The Importance of Research and Development for Companies and Entrepreneurs in Gaining Competitive Advantage

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Značaj Istraživanja i Razvoja u Stvaranju Konkurentske Prednosti Preduzeća i Preduzetnika

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Abstract: *Creating competitive advantage depends on the capability of companies and entrepreneurs to be innovative. Innovations result from research and development. The capability of being innovative is an utmost necessity for contemporary business and its survival. Innovative behavior is particularly important for domestic companies, that have traditionally neglected research and development, which has led to a situation of low level of innovativeness and lack of competitiveness. The paper addresses the issue of domestic companies' investments into research and development, the factor which is expected to result in a rise in innovativeness and competitiveness.*

Key words: *research, development, competitiveness, company, entrepreneur*

Rezime: *Mogućnost stvaranja konkurentske prednosti preduzeća i preduzetnika se izvodi iz njihove sposobnosti da budu inovativni. Inovacije se javljaju kao rezultat istraživačko razvojne aktivnosti u preduzeću. Ona predstavlja imperativ savremenog poslovanja i uslov opstanka preduzeća. Naročito dobija na značaju u poslovanju domaćih preduzeća, koja su tradicionalno nedovoljno ulagala u istraživačko-razvojne aktivnosti, pa je inovativnost na vrlo niskom nivou, a time i konkurentnost. U radu se istražuje ulaganje u istraživanje i razvoj domaćih preduzeća, što treba da rezultira povećanjem inovativnosti i konkurentnosti.*

Ključne reči: *istraživanje, razvoj, konkurentnost, preduzeće*

I. Introduction

The function of research and development (R&D), as a significant factor in creating competitive advantage, with a special emphasis on local companies is the subject of this work. The research is aimed at identification of the abilities of companies to innovate, retain and sustain differential advantages, which should result in higher level of competitiveness and business success on the market.

I. Uvod

U ovom radu funkcija istraživanja i razvoja (IR) prikazana je kao značajan faktor u stvaranju konkurentske prednosti sa posebnim osvrtom na domaća preduzeća. Istraživanje je usmereno na identifikovanje mogućnosti preduzeća da se u postojećim uslovima inoviraju, kreiraju i održe diferentne prednosti koje treba da rezultiraju boljom konkurentnošću i poslovnim uspehom na tržištu.

II. Research and development – a source of competitiveness of a company

The main function of research and development lies in the identification of chances and threats in the environment and directing actions towards defined aims. At the same time, the environment counteracts a company, primarily by means of market mechanisms. This relation between a business system and environment requirements is a subject of the primary R&D activity.

The first aim of research and development within a company is the synchronisation of relations of sub-systems, which guarantees stability of operation in an organisation. R&D has the most stable relation with technology. Lately, as technology is having ever more influence on operation, this relation between R&D work and development of technology is becoming even more important.

Investments in research and development depend on differences between the external scientific technology and the company's own capabilities, i.e. whether technology was bought or developed within the company's R&D sector. There are three levels of R&D influences on company development and they certainly differ in intensity and duration.

1. Environmental innovation happens at longer intervals, but shifts are the highest.
2. Within the system, development happens at shorter intervals, but its intensity is lower.
3. Within R&D sector, development is more frequent, but the growth is incremental.

There are figures that confirm that an encreasing share of innovation in an economy comes from regular operation of a company. According to the data given by Jackob Schmokler, almost 60% of patents approved in the USA in 1953 originated from businesses, while the rest came from independent researchers.

II. Istraživanje i razvoj - izvor konkurentnosti preduzeća

Osnovna funkcija istraživanja i razvoja je u identifikovanju šansi i pretnji iz okruženja, i usmeravanje akcija prema određenim ciljevima. Nasuprot tome, okruženje povratno deluje na preduzeće, u najvećoj meri putem tržišnih mehanizama. Upravo ovaj odnos između poslovnog sistema i potreba okruženja, čini predmet osnovne delatnosti IR rada.

Primarni cilj istraživanja i razvoja unutar preduzeća je harmonizacija odnosa podsistema, čime se garantuje stabilnost poslovanja u organizaciji. Najstabilnija veza IR je sa tehnologijom. Kako je uticaj tehnologije u poslovanju preduzeća u novije vreme sve izraženiji, time i ovaj odnos između IR rada i razvoja tehnologije dobija na značaju.

U zavisnosti od razlike spoljnje naučne tehnologije i sopstvenih sposobnosti zavisi i visina ulaganja u istraživanje i razvoj, što je u direktnoj vezi sa tim da li je tehnologija kupljena ili je generisana unutar sopstvenog IR. Postoje tri nivoa uticaja IR na razvoj preduzeća, i svakako nemaju podjednako dejstvo ni po intenzitetu ni po vremenu.

1. Inovacija na okruženje se dešava u većim razmacima, ali su pomaci najveći,
2. U odnosima unutar sistema razvoj se dešava u češćim intervalima, ali je slabijeg intenziteta i
3. Unutar IR odeljenja, razvoj je čest ali sa inkrementalnim porastima.

Pojavljuju se podaci koji potvrđuju da sve veći udeo inovacija u privredi potiče rutinski iz tekućeg poslovanja preduzeća. Još 1953. godine, prema podacima Jackob Schmokler-a, skoro 60% patenata odobrenih u Sjedinjenim Državama poteklo je iz poslovnih preduzeća, a preostalih 40% došlo je od nezavisnih istraživača.

