

UDK 005.591.6

Open Innovation in Developing Regions: An Empirical Analysis across Manufacturing Companies

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Received (23.02.2017.); Revised (01.06.2017.); Accepted (04.08.2017.)

Abstract

Even though innovation potential in manufacturing companies from developing countries has been recognized, companies from these countries are more focused on internal than on external sources of innovation. External sources enable open innovation which is a valuable form of innovation that is receiving an increasing attention. Open innovation potential in manufacturing companies from developing countries could be exploited more. The purpose of this paper is to investigate current innovation practice used by manufacturing companies in a specific developing region namely the Autonomous Province of Vojvodina (Serbia). This investigation deepens non-pecuniary inbound form of open innovation. For this purpose, data taken from European Manufacturing Survey are used. The results of the analyses show that manufacturing companies from Vojvodina collaborate with different partners to innovate. Customers represent the most frequent source of innovative ideas even though, overall, the innovation ideas are generated more from internal sources.

Key words: *Open Innovation, Inbound Innovation, European Manufacturing Survey, Developing Countries*

1. INTRODUCTION

Innovation has been recognized and widely acknowledged as one of the main drivers of the knowledge society [1]. Recently, an increased number of companies started to involve customers, suppliers and other external partners in the process of innovation [2]. The use of external relationships is increasingly considered as a key factor in enhancing the innovation performance of modern enterprises [3]. Therefore, a number of companies are shifting from closed to open innovation practice [4].

Open innovation can be defined as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively” [5]. The main four drivers for companies to start open Innovation

are cost reduction, knowledge gain, risk sharing and resources accessibility [6]. Shift to open innovation is constrained with barriers related to technology, market place, collaboration among partners, financial sources availability, clients' needs, workforce and knowledge and intellectual property rights [6].

Open innovation practice has received an extensive attention in the scientific research, management and government [7]. However, most research on open innovation relies on case studies, while there are relatively few large scale empirical studies [8]. Furthermore, most of the research is based on companies from developed countries [5], [9], [10]. There is a lack of research on open innovation practice in companies from developing countries [7].

Companies from developing countries were operating in relatively protected environment in the past [11]. Globalisation has exposed developing countries' companies to foreign competition and the majority of them cannot withstand this competitive pressure because they are not yet sufficiently competitive [12]. Market globalization is forcing companies from developing countries to adapt to new business strategies to survive [13]. To be more competitive, companies should be more agile and flexible. This is forcing companies to reconsider their strategies and processes, and to become network organizations [14]. This networking, in turn, creates great opportunities to apply more open innovation in developing countries too. Consequently, the role of external sources of knowledge in developing countries industries should be investigated more [15].

In this paper, we analyse different innovation areas and their importance for manufacturing companies coming from a developing country. Furthermore, we investigate the use of internal and external sources of innovation and analyse about collaboration of companies with different external partners in the innovation field.

The remainder of the paper is structured as follows. Literature review is presented in Section 2. Section 3 describes the research questions and method that has been used in this paper, Section 4 presents the research results and discussion, and Section 5 presents the conclusion of this paper with identified limitations of the study and suggestions for further research.

2. LITERATURE REVIEW

There are different innovation areas on which companies can focus. Innovation field is divided into four areas: new products [16], new technical production processes [17], new product-related services [18] and new organizational concepts [19]. Also, there are different sources of innovation ideas which can be used by companies to gather ideas for innovation. They can be divided into internal and external [20]. Internal sources for gathering innovation ideas are: R&D/engineering [21], production [22], customer services [23] and CEO/management [24]. External sources for gathering innovation ideas are: customers [25], suppliers [26], research institutions, universities [27], business or organisation consultancies [28] and competitors [29].

