research methodology

The research was carried out in May and June of 2011. In order to identify the possible forms of science-business interaction, a standardized written survey of students of Šiauliai University was carried out. The questionnaire for the survey was prepared on the basis of Chapter 3 "Description of possible forms of collaboration and activities they include" of the study "Model of collaboration of scientists, research organisations, and business sector" (Cibulskienė et al., 2010) where possible forms of science-business collaboration are identified and named. The logic of description of these forms of collaboration was also followed in this article, in a previous chapter "Forms of collaboration between science and business".

The questionnaire consists of demographic and diagnostic blocks. The demographic block contains questions intended to reveal a respondent's gender, age, study programme, area and extent of activities of the organisation a respondent works at (if works).

The diagnostic block of the questionnaire is intended to identify the possible forms of science and business collaboration. The block included 6 questions. 3 questions ("What is your organisation's relation to university?", "Do you know whom you should contact at university in order to initiate collaboration between your business company and university (faculty)?", "Do you think business is an active partner of university?") allowed the respondents to choose a suitable answer from the given options, the other 3 questions ("What forms and activities should be covered by collaboration between companies and university?", "What activities would you, as a student, like to participate in?", "How should the needs of business and competences gained by students be harmonized?") were open-ended and allowed the respondents to freely present their opinions. Open-ended questions were organised by using cluster analysis method. According to Čekanavičius, Murauskas (2002, p. 195), "applying cluster analysis, we determine the similarity of objects and sort them into clusters <...> The aim of cluster analysis is to sort the objects so that differences within clusters are as small as possible, and among clusters as big as possible".

After systematisation of answers to open-ended questions it turned out that they contain 551 statements reflecting respondents' attitude to interaction between science and business: "Forms and activities that should be covered by collaboration between companies and university" (200 indicators), "Activities the students would like to participate in" (171 indicators), and "Specific actions that should be taken when modifying the contents and forms of study programmes in order to make the needs of students and business compatible" (180 indicators). When processing the research data, a decision was made to switch to a "rigid system of variables" to make application of the quantitative method possible. Therefore categories were developed when sorting the received answers into separate groups (clusters).

197 respondents participated in the survey, of them 129 were males and 68 were females. The age of the respondents ranged from 19 to 39. Distribution of the respondents by study programmes was the following: environmental and occupational safety (N = 15), electronics engineering (N = 18), civil engineering (N = 37), mechanical engineering (N = 21), electric engineering (N = 4), informatics engineering (N = 30), economics (N = 53), business administration (N = 17). 58 respondents indicated they were employed at that time, 81 respondents indicated they were employed previously, but not currently, and 58 respondents never had any employment relationships. It turned out that there were 37 respondents in the research who worked at organisations having less than 10 employees, 29 respondents said they work at companies with 10-49 employees, and 23 respondents reported working at companies with 50-249 employees. Only a small part (12) of the respondents told working at companies that have more than 250 employees. It follows that most of the respondents work at small and medium companies. It was found that most of them are employed in service sector (N = 55), less of them in trade (N = 29) and manufacturing (N = 27) sectors.

Analysis of results of empirical research

When assessing the ***relation of the being represented organisation to the university***, it was noticed that only 29 respondents (mainly in economics

and environmental and occupational safety study programmes) chose the answer that representatives of the organisation study at the university. Meanwhile the research results revealed that 58 respondents who were employed at the period under investigation were questioned. It follows that every second employed respondent does not identify himself in the study process as a representative of a certain company.

Of all the employed respondents 18 replied their organisations accept students for practice. It must be noted that organisations represented by respondents who study electronics do not accept students for practice.

The students of engineering study programmes (civil, mechanical, informatics, and electronics engineering) mentioned participation of employees of their organisations in university events (N=6) and maintenance of informal relations with lecturers (N=5). Among the more rare collaboration activities, the students of environmental and occupational safety, civil and mechanical engineering, and business administration programmes named joint projects with the university (N=4), consultations by lecturers to employees of organisations (N=4), work activities of members of the representative organisations at university (N=3). One more additional activity was indicated: search for potential employees at university conducted by companies (N=1).

It was noticed that most of the respondents (N=164) do not know ***whom to contact at university in order to initiate collaboration between business company and university (faculty, centre, department)***. This fact points at insufficient information dissemination between the university as an organisation and its divisions. Without institutionalisation of science-business interaction, that is, without establishment of a special division or without delegation of respective functions to certain persons, interorganisational relations are often seen as spontaneous, not delivering any tangible and substantial result. Another part of the respondents mentioned that certain people (chancellor, dean, head of department, lecturers) or structural divisions (career centre, deaneries of faculties, student representation) of the university could be contacted for possible collaboration. The above-mentioned contacts were named by 33 respondents (mainly students of informatics and economics).