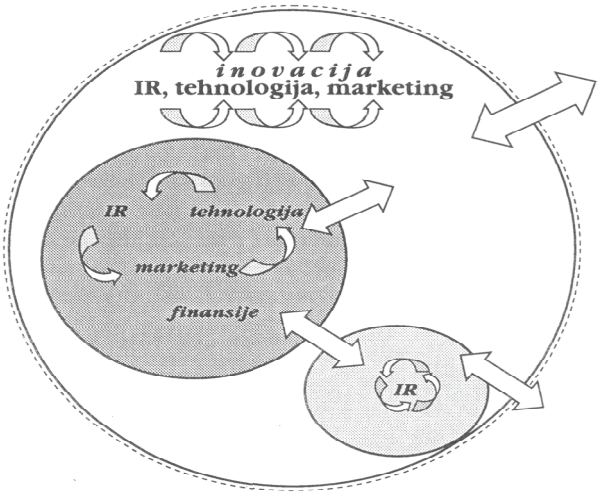

Figure 1. R&D in relation to subsystems of a company (Komazec 2002, p. 131)
Sl. 1. IR u odnosu sa podsistemima u preduzeću (Komazec 2002, str. 131)

Out of 500 billion dollars of expenses planned for R&D in 2000 for twenty-seven countries of the Organisation for Economic Cooperation and Development, according to parity of purchasing power, 85% is spent in seven countries only. The USA spent about 43% of the total investments of member countries of the Organisation.
In 2000, the USA spent more money on activities in the field of research than all the other countries from the group of seven most developed countries in the world (Canada, France, Germany, Italy, Japan and the United Kingdom) (Bomol 2006, p.31-32). Investments in R&D of these six countries in the period 1996-2002, measured by GDP, ranged from 1.9% in the United Kingdom to 4.6% in Sweden. In our country, that indicator of efforts in science and technology amounts to below 1% (Đuričin, Janošević 2007, p.443).

According to the World Bank research, average consumption for R&D in countries of central Europe and central Asia, amounts currently to 1% of GDP, as compared to 3% in the European Union.
In these countries, about two thirds of investments in research are financed by the public sector, which is unfavorable as compared to Western Europe where 85-70% of expenses are covered by the private sector.
The World Bank report includes a list of 25 countries of central Europe and central Asia ranged by their ability for efficient investments in innovations.

Od pet stotina milijardi dolara, prema paritetnim kursevima kupovne moći predviđeni rashodi za IR u 2000. godini, u dvadeset sedam zemalja Organizacije za ekonomsku saradnju i razvoj, 85% se troši u samo sedam zemalja. Sjedinjene Države troše oko 43% od ukupnih ulaganja zemalja članica Organizacije za ekonomsku saradnju i razvoj.
SAD su potrošile u 2000. godini više novca na aktivnosti na polju istraživanja nego bilo koja druga zemlja iz grupe sedam najrazvijenijih zemalja sveta (Kanada, Francuska, Nemačka, Italija, Japan i Ujedinjeno Kraljevstvo) zajedno (Bomol 2006, str. 31-32). Ulaganje u IR kod ovih šest zemalja u periodu 1996-2002 godine, mereno procentom BDP-a, kretalo se od 1,9% za Ujedinjeno Kraljevstvo do 4,6% za Švedsku. Kod nas je ovaj indikator napora u nauci i tehnologiji ispod 1% (Đuričin, Janošević 2007, str. 443).
Prosečna potrošnja na IR u zemljama centralne Evrope i centralne Azije, prema istraživanju Svetske banke, trenutno iznosi 1% BDP-a, dok je u Evropskoj uniji 3%.
Nepovoljno je i to što je u tim zemljama oko dve trećine ulaganja u istraživanje finansirano iz javnog sektora, dok u zapadnoj Evropi 65-70% tih troškova pokriva privatni sektor.
U izveštaju Svetske banke data je lista dvadeset pet zemalja centralne Evrope i centralne Azije koje su rangirane na osnovu mogućnosti da efikasno investiraju u inovacije.

In that list (where Serbia holds 17th position) Estonia is leading followed by Slovenia, Latvia, Hungary and Czech Republic, while Albania is at the bottom (Dismukes 2004, p.76).

Na toj listi, na kojoj se Srbija nalazi na 17. mestu, na prvom je Estonija, a slede Slovenija, Litvanija, Mađarska i Češka, dok je Tadžikistan na predposlednjem, a Albanija na poslednjem mestu (Dismukes 2004, str.76).

Table 1. Investments into research and development in transitional economies in the period 1989 – 2000. measured in USA dollars [SPRU (2001-2002)]
Tabela 1. Obim ulaganja u istraživanje i razvoj u zemljama u tranziciji od 1989 do 2000 godine, i 2000 godina izraženo u $ [SPRU (2001-2002)]

Country	DSI per capita 1989-2000	DSI per capita 2000	Country	DSI per capita 1989-2000	DSI per capita 2000
Czech Republic	2102	4797	**Albania**	161	1195
Estonia	1337	3404	**B & H**	71	972
Hungary	1935	4734	**Bulgaria**	407	1484
Latvia	1027	3019	**Croatia**	907	4211
Lithuania	642	3045	**SRY**	13	1225
Poland	751	4108	**Macedonia**	219	1685
Slovakia	669	3742	**Romania**	303	1596
Slovenia	768	9320	**SE Europe**	212	212
Armenia	159	504	**Moldova**	102	326
Azerbaijan	502	507	**Russia**	85	1697
Belarus	78	1104	**Tajikistan**	23	158
Georgia	128	555	**Turkmenistan**	165	415
Kazakhstan	571	1225	**Ukraine**	67	640
Kyrgystan	97	275	**Uzbekistan**	28	298

The table contains the amount of investments in research and development for transitional economies, for the period from the beginning of the transition starting in 1989 until the year 2000, as well as for that year separately. According to the given data, we can conclude that almost all countries in transition had understood the significance of R&D for overall economic development, so that the investments in research and development, particularly in new technologies, were constantly rising. We also see that countries that invested most funds in R&D achieved best results during the transition period, which irrevocably confirms its significance.

The Czech Republic, Slovenia, Poland, Hungary and Estonia were leaders among transitional economies.
Measured by Global Competitiveness Index, Serbian economy has a remarkably low level (Index is 3.78).

U prethodnoj tabeli prikazan je obim ulaganja sredstava u istraživanje i razvoj u zemljama u tranziciji, za period od početka tranzicije do 2000. godine i za samu 2000. godinu.