In the core of the open innovation idea is the assumption that innovation activities of companies are more like an open system than the traditional vertically integrated model [30]. The original concept of open innovation was modified and extended since the introduction in 2003. There are four different forms of openness, summarized by Dahlander and Gann namely acquiring, sourcing, selling, and revealing (Table 1). Acquiring is a pecuniary inbound form of innovation that relates to getting input to the innovation process through the market place. It can be understood as a licencing-in process. Sourcing is a non-pecuniary inbound form of innovation that refers to use of external sources of innovation by companies. Selling is a pecuniary outbound form of innovation that relates to commercialization of companies' inventions

and technologies through selling or licensing-out. Revealing is a non-pecuniary outbound form of innovation that relates to revelation of internal resources to the external environment with indirect benefits for focal company [31].

Table 1. Different forms of openness [29]

	Inbound innovation	Outbound innovation
Pecuniary	Acquiring	Selling
Non-pecuniary	Sourcing	Revealing

In response to increased interest in pecuniary and non-pecuniary knowledge flows the definition of open innovation was extended and defined as "a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model" [33].

The focus of this paper is on non-pecuniary inbound form of innovation, also known as sourcing. Sourcing of ideas and knowledge has positive effects on innovation performance [34]. We investigated the innovation practice of manufacturing companies from developing country, since the literature in this field is scarce. We aim to increase the knowledge on the use of external sources of innovation in manufacturing companies and their relationship with internal sources of innovation.

3. RESEARCH QUESTIONS AND METHOD

In order to augment the available knowledge about innovation culture of manufacturing sector in developing region, we will answer to the following research questions:

RQ1: What is the importance of different innovation areas for Vojvodina manufacturing companies?

RQ2: What are the major sources of innovation ideas for Vojvodina manufacturing companies?

RQ3: With which partners do Vojvodina manufacturing companies collaborate in different innovation areas?

Vojvodina is a part of the Republic of Serbia which is a developing country located in south-eastern Europe. Vojvodina is the most developed part of the Republic of Serbia, with well-developed manufacturing sector. Therefore, it was found suitable to conduct research on innovation practices of manufacturing sector in this region.

This paper is based on a descriptive survey research, conducted under the international project European Manufacturing Survey (EMS). EMS investigates technological and non-technological innovation in European industry and it is generally focused on technology diffusion and organisational innovation.

The survey is carried out on a triennial basis and targets a random sample of manufacturing companies with more than 20 employees. The dataset that is used in this paper is built from 2015 data collection. Manufacturing companies (NACE Rev 2 codes from 10 to 33) from Vojvodina are considered. A total population

of 600 companies in Vojvodina meets above mentioned criteria. The list of companies of this population was obtained from the Serbian Business Registers Agency. To obtain a representative sample, 334 companies evenly distributed across all previously defined manufacturing sectors of Vojvodina were contacted. Sample size was determined based on Cochran's formulas reported in [35]. Data collection was done through a pre-test phase and two mass distribution phases. The total number of companies that returned the questionnaires is 123, thus representing a response rate of 36,8%. We checked for sampling bias. More specifically, we used analysis of variance (ANOVA) to compare companies that participated in the research (respondents) to those that did not (non-respondents) based on their financial assets. The ANOVA analyses were made separately for the first and the second mass distribution phase. Both analyses did not show statistically significant differences between groups (i.e. respondents and non-respondents). At significance level $\alpha = 0.05$, p-value for the comparison of companies from the first mass distribution phase is 0.185 and p-value for the second mass distribution phase is 0.590. These results support the absence of bias and consequently we are reasonably confident that the representativeness of our sample is not undermined by non-respondents.

Companies were contacted by telephone to identify an appropriate respondent in each company. Employees responsible for production activities were identified as the most appropriate respondents because of the scope of the overall questionnaire which is mostly related to production processes. After gathering information about the person responsible for production activities, questionnaire was send directly to that person by mail or e-mail. We have communicated with each respondent directly and we encouraged him/her to involve other relevant employees in the process of completing the questionnaire. Information about working experience of respondents is presented in Table 2.

