MODELS OF COLLABORATION BETWEEN SMES AND UNIVERSITIES-SOME BRITISH AND SERBIAN EXAMPLES

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Abstract: The lecture presents examples of various British and Serbian models of collaboration between universities and small-and-medium-sized enterprises. An intra-national and inter-national comparison between the models leads to some conclusions about specific problems and possibilities of organization of collaboration between the university and SME sectors in countries with underdeveloped industry.

Introduction
Collaboration between small-and-medium-sized enterprises (SME) and academic sector (universities and other research institutions) are the talk of the moment in European Union research community, and to a somewhat lesser extent, in the rest of the Western World. SMEs represent a vast majority of registered businesses, and taken together, they represent an important economic factor. Furthermore, because of social transitions and opening of closed markets during the last two decades, SME represent practically complete domestic economies of underdeveloped regions of Europe. On the other hand, research and development in SMEs were traditionally financed and performed using their very limited financial and human resources. In the contemporary world of open markets and free competition, where permanent innovation is condition of survival, SME sector would have much improved market position if it has access to research community, knowledge and resources. While the member states and European Union recognized the need to support SMEs as one the pillars of their economies and society, and provided financial mechanisms to support collaboration between the academic and SME sectors, the response from both sectors is mild. Considering the amount of time and resources committed to the promotion of collaboration between the academic and SME sector, the causes for such a response are worthy of study.

While it may be expected that collaboration between any two sectors could have slow start if it is initiated and stimulated by a third party, it is good to be aware of the inherent contradictions that exist between academic and SME sector, which are the main reason that the two sectors had not already developed collaboration in the past. The main points of discourse are listed in the Table 1, and they represent fundamental differences between the sectors, because the respective characteristics are elements of their definitions. Therefore, one cannot expect or request changes of those characteristics of respective sectors. The solution
for better collaboration between academic and SME sector should be sought in development of efficient models of collaboration between the sectors. Such a model should provide means to transform permanent and long-term research work at universities to products that satisfy ever-changing needs of SME markets.

Table 1: SME-university points of discourse

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>SME</th>
<th>University</th>
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<tr>
<td>Primary goal</td>
<td>Profit</td>
<td>Excellent research</td>
</tr>
<tr>
<td>Key driver</td>
<td>Current market needs</td>
<td>Dedicated research</td>
</tr>
<tr>
<td>R&amp;D priority 1</td>
<td>Fast answers</td>
<td>Long-time research</td>
</tr>
<tr>
<td>R&amp;D priority 2</td>
<td>Practical solutions</td>
<td>Theoretical knowledge</td>
</tr>
<tr>
<td>R&amp;D priority 3</td>
<td>Simple advices</td>
<td>Elaborated conclusions</td>
</tr>
<tr>
<td>Capacity</td>
<td>Limited human resources</td>
<td>Expert teams</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Low-tech</td>
<td>High-tech</td>
</tr>
<tr>
<td>Size</td>
<td>Small</td>
<td>Large</td>
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Serbian models

Serbia passes through a very long period of social and economic changes, marked by civil war in ex-Yugoslavia, international isolation and transition from state-protected to free market. The consequence of the events was that the large industrial companies from the past vanished, and left space for SMEs that are the first generation of private companies, who entered that very unfriendly economic environment without experience and sufficient knowledge. These changes represent a considerable challenge for Serbian universities. As an example, here will be presented past and present models of collaboration between business sector and Faculty of Mechanical and Civil Engineering Kraljevo, part of University of Kragujevac.

Past model – “From industry to university”

Period after the end of the Second World War was characterized by rapid development of industry and extensive need for engineers and technicians. For that reason, the industry in central Serbia initiated and supported development of studies of mechanical engineering in Belgrade, Novi Sad, Niš, Kragujevac and Kraljevo. The industrial environment of Kraljevo was rather typical for the cities and stable, and in the period between the start of studies of mechanical engineering in 1960 and the breakup of Yugoslavia in 1990, it consisted of four large companies that manufactured heavy machines and employed almost 40,000 employees, as presented in the Table 2.

Table 2: An overview of the business environment of Faculty of Mechanical and Civil Engineering in Kraljevo during period 1960-1990

| Faculty of Mechanical and Civil Engineering in Kraljevo during period 1960-1990 |
|------------------------------------------|-------------------------------|
| Kraljevo                                 | „Magnohrom“ refractory materials | 5000 employees |
| Kraljevo                                 | “Fabrika vagona Kraljevo“ railway vehicles | 6000 employees |
| Kruševac                                 | “14. oktobar“ building machinery | 8000 employees |
| Trstenik                                 | “Prva peoletka“ hydraulics and pneumatics | 20,000 employees |
| 4 large companies                        |                               | 39,000 employees |

The collaboration between the university and industrial sector was organized in such a way that Faculty of Mechanical Engineering Kraljevo [1] had four large research teams, and each of them established long-term collaboration with one of the companies. The predominant mechanism of collaboration were annual contracts between a company and the Faculty, which left freedom to research team to select problems in industry that will be matter of research work.
Present model – “From university to industry”

In the present time, the Faculty tries to re-organize research work to respond to new environment by establishment of a research centre “3D Impulse” [2]. The mission of the centre is to stimulate innovativeness of SMEs through introduction of digital technologies for new product development, because the studies of World Economic Forum showed that the weakest link of Serbian economy is low availability of specialized research and training services, although quality of research is comparatively high [3]. The centre established contact to 516 SMEs in surroundings, and recognized the obstacles for cooperation between the Faculty and the SMEs as presented in the Fig. 1.