Prema prethodnim podacima, može se zaključiti da su gotovo sve zemlje u tranziciji shvatile značaj IR za sveukupni privredni razvoj, tako da je obim ulaganja u istraživanje i razvoj, naročito novih tehnologija, konstantno rastao.

Isto tako, nije slučajno da su zemlje koje su najviše sredstava odvojile za IR postigle najbolje rezultate u procesu tranzicije, čime se nedvosmisleno potvrđuje njegov značaj.
Iz grupe zemalja u tranziciji posebno se izdvajaju: Češka, Slovenija, Poljska, Mađarska i Estonija.
Mereno Indeksom globalne konkurentnosti (Global Competitiveness Index) u 2007. godini izuzetno je nizak nivo konkurentnosti srpske privrede (indeks je 3,78).

Out of 131 countries included in the analysis, Serbia was 91st, behind countries such as Libya, Georgia, Botswana, Namibia, Bulgaria, Romania, Vietnam and Montenegro. In 2006, Serbia was 87th and its Global Competitiveness Index was 3.69 (Janošević 2007, p.40)

III. R&D in local companies

The functioning of R&D depends on the qualifications and skills of employees, financial funds and equipment for research work, as well as on stimulating atmosphere for research and development. A survey of local companies shows that a large number of companies have no organised R&D function in general. Innovative projects in companies are led by a small number of experts who, as a rule, are managers loaded by daily operations. If these services exist, they usually include insufficiently skilled or completely unqualified staff, in some cases. Therefore, it is necessary that Serbian companies direct their efforts to encouraging and developing R&D activities.
Research and development is the main driver of innovations and a prerequisite for successful business. As for innovative consciousness and coordination, it is clear that there is unacceptably low level of knowledge of innovative concepts and their role in economic growth, which directly lead to low competitiveness of the local economy. Concerning innovative performances, it is clear that a large portion of our companies perform innovative activities (85.9%), especially small and medium ones, while the scheme of distribution of these activities is far from satisfactory. Equipment and software take 57%, training 50% and product introduction 46%. As compared to the European Union countries, the level of patent protection is low; it amounts to 1.96% (Stojanović, 2007).

Concerning innovation expenses, their level is low as compared to that of the European Union countries and there are numerous limitations regarding financing of innovative activities. Failures of the educational system are especially stated.

Od 131 analizom obuhvaćenih zemalja privreda Srbije je na 91. mestu i nalazi se iza zemalja kao što su: Libija, Gruzija, Bocvana, Nambija, Bugarska, Rumunija, Vijetnam i Crna Gora. U 2006. godini privreda Srbije je bila na 87. mestu i imala je Indeks globalne konkurentnosti 3,69 (Janošević 2007, str.40).

III. IR u domaćim preduzećima

Nesmetano funkcionisanje IR zavisi od kvalifikovanosti i osposobljenosti zaposlenih, finansijskh sredstva i opreme za istraživački rad i postojanje stimulativne atmosfere za istraživačko-razvojni rad. Posmatranjem domaćih preduzeća može se uopšteno tvrditi da veliki broj preduzeća nema organizovanu funkciju IR. Inovativne projekte u preduzećima vodi mali broj stručnjaka pri čemu su to, po pravilu, menadžeri koji su opterećeni svakodnevnim operativnim poslovima. Ukoliko postoje pomenute službe u njima obično rade nedovoljno obučeni, ponekad potpuno nekvalifikovani kadrovi. Stoga je neophdno da srpska preduzeća usmere napore ka podsticanju i razvijanju aktivnosti IiR.
Istraživanje i razvoj predstavlja glavni pokretač inovacija i neophodan uslov uspešnog poslovanja preduzeća. Sa aspekta inovativne svesti i koordinacije ukazuje se na nezadovoljavajuće nizak nivo svesti inovativnih koncepata i njihove uloge u ekonomskom rastu, što ima direktan uticaj na nisku konkurentnost domaće privrede. Sa stanovišta inovativnih performansi evidentno je da naša preduzeća u velikom broju (85,9%), posebno mala i srednja, upražnjavaju inovativne aktivnosti, ali struktura raspodele tih aktivnosti ni izbliza ne zadovoljava kriterijume, jer u ukupnom procentu obezbeđenje opreme i softvera čini 57%, obuka 50%, a uvođenje proizvoda na tržište 46%. Nivo zaštite patenata je, u poređenju sa zemljama Evropske unije nizak, svega 1,96% (Stojanović, 2007).
Sa stanovišta inovativnih troškova konstatuje se nizak nivo u poređenju sa zemljama Unije, a u pogledu finansiranja inovativnih aktivnosti navode se i brojna ograničenja.

There is an insufficient number of students in the filed of natural and technical sciences, as well as insufficient inclusion of individuals in continuing education. It is also obvious that there is a complete absence of the system for encouraging innovations and that there is no efficient relation between the industry and scientific institutions. There is a need for more advanced support.

Serbian companies pay ever more attention to innovativeness as the main source of competitive advantage. However, there are numerous obstacles causing slow development of innovative activities of local companies. They are as follows: ownership problems of some companies that have not been solved yet; unfavorable age structure of employees; qualification structure; investments in R&D within a company - which are rather low or even non-existent; a small number of patents and new products; technology obsoleteness; permanent innovations are present in a small number of companies.
Companies are oriented to the local market in their business operation. Increase in export, as a key determinant of future development, could be realised only by increasing the competitiveness of our economy. The Holders of competitiveness are local companies which, in order to succeed, must change their overall concept of operation.

IV. Results of research and development in local companies

Research carried out in the period from 2006 to 2008 points to unsatisfactory innovativeness of local companies. The subject of the research was measurement of the innovative potentials of local companies. One hundred and fifty companies from 100 places in Serbia were included in the survey. The data were obtained from internal sources of the companies. Research was performed on a sample of small, medium and big companies.
Research showed that companies are mainly production oriented. They have been present in the market between 20 and 55 years.