Table 2. Years of working experience of respondents

	Mean
Years of experience in industry	17,05
Years of experience in the company at the current position	8,21

Several questions from this survey that are related to innovation processes were used for analysis of Vojvodina manufacturing sector innovation practice. The main questions used for the analysis are reported close to the results in order to facilitate the reader. The content of the questions was identified based on the literature review. The question subsequently formulated passed through a phase of pre-test. In the pre-test phase, we have contacted 13 companies, and asked them to give us feedback about the questionnaire and appropriateness of its content. After that, we modified questions based on their comments and finally we went into mass distribution phases. Respondents were provided with contacts for any additional question regarding the questionnaire.

Given our descriptive purpose our data analysis relies on simple statistics. More specifically, we used descriptive statistics and correlation analysis.

4. RESULTS AND DISCUSSION

This section presents the results of the survey and discusses these results. The presentation flow follows the order of the research questions introduced in the previous section.

4.1 Importance of Different Innovation Areas

In order to answer to RQ1 (i.e. to identify the importance of different innovation areas for Vojvodina manufacturing companies) we used the data gathered through the following question:

Q1 - How do you rank the importance of the following innovation areas in your company? Please rank from 1 (highest importance) to 4 (lowest importance), Please do not assign equal importance to any innovation area.

- new products
- new technical production processes
- new product-related services
- new organisational concepts.

The results are presented in Figure 1. The two most important areas of innovation for manufacturing companies in Vojvodina are the area of new products with the lowest mean value (2,08), followed by the area of new technical production processes (2,27). After these two areas that are pretty close each other we find, clearly located at lower level of importance, the area of new organizational concepts (2,75) and the area of new product-related services (2,89).

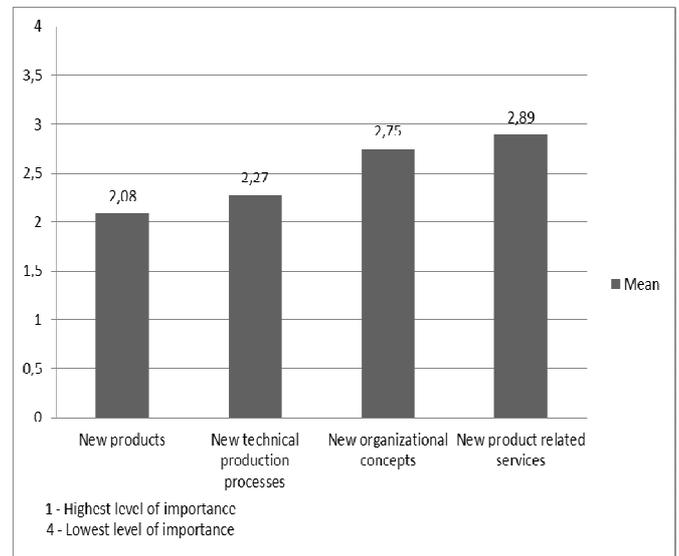


Figure 1. Importance of innovation areas

Innovation areas related to products and technologies are more important than those related to organisation and services for manufacturing companies in Vojvodina. This order is expected, since manufacturing companies are more focused on development of new products and implementation of advanced technologies then on improvements related to organisation and services [36]. However, it is important for companies to make

improvements in all innovation areas because of their complementarity. Organisational innovations should be considered as a prerequisite for technological innovations [37], while product-related services significantly contribute to the sales of manufacturing companies [38].

4.2 Major Sources of Innovation Ideas

In order to answer to RQ2 (i.e. to identify the major sources of innovation ideas for Vojvodina manufacturing companies) we used the data gathered through the following four questions, one for each innovation area (i.e. [new products], [new technical production processes], [new product-related services], [new organisational concepts]):

Q2..Q5 - *What are the major sources of innovations idea for [new products] in your company? Please tick a maximum of three sources.*

- R&D/engineering
- Production
- Customer services
- CEO/management
- Customers or users
- Suppliers
- Research institutions or universities
- Business or organisation consultancies.