The solution is sought into development of a specific model of collaboration between the centre and the SMEs. The model, called “Impulse” model, tries to solve the problems by engagement of four participants with specific roles: University that performs and manages research and provides funds from external sources for support to SME development (government, EU ...), Regional Chamber of Commerce that acts as a concentrator of communication with SMEs, NGO Centre for SME development that filters the requests for consulting and training services, and Science and Technology Park that acts as a mediator of requests for scientific and research services. The model turns out to be successful in facilitating the communication between the centre and large number of SMEs, but it cannot be really said that it considerably boosted innovativeness of SMEs as intended.

British models

In the search for a better model of collaboration between the academic and SME sectors, the management of participants in the “Impulse” model visited three universities in UK based on different principles and respective models of collaboration with SME sector, looking for the answers to the following specific questions:
How do university-SME models look in UK?
  o Which are key players?
  o How do they cope with huge number of SMEs?
  o How do they select SME partners and projects?
  o How are SME projects funded?
  o What about intermittent nature of the SME demands?
How do they stimulate SME innovativeness?
How do they solve problem of limited SME HR?
How do they support low-tech manufacturing companies?

University of Exeter – “Excellence in science”
The first university that will be presented is University of Exeter [4], which was considered to belong to the top ten research-intensive universities in the UK in 2013 [5]. The university supports SME through the Innovation Centre, an independent body established by the university, regional government and trade associations, and managed by the Board, which includes representatives of the University.

The Innovation Centre is dedicated to support to knowledge based-enterprises by providing them infrastructure, and the selection of the SME partners is made by the Board. University provides to the Innovation centre consulting services and rents equipment. The number of the SMEs supported simultaneously is 20-30, and student start-ups and university spin-offs represent considerable part of them. The Innovation Centre does not support low-tech manufacturing SMEs.

University of Coventry – “Applied research”
The next institution to be described is University of Coventry [6], which has been listed as No.1 Modern UK University [7]. The university is dedicated to the applied research and has elaborate structure to support collaboration with business sector, presented in Fig. 4.
The core of the structure is Business Development Group, management body of the whole collaboration system, which is flanked by research teams for selected advanced research topics (Grand Challenge Initiatives) and research teams formed according to the market request (Applied Research Centres), and followed by business partners established by the university, spin-outs (research activities) and trade subsidiaries (education and consulting). Such an elaborate structure relies on well-defined university policies that describe:

- Definition of knowledge economy
- Mission of university in knowledge economy
- Stimulating innovation
- Enabling conditions for collaboration
- Critical success factors
- Issues in collaboration
- Innovation Structure
- Innovation Strategy (also the role of SMEs and students here)
- Rewards and Recognition systems
- Staff
- Commercialisation process
- Pre company registration support
- Post company registration support
The part of the model of collaboration with business sector of University of Coventry is systematic division of collaboration into six levels presented in the Fig. 5, which determine the extent, financial mechanisms, human and other resources that are dedicated to each partner of the University.

The extended model of University of Coventry is tested on thousands of examples in practice and it led to conclusion that critical success factors in collaboration with SMEs are:

1. Intellectual Property
2. Culture
3. Defining the problem
4. Finding the right people
5. Trust

University of Hertfordshire – “Business-facing university”

The last university to be considered is the University of the Hertfordshire [8], which considers itself as the “leading business-facing university in the UK”. The University of the Hertfordshire model of collaboration with business sector is based on the existence of centralized and common Enterprise and Business Development Unit (EBDU) that is the sole contact between the university and companies, acting in the same time as concentrator and the filter. The EBDU consists of dedicated professionals responsible for the development and implementation of the following functionalities of the collaboration with business sector:

- Business
- Business School
- Knowledge transfer
- Science and Technology
- Student Business
- SME & students

![Figure 6: Organization model of collaboration between university and business of University of Hertfordshire](image)

The EBDU selects topics for collaboration, provides the resources for the collaboration and assigns the research, consultancy and training tasks to the faculties of the university.

Conclusion

An analysis, which cannot be presented here due to the limited space, shows that the presented British models are derived from a diverse and intensive economy, in which majority of the profit is generated by large companies, but SMEs represent a major pool of employment and skill development. Nevertheless, the problems of collaboration between the academic and university sectors in Serbia and United Kingdom are common in some parts, and valuable experiences may be gained by study of the presented models. The comparison of the British and Serbian models of collaboration between university and academic sector certainly confirms the conclusion from Wilson report for 2012 [9]: “... There is no simple model of interaction; … diverse business needs and diversity of supply from universities leads
to complexity …. The key to improving effectiveness … does not lie in regulation or in conformity; it lies in diversity, information sharing, mutual recognition and voluntary partnership.”

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[2] www.3dimpuls.com