Posebno se apostrofiraju slabosti obrazovnog sistema, nedovoljan broj studenata u okviru polja prirodnih i tehničkih nauka, kao i nedovoljna uključenost individualaca u celoživotno obrazovanje. Primećuje se, takođe potpuno odsustvo sistema za inovativnu podršku, u tom smislu ne postoji efektivna veza između industrije i naučnih institucija, kao i potreba obezbeđenja naprednije podrške.
Srpska preduzeća daju sve veći značaj inovativnosti kao osnovnom izvoru konkurentske prednosti. Međutim, postoji mnoštvo prepreka koje utiču da se inovativne aktivnosti domaćih preduzeća sporo razvijaju. One su: pitanje vlasništva nekih preduzeća koje još nije rešeno, nepovoljna starosna struktura zaposlenih, kvalifikaciona struktura, ulaganje u IR u okviru preduzeća veoma je malo ili ne postoji, mali broj patenata i novih proizvoda, tehnološka zastarelost, permanentne inovacije na nivou preduzeća prisutne su u malom broju slučajeva.
U svom poslovanju preduzeća su okrenuta domaćem tržištu. Povećavanje izvoza, kao ključne determinante budućeg razvoja, može se ostvariti jedino ukoliko se poveća konkurentnost naše privrede. Nosioci te konkurentnosti su domaća preduzeća koja, da bi uspela, moraju promeniti celokupnu koncepciju poslovanja.

IV. Rezultati istraživanja i razvoja u domaćim preduzećima

Da je inovativnost domaćih preduzeća nezadovoljavajuća svedoči istraživanje sprovedeno u periodu od 2006. do 2008. godine. Istraživanje je usmereno na merenje inovativnih potencijala domaćih preduzeća. Tom prilikom je anketirano 150 preduzeća iz 100 mesta u Srbiji. Podaci su dobijeni iz internih izvora preduzeća. Istraživanje je sprovedeno na bazi uzorka u kome su zastupljene sve tri veličine preduzeća: mala, srednja i velika.

Istraživanjem je uočeno da su preduzeća pretežno proizvodno orijentisana. Starost preduzeća je od 20-55 godina.

Research was based on the following elements:

1. Age structure

The first segment of research deals with age structure. Unfavorable age structure is evident from the Figure 1.

Istraživanje je zasnovano na elementima:

1. Starosna struktura

Prvi segment istraživanja usmeren je na starosnu strukturu. Sa grafika, na slici 2, može se utvrditi da je veoma nepovoljna starosna struktura.

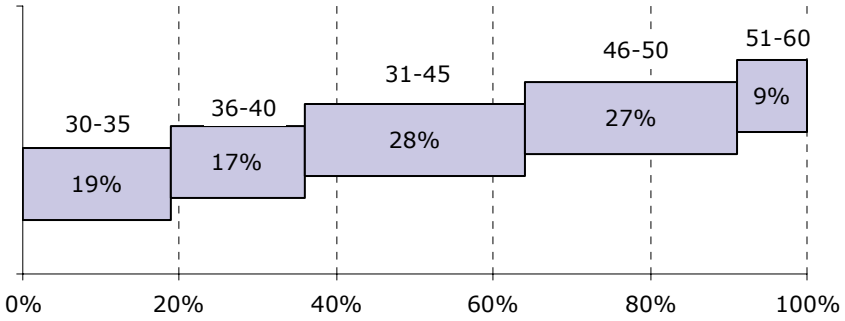

Figure 2. Age structure of employees

Sl. 2. Intervali godina starosti zaposlenih u srpskim preduzećima

2. Qualification structure of R&D employees in Serbian companies

Implementation of innovative process in a company requires engagement of the most creative human resources. In order to consider innovative activities, it is very important to study the qualification structure of employees. Qualification structure is studied through the percentage of particular qualifications in a sample (unskilled worker (uw), semi-qualified worker (sqw), qualified worker (qw), highly qualified worker (hqw), professional secondary school graduates (pss), high school graduates (hs), university graduates (ug), master (M.A.). Results of the analysis are given in the Figure 3.

The data given lead to the conclusion that, concerning innovative activities, the existing distribution of qualifications does not reflect the best distribution of employees' qualifications, due to the fact that pss (27.9%) and qw (21.8%) prevail in the structure of the companies studied. Successful application of innovative activities depends on the qualification structure of people engaged in particular innovative activities. Figure 4 shows that the ug category takes the highest percentage (22.32%).

It is important to point out that this category includes people with MSc and PhD degrees.

2. Kvalifikaciona struktura zaposlenih u IR u srpskim preduzećima

Sprovođenje procesa inovativnosti u preduzeću zahteva angažovanje najkreativnijih ljudskih potencijala. Za razmatranje inovativnih aktivnosti od velike je važnosti da se razmotri i kvalifikaciona struktura zaposlenih u preduzeću. Kvalifikaciona struktura zaposlenih, sa stanovišta školske spreme, razmotrena je kroz procenat zastupljenosti pojedinih kvalifikacija [nekvalifikovani (nk), polukvalifikovani (pk), kvalifikovani (kv), visoko kvalifikovani radnik (vkr), srednja stručna sprema (sss), visoka školska sprema (všs), viša školska sprema (vss), magistri (mr)] u uzorku. Rezultati analize su prikazani kroz grafik na slici 3.

Iz prezentiranih podataka zaključuje se da, sa stanovišta inovativnih aktivnosti, postojeća raspodela sigurno ne odražava najbolju raspodelu kvalifikacija zaposlenih, budući da su dominantne školske spreme u strukturi razmatranih preduzeća sss (27,9%) kao i kv (21,8%).

Uspešno sprovođenje inovativnih aktivnosti zavisi od kvalifikacione strukture angažovanih na određenim inovativnim aktivnostima. Sa slike 4, se zaključuje da je najveći procenat zastupljen kod vss (22,32%).

Značajno je istaći da su u ovu kategoriju strukture uključeni i angažovani sa naučnim zvanjima magistar (mr) i doktor (dr).