Business as an active partner of university, which not only accepts students for practice, but also shares experience with them, carries out research together, identifies and resolves problems, and runs important projects was named by 55 respondents (mainly students of economics and business administration). Responses of students in these study programmes are not surprising to the research authors, because these are the students who deeply analyze business problems during studies, which enables better understanding of collaboration results as development of products and processes, access to academic networks, management of human capital, immediate opportunities for business, etc. (Cibulskienė et al., 2010). The research results show that the largest number of students (N=53) who negatively see business activeness in partnership with science is in civil engineering study programme. It could be explained by that students of this programme have little practice during studies or are poorly familiar with other forms (activities) of interorganisational relations.

The carried out cluster analysis of the research data allowed to group the components of the phenomenon under investigation by their similarity. Hierarchic cluster analysis method, Ward methodological grouping procedure and the Euclidean distance metric were used for grouping.

Possible forms of science and business collaboration. Figure 1 presents a dendrogram obtained through cluster analysis and having 3 relatively more pronounced clusters. The first cluster consists of a single category ***Practice*** that significantly outperforms all the others by frequency rating. It is a category where one of the most efficient ways of learning is going beyond the classroom and participation in practical activity of organisations. Certainly, people who organise such activity encounter various problems when arranging visits to companies (matching date and time with packed students' schedules and less venue and lecture halls available for the industrial talk during lecture weeks" (Markom et al., 2011, p. 678)). Moreover, not all companies are ready to accept students and visitors in general. According to the latter source, "this is probably due to their hectic production schedule, confidentiality and safety issues, or unavailability of staff or unit in charge of the tour" (ibid., p. 678). Thus purposefully or naturally there appear obstacles to visiting any department of the company and students are restricted to participation in instructing, control rooms, or superficial inspection of the company. It also needs to be mentioned that the number of students per visit is limited as well. In confirmation of the benefit of skills gained during practice the students say that "*Students should be allocated more practical classes at companies for practice rather than practicing at university only*" (a student of environmental and occupational safety); "*Any practical activities. Suppose the study program is civil and mechanical engineering – practice could be organised each year, for example, work as an assistant of a construction manager or a foreman*" (a student of civil and mechanical engineering).

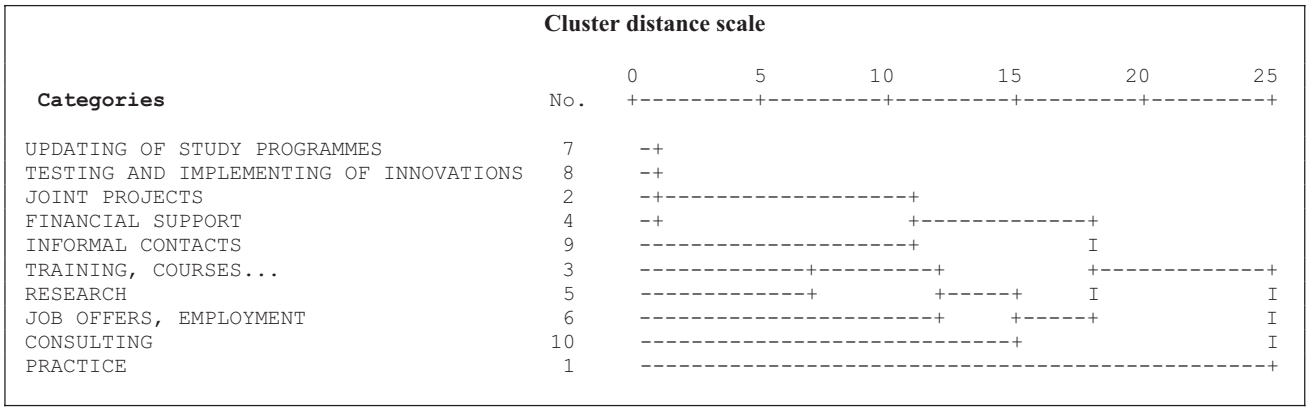

Figure 1. Cluster dendrogram encompassing the components of possible forms of science-business collaboration (N=176)

The second cluster (see Fig. 1) includes the following categories: *Consulting / Job offers, employment / Research / Training, courses, programmes, temporary employee exchange*. Cumulatively, these categories could be called the ***development of human resources***. Bearing in mind that "learning is not a spectator sport" (Chickering, Gamson, 1987, cited by Bonwell, 1991), later it is not longer enough just to passively sit at a classroom, use the notes prepared long ago, or keep providing the answers known in advance – you have to link your learning to experience you have gained and put the acquired knowledge into practice. Such activity could involve "*scientific experiments, training of university lecturers for companies*" (a student of informatics engineering); "*practice, traineeships, seminars*" (a student of civil engineering); "*Conducting ordered research*" (a student of electronics engineering), which would allow enterprises to use the top level scientists' inventions and also incur lower costs than when carrying out research on their own (Lee, Win, 2004, cited by Kiškienė, 2009; Perkmann, King, Pavelin, 2011). As noted by Perkmann, Walsh (2009), "for business, joint activities (contractual research, consultations, etc.) are much more important than transfer of intellectual property".