Among the 8 considered sources of ideas for innovation, four are internal ones (R&D/engineering, production, customer services, and CEO/management) and four are external ones (customers or users, suppliers, research institutions or universities, and business or organisation consultancies). In total, the respondents made 674 selections. We analysed these 674 selections firstly by considering whether internal sources are more or less frequently included as major sources than external ones and subsequently by investigating how frequently each specific source has been selected as a major source. The results of these two analyses are reported in the following two subsections.

4.2.1 Internal versus externals

Figure 2 reports how many times internal versus external innovation sources have been selected.

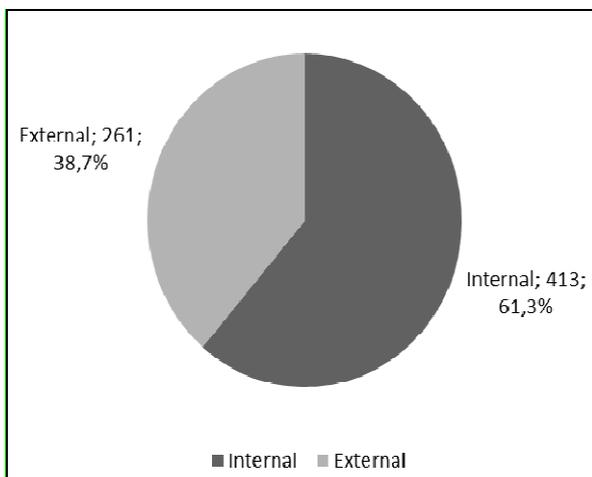


Figure 2. Internal and external sources of innovation ideas

We can see that in 413 (61,3%) cases, companies use internal sources for gathering innovation ideas, while in 261 (38,7%) cases the sources used for gathering innovation ideas are external.

4.2.2 Different importance of different sources

Even though internal sources of innovation ideas are much more present than external ones, if we analyse the single sources (see Fig 3) we can see that customers represent the most frequent source of innovation ideas (148). However, immediately after the customers we find all the internal sources: CEO/Management (146), production (115), R&D/Engineering (93), and customer service (59). Only at the end of the ranking we find all the remaining external sources: suppliers (45), business or organisation consultancy (37) and research institutions and universities (31). So, the detailed analysis reported in Figure 3 clarify the picture showing that the major sources for innovation are the customers and the CEO/management followed by the other three internal sources while the remaining external sources altogether are major sources only in 16% of the selection made by the respondents. R&D/Engineering, which is a function devoted to innovation, comes after CEO/management and production functions. This can be explained with low technological development and small size of companies in Vojvodina.

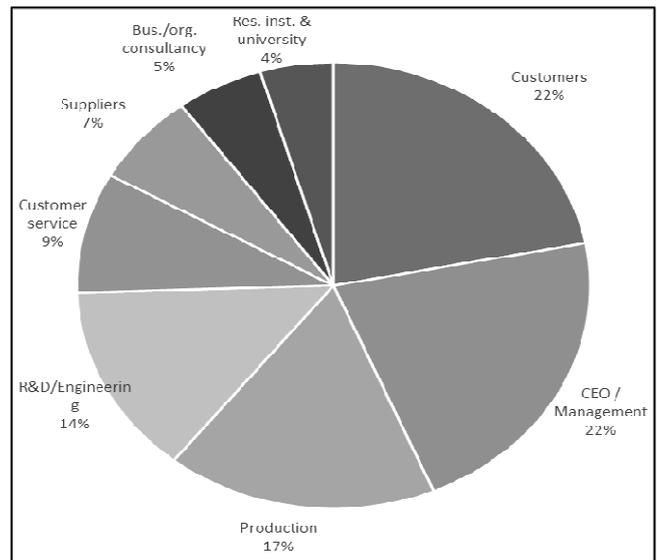


Figure 3. Major sources of innovation ideas

4.2.3 Each major source for which Innovation Areas?

Table 3a presents the answers to questions Q2-Q5 in a way that allows identifying for which areas of innovation is each major source of innovation used for. It is possible to identify the following four situations.