Having in mind that we consider R&D activities, such a structure of the most creative research resource is not satisfactory. Also, the ratio of hs (25.5%) and pss (32.53%) is unfavorable as the difference should be much greater. The situation is similar with hqw (7.96%) and qw (6.65%).

S obzirom na to da se radi o poslovima IR ovakva procentualna zastupljenost najkreativnijeg istraživačkog resursa je nedovoljna. Tako je posebno nepovoljna raspodela všs (25,5%) u odnosu na sss (32,53%), gde bi trebalo da bude znatno veća razlika, a slična je situacija vkv (7,96%) u odnosu kvr (6,65%).

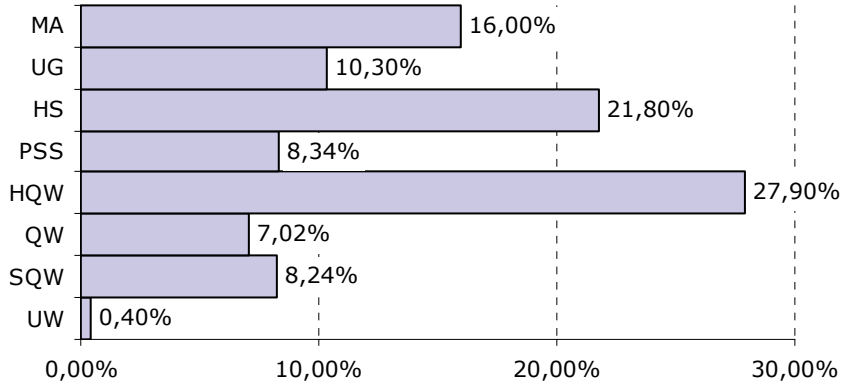

Figure 3. School qualification of employees (in%)
Sl. 3. Prosečna školska sprema zaposlenih u %

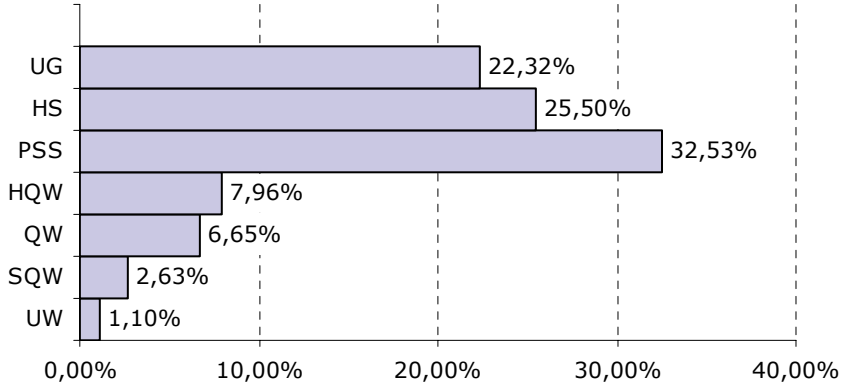

Figure 4. Qualifications of employees engaged in innovative activities
Sl. 4. Kvalifikaciona struktura angažovanih radnika na inovativnim aktivnostima

3. Organisational forms of R&D

Having in mind that R&D is a source of innovations in a company, the organisational form of research and development work in a company is an important parameter of innovativeness. In this analysis, the starting point was possible forms of organising research and development operations such as institute, laboratory, R&D department, project bureau, development service, some other form of organising, organisation on the level of jobs, without organised R&D form.

3. Oblik organizovanosti IR

S obzirom na to da IR predstavlja izvor inovativnosti u preduzeću, organizacioni oblik istraživačko-razvojnog rada u preduzeću važan je pokazatelj inovativnosti. U analizi se pošlo od mogućih oblika organizovanja istraživačko-razvojnog rada kao što su: instituti, laboratorije, sektor IR, projektni biro, služba za razvoj, drugi oblik organizovanja, organizovanje na nivou poslova, bez organizovanog oblika IR.

Companies that have more developed forms of organised activity are more innovative, which can be seen in Figure 5, made on the basis of research results.
The data show that the highest percentage is demonstrated by two forms of organising, i.e. development service (40 companies or 26.6%) and development sector (25 companies or 16.6%).

Preduzeća koja imaju razvijenije oblike organizovane delatnosti više su inovativna, što se može videti iz grafika na slici 5, na bazi rezultata istraživanja.
Posmatrajući podatke evidentno je da su procentualno najviše zastupljena dva oblika organizovanja: služba za razvoj (ima je 40 preduzeća ili 26,6%) i sektor za razvoj (ima ga 25 preduzeća ili 16,6%).

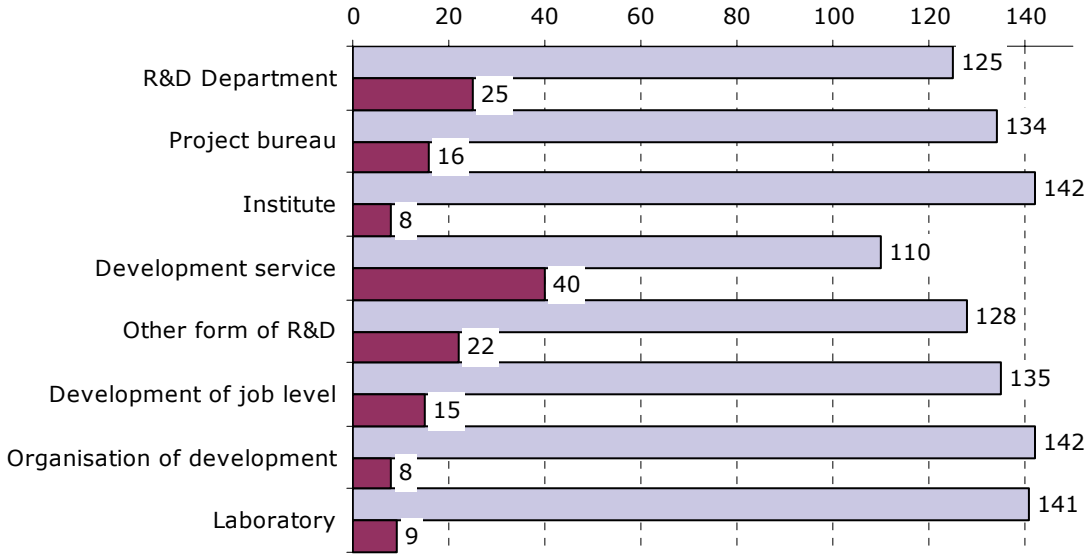

Figure 5. Organisational form of R&D in companies
Sl. 5. Organizacioni oblik IR rada u preduzećima