The third cluster consists of *informal contacts* / *financial support* / *joint projects* / *testing and implementing of innovations* / *updating of study programmes*. The method of cluster analysis has confirmed the regularities of rating of components of forms of interaction: by similarity, the third cluster consists of categories related to ***innovations***. This can be illustrated by the students' answers: "*Tests of innovations created or brought by university under work conditions at companies. Help in creating new products*" (a student of electronics engineering); "*Practical application of technologies and new knowledge of lecturers and students*" (a student of informatics engineering); "*Companies could become one of the sponsors of university*" (a student of environmental and occupational safety); "*Renewal of equipment in exchange for consultations or training*" (a student of mechanical safety). Mutual benefit obtained through various projects is reflected in this statement of a respondent: "*Students could cooperate with employees of a company and thus acquire new knowledge, and companies would achieve new ideas and plans*" (a student of economics).

A necessity for representatives of business companies to participate in updating of study programs, which was named by the students, is also worth mentioning. It is illustrated by the following statements: "*Requirements of companies for a university: what to teach or what knowledge to deepen*" (a student of electronics engineering); "*To discuss what competences in employees a company needs*" (a student of business administration).

When analyzing ***activities the students would like to participate in***, a very broad range of desired activities has been found. Despite the relatively large number of identified categories, the first cluster contains only one category (see Fig. 2) and is far ahead of all others by frequency rating. This is the category that reflects ***Practice***. In respondents' opinion, practice should be related to "*organising, planning, sales, manufacturing*" (a student of civil engineering); "*involvement in practical activities, such as going to companies and doing practical tasks there*" (a student of economics). According to Vandzinskaitė, Ruškus, (2008), this would let students strengthen the sense of responsibility, get more familiar with current issues on the labour market, acquire competences for resolving problems and conflicts, socialize and adapt, see benefit for future, and develop critical thinking.

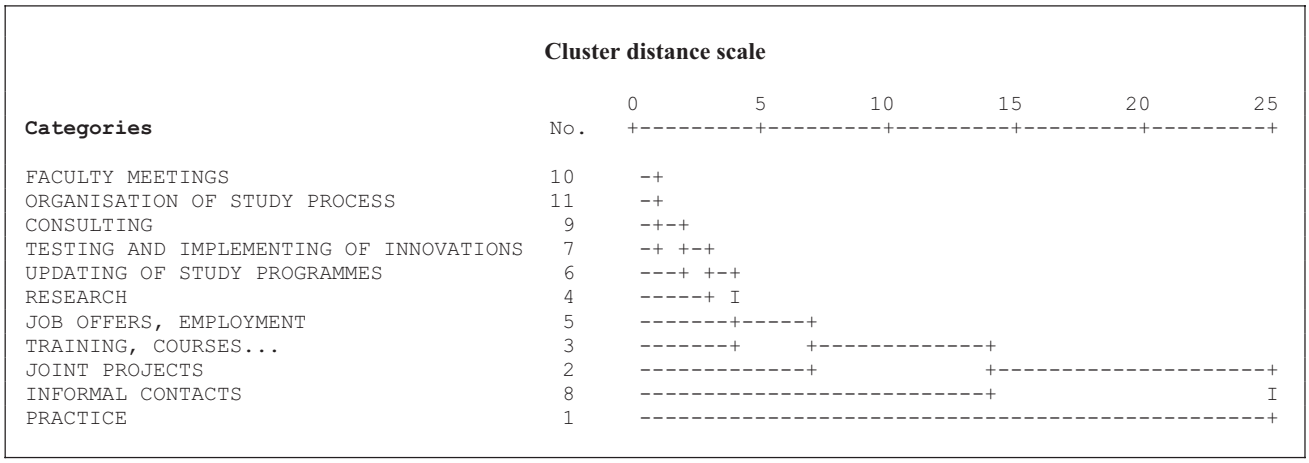

Figure 2. Cluster dendrogram encompassing the interaction activities desired by students (N=168)

The second cluster contains the only category: ***informal contacts,*** which reflects the importance of personal contacts and efforts, however, it is considered being only an extra tool for conducting other activities, according to Kiškienė (2009). As noted by Brewer and Gray (1999) cited by Person and Rosenbaum (2006), "systematic information about school–employer contacts can be difficult to obtain, as these linkages may rely on informal arrangements between individual teachers and employers". The questioned students also name lack of after-classes activities: "*I would like hobby groups; if such are available, then there is a lack of information about them*" (a student of mechanical engineering); "*intense activities that would open up an opportunity for self-expression in creative environment without strict definitions for everything; activity a person would be useful at and work would be appreciated, a person would feel necessary*" (a student of informatics engineering).

Categories within the third cluster (*joint projects* / *training, courses, etc.* / *job offers, employment* / *research* / *updating of study programmes* / *testing and implementing of innovations* / *consulting* / *organisation of study process* / *faculty meetings*), which encompass ***traditional activities*** of a university and highlight the necessity for ***the third mission*** (commercialisation of research results, strong interaction with business sector, etc.) of a university, can also be explained. However, according to Grubb (1996) and Perin (2001) cited by Person, Rosenbaum (2006), many reforms integrate occupational content into the curriculum, without building linkages to employers and this causes students to have a perspective (probably even misleading) that higher school is irrelevant, because involvement of representatives of companies in improvement of study programmes is not made very public, there is no talking about the established relations and benefit they bring.