- R&D / engineering and production are major sources mainly for technological innovation areas: new products and new technical production processes;
- Customers and customer service are major sources mainly for product and service innovations;
- CEO / management, research institutions, universities, and business or organization consultancy are major sources mainly for production process and organization innovations;
- Suppliers are major sources mainly for product, process and service innovation areas.

4.2.4 Which major sources for each Innovation Areas?

Table 3b presents the answers to questions Q2-Q5 in a way that allows identifying for each areas of innovation what are the major sources of innovation. It results the following:

- For new products, the major sources of innovation ideas are (in decreasing order of importance) customer, R&D / engineering, CEO / management, and production;
- For new technical production processes, the major sources of innovation ideas are (in decreasing order of importance) production, CEO / management, and R&D / engineering;
- For new product related services, the major sources of innovation ideas are (in decreasing order of importance) customer, and customer service;
- For new organizational concepts, the major sources of innovation ideas are (in

decreasing order of importance) CEO / management, and production.

Table 3b allows increasing our confidence on the results obtained by analysing the answers to Q1. In fact, the innovation areas who result to be more important in Figure 1 do present a higher number of major sources of innovation ideas in the last row of table 3b, that is the innovation area of new products (192), followed by the innovation area of new technical production processes (179), the innovation area of new product-related services (156) and the innovation area of new organisational concepts (147). This also confirms that manufacturing companies in Vojvodina region are more oriented towards technological improvements.

4.2.5 Reflections on the major sources for innovation ideas

Manufacturing companies from Vojvodina are more focused on internal than on external sources of innovation ideas. This can be found as a good balance, since too much open innovation can have negative effects on company performance [39]. It is important that internal capacity stays strong because it represents significant point of strength for companies [3]. However, external search for innovation ideas should also be present and used as a complement for internal R&D [40]. It is suggested that emerging economy companies should rely on internal R&D from one side, and on diversified learning sources from the other side [41]. Therefore, manufacturing companies from Vojvodina could increase the use of external sources of innovation but at the same time should keep the balance between internal and external sources of innovation.

Table 3a. Major sources of innovation ideas: use across innovation areas

		New products		New technical production processes		New product-related services		New organizational concepts		Total	
		N	Share	N	Share	N	Share	N	Share	N	Share
Internal	R&D / Engineering	36	39%	27	29%	9	10%	21	23%	93	100%
	Production	27	23,5%	49	43%	14	12%	25	22%	115	100%
	Customer service	13	22%	6	10%	36	61%	4	7%	59	100%
	CEO / Management	32	22%	38	26%	24	16%	52	36%	146	100%
External	Customer	60	41%	21	14%	51	35%	16	11%	148	100%
	Supplier	11	24%	18	40%	12	27%	4	9%	45	100%
	Research institutions, universities	5	16%	10	32%	3	10%	13	42%	31	100%
	Business or organization consultancy	8	22%	10	27%	7	19%	12	33%	37	100%
Total		192	28%	179	27%	156	23%	147	22%	674	100%

Table 3b. Major sources of innovation ideas: use within each innovation area

		New products		New technical production processes		New product-related services		New organizational concepts		Total	
		N	Share	N	Share	N	Share	N	Share	N	Share
Internal	R&D / Engineering	36	19%	27	15%	9	6%	21	14%	93	14%
	Production	27	14%	49	27%	14	9%	25	17%	115	17%
	Customer service	13	7%	6	3%	36	23%	4	3%	59	9%
	CEO / Management	32	17%	38	21%	24	15%	52	35%	146	22%
External	Customer	60	31%	21	12%	51	33%	16	11%	148	22%
	Supplier	11	6%	18	10%	12	8%	4	3%	45	7%
	Research institutions, universities	5	3%	10	6%	3	2%	13	9%	31	5%
	Business or organization consultancy	8	4%	10	6%	7	4%	12	8%	37	5%
Total		192	100%	179	100%	156	100%	147	100%	674	100%