4. Way of performing innovative activities

The way innovative activities are carried out in a company is one of the significant parameters. Development activities could be performed primarily independently, in cooperation with other companies and in cooperation with scientific and research institutions.
The results shown in Figure 6, clearly show that companies prefer independent performing of R&D activities. The majority of companies included in the research, i.e. 27 enterprises, perform R&D activities independently, although the global trend is cooperation with other companies, due to the benefits of participation in the financing costs of research and development. Moreover, direct competitors jointly invest in research and development in order to keep the costs at minimum. Eighteen domestic companies cooperate in research and development projects.

4. Način sprovođenja inovativnih aktivnosti

Način sprovođenja inovativnih aktivnosti u preduzeću jedan je od značajnih pokazatelja. Obavljanje razvojnih aktivnosti se može sprovoditi pretežno samostalno u saradnji sa drugim preduzećima i u saradnji sa naučno istraživačkim institucijama.
Analizom rezultata istraživanja grafika na slici 6, jasno je da preduzeća preferiraju samostalno obavljanje svoje delatnosti IR. Najveći broj preduzeća (ukupno 27) aktivnosti obavlja pretežno samostalno iako je trend u svetu da se upravo iz razloga podele troškova istraživanja te aktivnosti obavljaju kroz saradnju više preduzeća. Čak se i direktni konkurenti u poslovanju ujedinjuju oko zajedničkih razvojnih projekata da bi se troškovi sveli na minimum. Saradnju na projektima IR upražnjava samo 18 domaćih preduzeća.

The situation is even more unfavorable in the field of cooperation with research institutes. Among the companies that participated in the research, only sixteen cooperate with research institutions.

5. Influence of introduced innovation on the revenue of a company

New product introduction regularly results in the increase of company performances. Logically, the obtained income, being the result of the introduction of a new or improved product, is an important indicator of successfully realised innovative project.

Što se tiče saradnje sa institutima situacija je još nepovoljnija, jer samo 16 preduzeća koristi ovaj način realizacije.

5. Uticaj uvođenja inovacija na porast prihoda preduzeća

Po pravilu uvođenje novog proizvoda rezultira povećanjem izlaznih performansi preduzeća. Logično je da je ostvareni prihod, kao rezultat uvođenja novog ili poboljšanog proizvoda, važan pokazatelj uspešnosti realizovanog inovativnog projekta.

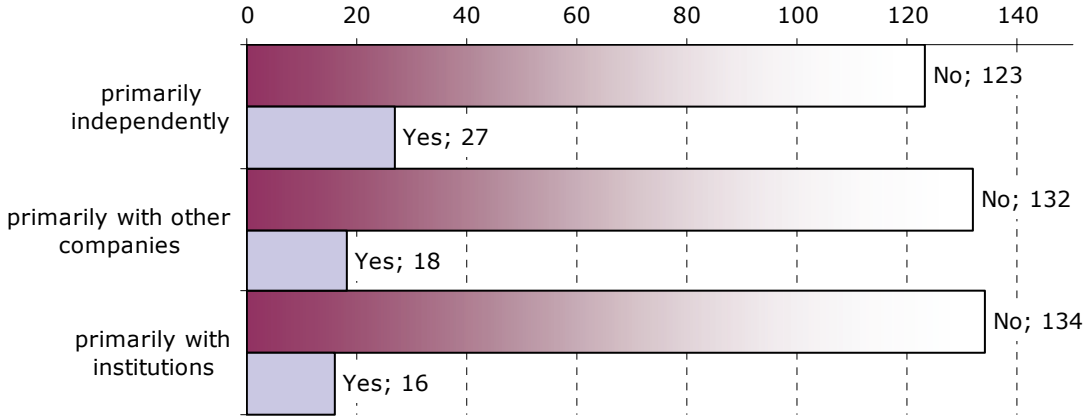

Figure 6. Way of performing innovative activities in companies
Sl. 6. Način sprovođenja inovativnih aktivnosti u preduzećima

Figure 7 shows that the greatest increase in revenues is obtained with marginal product innovations (57%), while increase due to a new product introduction is on the third place (10%), which is unacceptable. The ratio should be the opposite.

6. Investments in innovativeness

Expenditures are an important factor for the success of innovative activities. The data given in Figure 8 shows that purchase of new equipment accounts for the highest costs, in the structure of costs related to innovative activities. They amount to 52.93% of innovative activity expenditures and are far above the other costs. Particularly, costs of personnel training are low and amount to 2.41% of R&D expenditures.

Iz grafika na slici 7, vidi se da se najveće uvećanje prihoda ostvaruje na osnovu marginalnih inovacija proizvoda (57%), a da je uvećanje usled novog proizvoda tek na poslednjem mestu (10,%), što je svakako nepovoljna raspodela. Odnos bi trebao da bude upravo suprotan.

6. Ulaganja u inovativnost

Za uspešnost inovativnih aktivnosti važni su troškovi. Iz prezentiranih podataka sa grafika na slici 8, evidentno je da su u strukturi troškova, po osnovu inovativnih aktivnosti, najveći troškovi učinjeni po osnovu nabavke nove opreme. Oni iznose 52,93% troškova inovativnih aktivnosti i daleko prevazilaze sve ostale. Posebno je nepovoljno što su niski troškovi obuke zaposlenih svega 2,41% troškova IR.