On the other hand, there can be seen manifestations of students' indifference, when students are short of "motivation and sometimes low in self esteem when meeting with the industrial people. The opportunity to ask questions during the visit and talk was not well utilized. Most of the students did not attempt to investigate and find more about the industry that they were going to visit" (Markom et al., 2011, p. 678). Therefore it would be good to ask students after practice in order to find out whether the industrial visit helped them to better understand the relationship of the courses that have been studied; whether they were able to relate the theory learned in the university to its application in the industry; whether they were able to see up close the unit operations that have been learned in the course and understand its function; whether they were able to understand better the role of them as specialists (Markom et al., 2011).

As to analysis of ***possibilities of reconciliation of business needs and competences acquired by the students***, the Figure 3 presents a dendrogram obtained through cluster analysis, in which 2 clusters clearly prevail: 1) *Updating of study programmes / Practice* and 2) *Informal contacts / Job offers, employment* / *training, courses, etc.* / *Student-lecturer interaction* / *Collaboration based on contracts* / *Joint projects* / *Organisation of study process* / *Change of businesspersons' thinking*. The method of cluster analysis confirmed the regularities of rating of empirically made categories: by similarity, the categories on top of the rating structure fell into one cluster. To ensure competitiveness of specialists on the labour market and resolve the recently often escalated problem with quality of studies (study programme contents not meeting the current market needs), specialists' unreadiness to work creatively, and similar issues, the universities initiate and run various projects, for example, PROMOK, UNIWIL, etc. (Šiaulių universiteto Karjeros..., 2009), on the basis of activities in which the methodological and informational conditions for problem-based learning which ensure competitiveness of specialists on the labour market are

being created, competence of lecturers is being improved, and new in-demand study programmes are being prepared or the current ones are being updated taking into account their applicability.

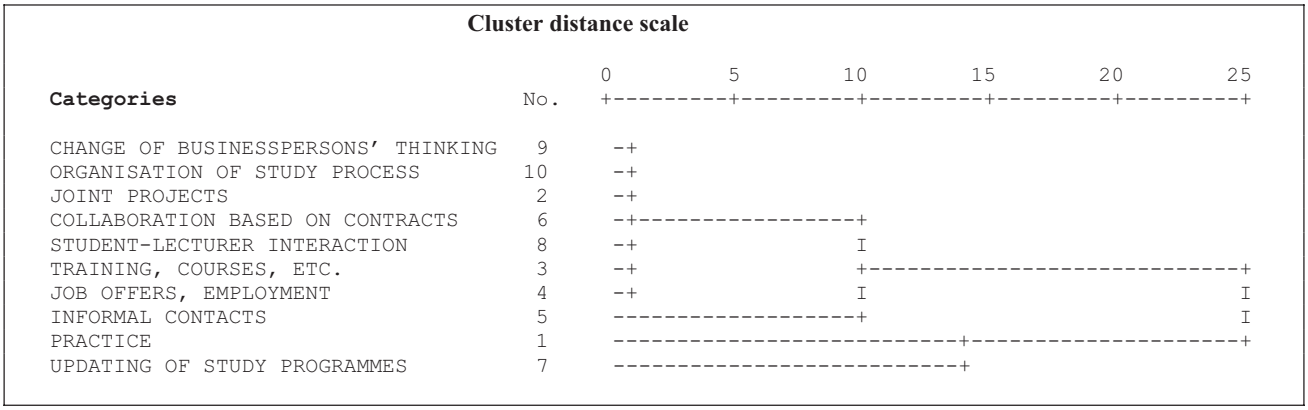

Figure 3. Cluster dendrogram encompassing the reconciliation of business needs and competences acquired by the students (N=172)

The benefit of practice and the need for updating of study programmes is particularly emphasized by students of social sciences (business administration and economics) and civil engineering. It must be noted that quite a lot of respondents emphasized a problem with duration of practice, which is accurately illustrated by replies of some students: "*Prolong the practice <...> Longer duration of practice in different (at least two) organisations in accordance with the study programme <...> Establish longer obligatory practice for students, which would allow students to test themselves in several fields and become more popular on the labour market <...> Allocate more time for practices, and not only for the 4th year students, but also for the 1st and the 2nd year students*".

To ensure quality of studies it would be of use not only to organize the study process more flexibly ("*Let students choose at least half of the courses*" – a student of economics), but also introduce new methods and technologies to study environment, keep in touch with business representatives who would ensure applicability of the study contents to practice: "*I think it would be necessary <to identify> what business needs and then modify the study programs accordingly*" (a student of business administration); "*Students have to be prepared so that when they start working they immediately integrate into the system; this means teaching subjects that will be actually necessary for job, doing group projects, because you will work in team at a company and so you have to learn to work in this way*" (a student of mechanics); "*Convey more practical knowledge and skills so that when you finish your studies and start working you are not 'green' and not having even seen the work that must be done at a company*" (a student of environmental and occupational safety). However, an entirely different opinion was also met: "*Universities do not have to prepare employees for a specific business company*" (a student of electronics).