4.3 Collaboration with Partners

In order to answer to RQ3 (i.e. to identify which partners do Vojvodina manufacturing companies collaborate with in different innovation areas) we used the data gathered through 6 different questions devoted to considering different aspects of the non-pecuniary inbound form of collaborations between manufacturing companies from Vojvodina with different partners in four innovation areas. The questions and the results of the analyses are reported in the following subsections each one devoted to a specific aspect.

4.3.1 How much collaboration for each innovation area?

The level of collaboration of Vojvodina manufacturing sector companies in different innovation areas is presented in Table 4. This table analyses the data collected through the following question:

Q6 - What is the level of collaboration with external partners in the following areas of innovation? Please choose "low", "medium", or "high" for each area.

- New products
- New technical production processes
- New product-related services
- New organisational concepts.

In the area of new products, collaboration is on medium (39) or high (38) level. Low level of collaboration in this area is present in only 5 (out of 123) companies. In the area of new technical production processes medium (39) level of collaboration is the most present, followed by high (19) and low (11) level of collaboration. In the area of new product-related services medium (37) level of collaboration is the most present, followed by high (15) and low (8) level of collaboration. In the area of new organizational concepts medium (24) level of collaboration is the most present, followed by low (10) and high (8) level of collaboration. Medium level of

collaboration is the most present in all innovation areas.

4.3.2 Which partners for each innovation area?

The analysis of the collaboration of Vojvodina manufacturing sector companies in different innovation areas with different partners is presented in Tables 5a and 5b. These tables analyse the data collected through the following questions:

Q7..Q10 - With which partners do you collaborate in the following area of innovation: [new products], [new technical production processes], [new product-related services], [new organisational concepts] in your company? Please tick all partners that apply.

- Customers
- Suppliers
- Competitors
- Service organizations
- Research institutions or universities

From Table 5a we can see that collaboration with customers and suppliers is much more present than collaboration with competitors, service organisations, and research institutions or universities. In the innovation area of new products and new product-related services the greatest number of collaborations is realised with customers. In the innovation area of new technical production processes the greatest number of collaborations is realized with suppliers. In the innovation area of new organisational concepts the greatest number of collaborations is realized with service organizations.

4.3.3 In which innovation areas is each partner typically involved?

Table 5b presents the answers to questions Q7-Q10 in a way that allows identifying in which innovation areas each partner is more frequently involved across manufacturing companies in Vojvodina. It results the following:

- Customers are mainly involved in product and service innovations;
- Suppliers are mainly involved (in decreasing order) in process, product, and service innovation;
- Competitors and service organizations are significantly involved in all innovation areas. However, while competitors are more involved in product innovation and less in the other three innovation areas, for the service organization the situation is the opposite one;
- Research institutions and universities are involved in a not negligible way in all innovation areas, with a greater presence in product, mainly for production, process and, at lower extent, organization innovations.

Table 5a and 5b allow once more increasing our confidence on the results obtained by analysing the answers to Q1. In fact, the innovation areas which result to be more important in Figure 1 do show a higher number of collaborations with partners. The total number of collaborations of manufacturing companies with other organizations is the highest in the area of new products (150), followed by the area of new technical production processes (98), the area of new product-related services (94) and the area of new organizational concepts (61).

Table 5a and 5b allow to increase our confidence on the results obtained by analysing the answers to Q2..Q5. In fact, by summing the involvement of each partner in all the innovation areas we obtain a total score for each partner that put the partners in the same order that is shown in Figure 3. Incidentally, the competitors, which are not present in Figure 3, result to have the minimal score.