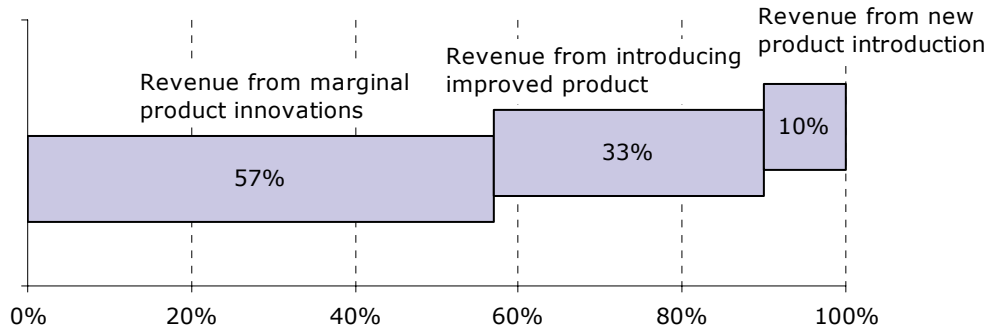

Figure 7. Percentage of increase in revenue due to introduction of innovated products
Sl. 7. Uvećanje prihoda kroz uvođenje inovacije proizvoda u %

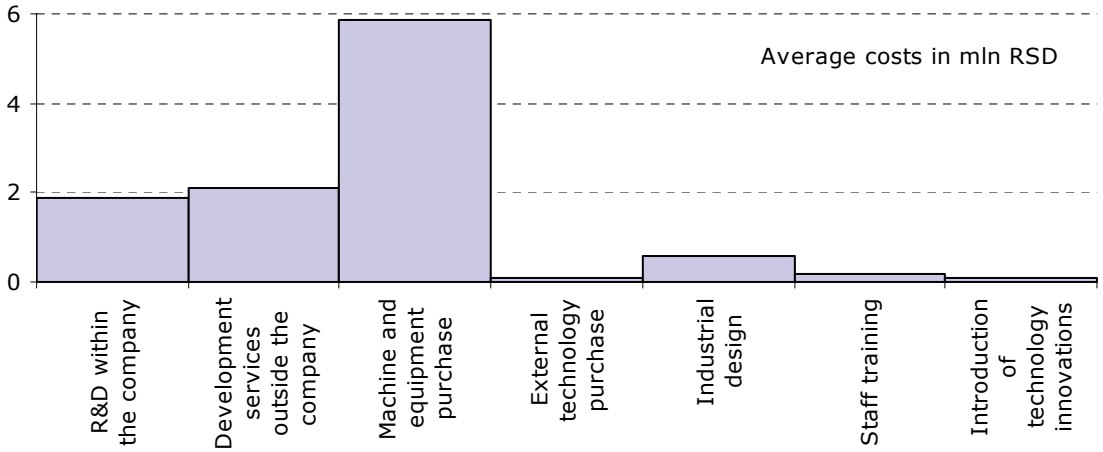

Figure 8. Components of research and development costs
Sl. 8. Komponente troškova istraživanja i razvoja

7. Engagement of permanently employed persons in R&D activities

The data presented in Table 2, indicate that the majority of companies have full-time employees engaged in R&D (30.6% ranging from six to twenty-five persons; 37.3% ranging from one to five persons).

8. Financial support to R&D

Successful implementation of R&D projects depends on financial support. Potential financing sources, in addition to company's own funds, could be as follows: various funds, non-governmental organisations or governmental financial support. We have analysed how much companies have used these forms of the financial support in the last three years of the investigation period. Table 3, shows that a small number of companies (13.3%) have used incentive funds for R&D.

7. Angažovanje stalno zaposlenih u IR aktivnostima

Iz prezentiranih rezultata u Tabeli 2 evidentno je da najveći broj preduzeća ima stalno angažovane radnike na poslovima IR (30,6% u intervalu od šest do dvadeset i pet radnika, 37,3% u intervalu od jednog do pet radnika).

8. Finansijska podrška IR-u

Uspešno realizovanje inovativnog projekta zavisi od finansijske podrške. Potencijalni izvori finansiranja, osim sopstvenih mogu biti: različiti fondovi, nevladine organizacije ili vladina finansijska sredstva podrške. U tom smislu je analizirano u kom obimu su preduzeća bili korisnici tih oblika finansijske podrške u periodu poslednje tri godine istraživanog perioda. Iz tabele 3 vidi se da je veoma mali broj preduzeća (13,3%) koristio podsticajna sredstva za IR.

Table 2. Full-time personnel in R&D
Tabela 2. Broj stalno angažovanih radnika na IiR po intervalima broja radnika

	Full-time employees in R&D activities					Total
	0	1-5	6 -25	25-100	Over 100	
Number of companies	7	56	46	31	10	150
%	4,6	37,3	30,6	20,6	6,6	100

Table 3. Number of companies using financial support
Tabela 3. Broj preduzeća koja su koristila finansijska sredstva podrške

	Number of companies	Percentage
No	130	86,7
Yes	20	13,3
Total	150	100

V. Conclusion

All the information given above leads to the conclusion that the level of R&D activities in Serbian companies is rather low, directly causing low level of innovativeness and competitiveness based on it. Therefore, it is necessary to implement radical measures aimed at increasing research and development activities of a company. This problem is an issue of the company, but of the state as well. Namely, research and development present an internal source of competitiveness of a company, as well as the Serbian economy as a whole. This work points out that R&D is a prerequisite of modern business operation and is becoming more and more important. Therefore, for the purpose of this paper, R&D activities were researched in local companies, as a basic place for creating innovations. It shows that more intensive investments of local companies in R&D as a main source of innovations will enable their expansion in the existing and new markets. The analysis of the business practices of local companies shows that a low number of companies perform R&D activities in an organised way. That leads to the conclusion that companies having an organised form of research and development work (institutes, laboratories, project bureaus, development services and other forms of organising) are more innovative. The largest number of companies performs this task independently, although it should be carried out in cooperation with more companies due to cost share and other advantages.
Serbian companies are primarily oriented to the local and regional markets.