The second cluster (see Fig. 3) includes categories that take the lowest positions, which can be identified with business-science linkages that, according to Person, Rosenbaum (2006), cannot be very modest and unsystematic. However, as changes in businesspersons' thinking occur and as associated business structures enter joint projects with higher schools and governmental institutions, entrepreneurship of young people is encouraged through various activities, such as contests "Idea for Šiauliai City and Business" (Jurevičiūtė, 2010). It has been noticed that along structural reforms and changes in traditions and values it is increasingly more actively tried to involve students in organisation of the process of studies, the opinion of whom in assessing the lecturers' competence should be treated as equal to opinions of the staff (including head) of the department (Šiaulių universiteto mokslo..., 2010). As to lecturers-students interaction, original replies from the respondents should also be mentioned: "*Increased cooperation with lecturers and reaching of a common opinion*" (a student of economics); "*<...> allow students not only to study, but also to work (some lecturers do not understand that and reprehend students for that)*" (a student of business administration), etc.

On one hand, *lecturers-students interaction* is not seen as a form of science-business collaboration, on the other hand this category is important in seeking to identify the obstacles to development of the previously analysed forms of interaction. It must be noted that students' opinion presented in this article cannot be estimated unequivocally without first hearing opinions of all the participants of the study process, without a comprehensive assessment of quality of study programmes, however, needs and expectations of business representatives must be heard.

Generalisation

To conclude, it can be said that the main forms of collaboration as identified by students (in the order of priority) are practice, participation of employees of the representative organisations at university events, non-formal relations with lecturers, joint projects with the university, consultations by lecturers to employees of organisations, work activities of members of the representative organisations at university as well as search for potential employees at university. The cluster analysis shows that the following 3 categories are the most pronounced ones: practice, development of human recourses, and innovations.

A very broad range of activities the students would like to engage in when developing different forms of collaboration has been found. For example, practice should be related to organising, planning, sales, production, visits to companies, etc. A special place was taken by informal contacts and commercialisation of research results as well as consolidation of strong interaction with business sector.

Therefore, to sum up, it can be said that in order to make the collaboration as fruitful as possible (that is, to develop it), it is necessary to know opinions and attitudes of all the stakeholders towards this issue, because they may be an initial position for coordination of action plans. In other words, to avoid misunderstandings and minimize the scale of rejection, already in the first stage of collaboration it could be started with the already known schemes of foreign researchers' activities of how to begin developing separate forms of collaboration. One of these (the step-by-step coordination flow procedure) is presented below (see Figure 4).

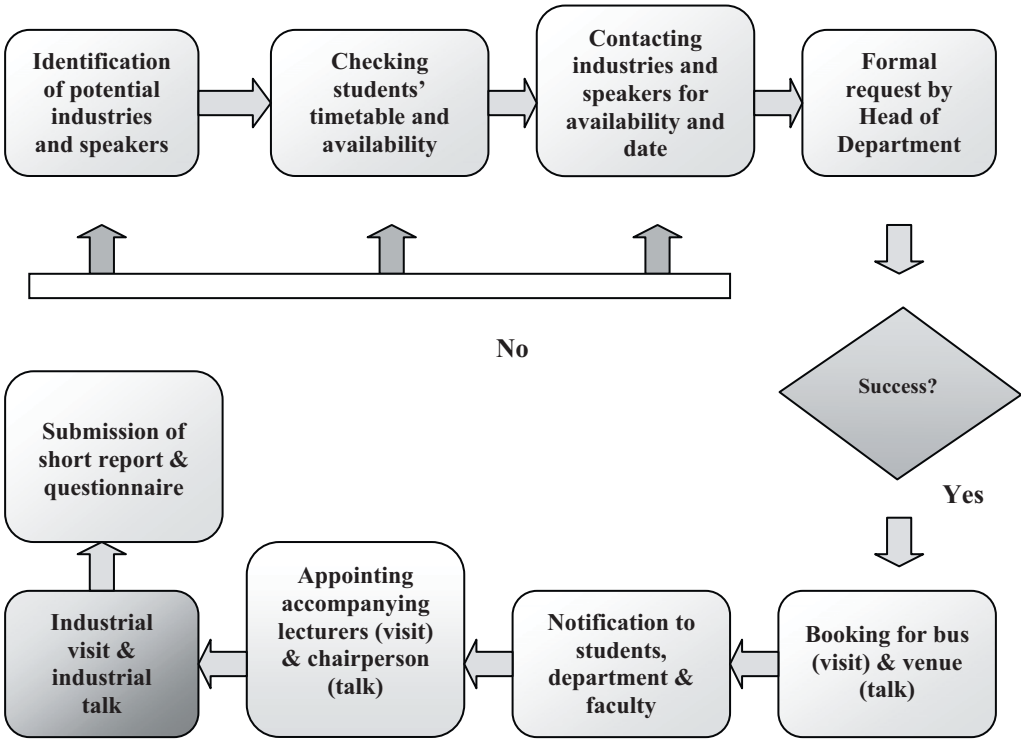

Figure 4. Industrial Talk and Visit Coordination flow chart
Source: Markom et al. (2011, p. 676).