V. Zaključak

Iz svega analiziranog i navedenog može se izvesti zaključak da je nivo IR aktivnosti u našim preduzećima nezadovoljavajući, što direktno utiče na nizak nivo inovativnosti i na njoj zasnovane konkurentske prednosti. Stoga je neophodno sprovesti radikalne mere u cilju povećavanja istraživačko-razvojne aktivnosti preduzeća. Koliko je to interno pitanje preduzeća toliko je i eksterno, odnosno pitanje države. Naime, istraživanje i razvoj predstavlja interni izvor konkurentnosti preduzeća i celokupnog privrednog ambijenta. U radu je pokazano IR predstavlja neophodan uslov savremenog poslovanja i da vremenom sve više dobija na značaju. Stoga je izvršeno istraživanje IR aktivnosti, domaćih preduzeća, kao matičnog mesta za stvaranje inovacija. Pokazano je da će intenzivnije ulaganje domaćih preduzeća u IR, kao bazičan izvor inovacija, omogućiti njihovu ekspanziju na postojeća i nova tržišta. Analizom poslovne prakse domaćih preduzeća, uočava se da veliki broj nema organizovanu aktivnost IR. Došlo se do zaključka da preduzeća koja imaju organizovan oblik istraživačko-razvojnog rada (instituti, laboratorije, projektni biroi,službe za razvoj, i drugi oblici organizovanja) više su inovativna. Najveći broj preduzeća ovu aktivnost obavlja samostalno, a zbog podele troškova i drugih, brojnih prednosti, trebalo bi je obavljati kroz saradnju više preduzeća.

Srpska preduzeća su, pretežno orijentisana na lokalno-regionalno tržište.

There is no qualified professional staff for supporting development processes. Namely, secondary professional school graduates (27.9%) and qualified workers (21.8%) prevail in the qualification pattern.

They cannot carry out that process in a proper manner. For R&D, only 13.3% of local companies use incentives given by various funds, non-governmental organisations and the government itself as a financial support. Therefore, we conclude that the level of innovativeness of local companies is low. This is reflected in the low level of their competitiveness, as well. More intensive investing of local companies in R&D as a main source of innovation is the only means for encouraging their expansion into the existing and new markets.

Pokazano je da nepostoji kvalifikovan stručni kadar koji bi podržao istraživačko razvojne procese. Naime, dominirajuće školske spreme su srednja stručna (27,9%) i kvalifikovani radnici (21,8%), koji takav proces ne mogu da iznesu na pravi način.

Svega 13,3% domaćih preduzeća koristi podsticajna sredstva za IR, koja u vidu finansijske podrške pružaju različiti fondovi, nevladine organizacije i sama vlada. Iz svega napred navedenog, nameće se zaključak da je nivo inovativne aktivnosti domaćih preduzeća nezadovoljavajući, što se direktno odražava na nizak nivo njihove konkurentnosti. Intenzivnije ulaganje domaćih preduzeća u IR, kao bazičnog izvora inovacija, jedino bi moglo da pospeši njihovu ekspanziju na postojeća i nova tržišta.

References/ Literatura

[1]. **Barnett E., Storey J**. (2005). Narratives of Learning, Development and Innovation: Evidence from a Manufacturing SME, Enterprise and Innovation Management Studies, Vol. 2, No. 2, p. 134-168

[2]. **Barney, B. J**. (1997). Gaining and Sustaining Competitive Advantage, Addison-Wesley Publishing Company, New York

[3]. **Bomol V**. (2006). Innovative machinery of free market, Center for publishing, Podgorica (in Serbian)

[4]. **Cumming, B. S**. (2006). Innovation overview and future challenges, European Journal of Innovation Management, Vol. 1, No. 1

[5]. **Riznić D., Vojinović B**. (2010). Managerial tools as a means of regional development, monograph, Technical faculty in Bor (in Serbian)

[6]. **Đuričin D., Janošević S**. (2007) „Management and strategy", Center for publishing, Faculty of Economics, University of Belgrade (in Serbian)

[7]. **Dismukes J.** (2004). Accelerate Radical Innovation, Research – Technology Management , September – October, p. 65-76

[8]. **Haberberg A., Rieple A**. (2008). Strategic Management, Oxford University Press, New York

[9]. **Howitt P., Griffith R., Blundell R., Bloom N., Aghion P.** (2007). Competition and Innovation: An inverted-u relationship, Quarterly Journal of Economics, Vol. 16, No. 3, p. 34-45

[10]. **Janošević S**. (2007). Change management as a means of gaining competitive advantage, In "The development of competitive advantage of Serbian companies in the context of European integrations", Faculty of Economics, University of Niš (in Serbian);

[11]. **Komazec G**. (2002) Management od research and development, Megatrend University, Belgrade, (in Serbian)

[12]. **Noori H**. (1990). Managing the Dynamics of New Technology, Prentice Hall, New Jersey

[13]. **Schlegelmilch B. B., Diamantopoulos A. Kreuz P**., (2003). Strategic Innovation: the Construct, its Drivers and its Strategic Outcomes, Journal of Strategic Marketing, Vol. 11, p. 23-32

[14]. **SPRU** - Science and Technology Policy Research visiting fellow (2001-2002), University of Sussex, Brighton BN1 9RF UK D.Kutlaca@sussex.ac.uk

[15]. **Stanković Lj., Jočić-Radenović P., Đukić S**. (2007). Improvement of business competitiveness, Faculty of Economics, University of Niš (in Serbian)

[16]. **Stojanović B**. (2007). The competitiveness of Serbian economy and the policy of assuring cometitive context, Business economics (in Serbian)

[17]. **Tidd J., Bessant J., Pavitt K**. (2001). Managing Innovation, John Wiley&Sons, Chichester