According to Markom et al. (2011), the planning and implementation of the industrial visit and talk for students are conducted by a coordinator, who is appointed by the Head of department among the lecturers. The coordinator is often assisted by the department tutors.

Although this article was not intended to analyze each science-business interaction form, roles and commitments of its participants, detail the course of implementation of a certain form, motivation for participation of all the stakeholders in interaction, and necessary conditions for efficient collaboration very thoroughly, but the findings of this research may be useful if universities seek to improve university-employer linkages.

References

1. Arvanitis, S., Kubli, U., Wörter, M. (2008). University-Industry Knowledge and Technology Transfer in Switzerland: What University Scientists Think about Co-Operation with Private Enterprises. *Research Policy*, 37, p. 1865-1883.
2. Bersėnaitė, J., Tijūnaitienė, R., Cibulskienė, D., Būdvytytė-Gudienė, A. (2010). Levels of Science-Business Collaboration and Roles of Participants: Theoretical Aspect. *Socialiniai tyrimai=Social Research*, 3 (20), (2010), 19-32.

3. Bonwell, C. C. (1991). Active Learning: Creating Excitement in the Classroom. Active Learning Workshops. Available online at www.active-learning-site.co.
4. Carayol, N. (2003). Objectives, Agreements and Matching in Science–Industry Collaborations: Reassembling the Pieces of the Puzzle. *Research Policy*, 32, 887–908.
5. Cibulskienė, D., Tijūnaitienė, R., Bersėnaitė, J., Būdvytytė–Gudienė, A., Steponavičiūtė, V., Dargis, V. (2010). Mokslininkų, tyrėjų organizacijų ir verslo sektoriaus bendradarbiavimo modelis. Mokslo studija. Šiauliai: Šiaurės Lietuva.
6. Čekanavičius, V., Murauskas, G. (2002). *Statistika ir jos taikymai. II*. Vilnius: TEV.
7. Čiegis, R., Gineitienė, D. (2006). The Role of Universities in Promoting Sustainability. *Engineering Economics*, 3 (48), 56-62.
8. Etzkowitz, H. (2008). *The Triple Helix - University-Industry-Government Innovation in Action*. New York: Routledge.
9. Jurevičiūtė, L. Verslininkai apmovė studentus (2010, birželio 9). Available online at http://www.snaujienos.lt/the-newslt/miesto-naujienos/5238-verslininkai-apmov-studentus.
10. Kiškienė, A. (2009). Mokslo žinių ir technologijų perdavimo politika Lietuvoje (Daktaro disertacija, Mykolo Romerio universitetas).
11. Lam, A. (2007). Knowledge Networks and Careers: Academic Scientists in Industry-University Links. *Journal of Management Studies*, 44 (6), 993-1016.
12. Markom, M., Khalil, M. S., Misnon, R., Othman, N. A., Abdullah, S. R.S., Mohamad, A. B. (2011). Industrial Talk and Visit for Students. *Procedia Social and Behavioral Sciences*, 18, 674–682.
13. Mažeikienė, N. (2008). Empirical Research and Assesment of ServiceLearning: at the Crossroads of Research Objects, Strategies and Methods. *Socialiniai tyrimai = Social Research*, 1 (11), 21–30.
14. Perkmann, M., King, Z., Pavelin, S. (2011). Engaging excellence? Effects of faculty quality on university engagement with industry. *Research Policy*, 40, 539–552.
15. Perkmann, M., Walsh, K. (2008). Engaging The Scholar: Three Types of Academic Consulting and Their Impact on Universities and Industry. *Research Policy*, 37, p. 1884-1891.
16. Perkmann, M., Walsh, K. (2009). The two faces of collaboration: impacts of university-industry relations on public research. *Industrial and Corporate Change*, 18 (6), 1033–1065.
17. Person, A. E., Rosenbaum, J. E. (2006). Educational Outcomes of Labor-Market Linking And Job Placement for Students at Public and Private 2-Year Colleges. *Economics of Education Review*, 25, 412–429.
18. Putinaitė: mokslo ir verslo bendradarbiavimas tik prasideda (2011, rugpjūčio 4). Available online at http://www.alfa.lt/straipsnis/12075185/Putinaite..mokslo.ir.verslo.bendradarbiavimas.tik.prasideda=2011-08-04_14-09/.
19. Santoro, M. D., Chakrabarti, A. K. (2002). Firm Size and Technology Centrality in Industry–University Interactions. *Research Policy*, 31, 1163–1180.
20. Schiller, D., Diez, J. R. (2007). University-Industry Linkages. Potential and Realization in Developing Countries: Thai Experiences. *Tech Monitor*, 38, Jan–Feb, 38–44.
21. Schmoch, U. (2003). Hochschulforschung und Industrieforschung. Perspektiven der Interaktion. Available online at www.campus.de.
22. Slaughter, S., Campbell, T., Holleman, M., Morgan, E. (2002). The "Traffic" in Graduate Students: Graduate Students as Tokens of Exchange between Academe and Industry. *Science, Technology, & Human Values*, 27 (2), 282-312.
23. Spithoven, A. (2009). Academic views on industry-science relations: lessons and challenges. *In* Spithoven, A., Vandecandelaere, S. (Eds.). *Echanges de connaissances et transferts de technologies entre les entreprises et le monde de la recherche* (88-106). Bruxelles. Available online at http://www.ccecrb.fgov.be/txt/fr/ISR.pdf.
24. Šiaulių universiteto Karjeros centro tinklalapis. Projektai (2009, lapkričio 2). Available online at http://karjera.su.lt/Apie-mus/Projektai/PROMOK-2010-2012.
25. Šiaulių universiteto mokslo darbuotojų ir dėstytojų atestavimo ir konkursų pareigoms eiti laikinieji nuostatai (2010, balandžio 7). Available online at http://su.lt/su-tarnybos-ir-skyriai/ts-personalo-tarnyba/atestacija-ir-konkursai.
26. Vandzinskaitė, D., Ruškus, J. (2008). Experience of Service-Learning Adaptation in Lithuania: Sociocultural Challenges, Pragmatic Benefit and Strategies for Success. *Socialiniai tyrimai=Social Research*, 1 (11), 31–42.
27. Wallin, M. W., Lindholm Dahlstrand, Å. (2005). Sponsored Spin-Offs, Industrial Growth and Change. *Technovation*, 26, 611–620.
28. Wright, M., Clarysse, B., Lockett, A., Knockaert, M. (2008). Mid-Range Universities' Linkages with Industry: Knowledge Types and the Role of Intermediaries. *Research Policy*, 37, 1205-1223.

Tijūnaitienė R., Bersėnaitė J., Matuzienė I.

Mokslo ir verslo organizacijų bendradarbiavimo formos: Šiaulių universiteto studentų kaip vienos suinteresuotų grupių požiūris

Santrauka

Bendradarbiavimas tarp mokslo ir verslo gali vykti įvairiomis formomis, kurioms įtaką daro skirtingi veiksniai. Gilesnių mokslinių įžvalgų apie verslo ir pramonės bendradarbiavimo formas galima rasti užsienio autorių

(Santoro, Chakrabarti, 2002; Schmoch, 2003; Arvanitis, Kubli, Wörter, 2008; Perkmann, Walsh, 2008; Wright, Clarysse, Lockett, Knockaert, 2008) mokslo darbuose. Tačiau Lietuvos autorių darbuose šie aspektai sutinkami retai (pvz., Kiškienė (2009) analizavo žinių ir technologijų perdavimo procesą ir tyrė technologijų perdavimo iš mokslo institucijų verslo įmonėms ypatumus). Gilesnės bendradarbiavo formų mokslo studijos straipsnių autorėms rasti nepavyko. Nors šiame straipsnyje nepretenduojama į apibendrinamąsias išvadas šiuo klausimu, tačiau ketinama pristatyti vienos suinteresuotųjų pusių – studentų – nuomonių analizę, kuri gali būti pagrindas gilesnei ir tolesnei šio klausimo analizei.

Tyrimo problemą galima apibrėžti klausimu: kokias bendradarbiavimo formas ir konkrečias veiklas galėtų apimti universiteto ir verslo įmonių bendradarbiavimas, kuriose dalyvautų studentai?

Tyrimo objektas – universiteto studentų nuomonės apie mokslo ir verslo bendradarbiavimo formas.

Tyrimo tikslas – remiantis Šiaulių universiteto studentų nuomonėmis, identifikuoti galimas mokslo ir verslo bendradarbiavimo formas.

Tyrimo uždaviniai:

1.Išsiaiškinti, kokios mokslo ir verslo sąveikos formos galėtų apimti universiteto ir verslo įmonių bendradarbiavimą.

2.Išskirti mokslo ir verslo sąveikos veiklas, į kurias studentai norėtų įsitraukti ir dalyvauti.

Tyrimo metodai: mokslinės literatūros analizė, anketinė apklausa raštu. Empiriniai duomenys apdoroti kompiuterinės statistikos programos *SPSS.11* skaičiuokle, naudojant aprašomosios statistikos (dažnių ir klasterinės analizės) metodus.

Tyrimas atliktas 2011 m. gegužės–birželio mėn. Siekiant identifikuoti galimas mokslo ir verslo bendradarbiavimo formas, atlikta standartizuota Šiaulių universiteto studentų apklausa raštu. Klausimynas, pagal kurį atlikta apklausa, parengtas mokslinės studijos „Mokslininkų, tyrėjų organizacijų ir verslo sektoriaus bendradarbiavimo modelis“ (Cibulskienė ir kt., 2010) trečiojo skyriaus „Galimų bendradarbiavimo formų, jas sudarančių veiklų aprašas“ pagrindu, kuriame išskirtos ir įvardytos galimos mokslo ir verslo bendradarbiavimo formos. Pastarųjų bendradarbiavimo formų aprašo logikos laikytasi ir šiame straipsnyje prieš tai pateiktame skyrelyje „Mokslo ir verslo bendradarbiavimo formos“.

Apklausoje dalyvavo 197 respondentai – 129 vyrai ir 68 moterys. Respondentų amžius svyravo nuo 19 iki 39 m. Pagal studijų programas respondentai pasiskirstė taip: aplinkos ir profesinė sauga (N = 15), elektronikos inžinerija (N = 18), statybos inžinerija (N = 37), mechanikos inžinerija (N = 21), elektros inžinerija (N = 4), informatikos inžinerija (N = 30), ekonomika (N = 53), verslo administravimas (N = 17). 58 apklaustieji nurodė, kad tuo metu dirbo, 81 apklaustasis pažymėjo, jog anksčiau dirbo, bet dabar nedirba, o 58 respondentai nebuvo turėję jokių darbo santykių. Paaiškėjo, jog tyrime dalyvavo 37 respondentai, kurie dirbo organizacijose, turinčiose mažiau nei 10 darbuotojų. 29 respondentai nurodė, kad dirba įmonėse, kur darbuotojų skaičius svyruoja nuo 10 iki 49, o 23 respondentai pažymėjo, kad dirba įmonėse, kuriose darbuotojų skaičius yra 50–249. Tik 12 apklausoje dalyvavusiųjų respondentų nurodė dirbantys įmonėse, kuriose darbuotojų skaičius viršija 250. Taigi daugelis respondentų dirba mažose ir vidutinėse įmonėse. Išsiaiškinta, kad jų dauguma dirba paslaugų (N = 55) srityje, mažiau atstovauja (-avo) prekybos (N = 29) ir gamybos (N = 27) sektorius.

Tyrimo rezultatai atskleidė, kad daugelis respondentų (N = 164) nežino, *į ką reikėtų kreiptis universitete norint inicijuoti bendradarbiavimą tarp verslo įmonės ir universiteto (fakulteto, centro, katedros)*. Tai rodo informacijos sklaidos stygių tarp universiteto kaip organizacijos ir jo atskirų padalinių. *Verslą kaip aktyvų universiteto partnerį*, kuris ne tik priima studentus į praktiką, dalijasi su jais savo patirtimi, kartu atlieka tyrimus, formuluoja ir sprendžia problemas, vykdo svarbius projektus, įvardijo 55 respondentai (daugiausia ekonomikos ir verslo administravimo studijų programų studentai). Tyrimo rezultatai parodė, jog neigiamai vertinančių (N = 53) verslo aktyvumą partnerystėje su mokslu daugiausia yra statybos inžinerijos programos studentų. Tai aiškintina tuo, kad šios programos studentai studijų metu sąlyginai mažai turi praktikos arba yra menkai susipažinę su kitomis tarporganizacinės sąveikos formomis (veiklomis).

Pagrindinės bendradarbiavimo formos, kurias identifikuoja studentai (prioritetų eilės tvarka), yra praktika, atstovaujamų organizacijų darbuotojų dalyvavimas universiteto renginiuose, neformalūs ryšiai su dėstytojais, bendri projektai su universitetu, dėstytojų konsultacijas organizacijų darbuotojams, savo atstovaujamų organizacijų narių darbinė veikla universitete bei potencialių darbuotojų paieška universitete. Apibendrinant galima teigti, kad ryškiausios yra tokios 3 kategorijos (remiantis klasterine analize): praktika, žmogiškųjų išteklių vystymas ir kategorijos, sietinos su naujovėmis-inovacijomis.

Tačiau veiklų, kuriose studentai norėtų dalyvauti plėtodami skirtingas bendradarbiavimo formas, nustatytas labai platus spektras. Pavyzdžiui, praktika turėtų būtų susieta su organizavimu, planavimu, pardavimu, gamyba, vykimu į įmones ir pan. Išskirtinė vieta teko ir neformaliems kontaktams bei tyrimo rezultatų komercializavimui, stiprios sąveikos su verslo sektoriumi stiprinimui.

Taigi galima teigti, jog siekiant kuo vaisingesnio bendradarbiavimo, t. y. jo vystymo, reikia žinoti visų suinteresuotųjų nuomones ir nuostatas šiuo klausimu, kadangi jos gali būti startinė pozicija derinant veiksmų planus. Be to, šioje diskusijoje yra daugiau kintamųjų, kurių šiame straipsnyje autorės nelietė, tačiau rezultatai gali būti naudingi plėojtant universiteto–verslo ryšius.

Pagrindiniai žodžiai: universiteto–verslo ryšiai, bendradarbiavimo formos, universitetas, verslas, studentai.