4.3.4 Adoption of open innovation: how each innovation area overall correlates to each innovation partner overall

To conclude the analysis on the collaboration with partners for innovation we perform a correlation analysis using data collected from Q7-Q10 with simple synthetic data collected through the following question:

Q11 - Does your company collaborate with external partners in the following areas of innovation? Please choose "yes" or "no" for each area.

- *New products*
- *New technical production processes*
- *New product-related services*
- *New organisational concepts.*

We coded the answers to Q11 in four variables named "collaborations in the innovation area [Xi]" (i.e. new

products, new technical production processes, new product-related services, and new organisational concepts). For example, "collaborations in the innovation area of new products" is 0 if a company does not have collaborations with any partner for product innovation while is 1 if that company collaborate with one or more partners for product innovation.

We created five new variables, one for each of the five partners called "collaboration with partner [Yi] for innovation" (i.e. customers, suppliers, competitors, service organizations, research institution or universities). For a given company if a given partner Yi was ticked for at least one area of innovation in the answers to Q7..Q10 than to "collaboration with partner [Yi] for innovation" was assigned the value 1 otherwise it was assigned the value 0.

Correlation analyses were used to determine relationship between collaborations that companies realize in different innovation areas and collaborations for innovation which are realized with specific partners. Results are presented in Table 6. By analysing the values of the Spearman's correlation coefficients reported in Table 6 we can infer that:

- Companies that practice open innovation for developing new products collaborate more in innovation with customers and suppliers. This is important, because collaboration with customers and suppliers has direct positive effect on the new product development process [42];
- Companies that practice open innovation for new product-related services collaborate more in innovation with customers, suppliers, and service organizations. Manufacturing companies are more and more providing services that are related to their products to be more competitive on the market [38]. Collaboration with service organisations can play important role in this area because of their expertise and freshness of ideas [28];
- Companies that practice open innovation for new technical production processes collaborate more in innovation with suppliers, service organizations, research institutions and universities. Suppliers, research institutions and universities represent good collaborating partners in this innovation area because of their high technological knowledge [29]. Collaboration with research institutions and universities is becoming increasingly popular because of the funding possibilities. In that way companies can get inexpensive specialist knowledge;

Table 4. Level of collaboration with external partners for the innovation

	Low		Medium		High		Total	
	N	Share	N	Share	N	Share	N	Share
New products	5	6,1%	39	47,6%	38	46,3%	82	100,0%
New technical production processes	11	15,9%	39	56,6%	19	27,5%	69	100,0%
New product-related services	8	13,3%	37	61,7%	15	25,0%	60	100,0%
New organizational concepts	10	23,8%	24	57,1%	8	19,1%	42	100,0%

Table 5a. Collaboration for innovation: use of different partner within each innovation area

Collaboration with:	Customers		Suppliers		Competitors		Service organizations		Research institutions, universities		Total	
	N	Share	N	Share	N	Share	N	Share	N	%	N	Share
Collaboration in:												
New products	68	45%	38	25%	8	5%	14	9%	22	15%	150	100%
New technical production processes	14	14%	42	43%	6	6%	20	20%	16	16%	98	100%
New product-related services	38	40%	24	26%	5	5%	19	20%	8	9%	94	100%
New organizational concepts	11	18%	10	16%	6	9%	23	38%	11	18%	61	100%
Total	131	33%	114	28%	25	6%	76	19%	57	14%	403	100%

Table 5b. Collaboration for innovation: use of each partner across innovation areas

Collaboration with:	Customers		Suppliers		Competitors		Service organizations		Research institutions, universities		Total	
	N	Share	N	Share	N	Share	N	Share	N	%	N	Share
Collaboration in:												
New products	68	52%	38	33%	8	32%	14	18%	22	39%	150	37%
New technical production processes	14	11%	42	37%	6	24%	20	26%	16	28%	98	24%
New product-related services	38	29%	24	21%	5	20%	19	25%	8	14%	94	23%
New organizational concepts	11	8%	10	9%	6	24%	23	30%	11	19%	61	15%
Total	131	100%	114	100%	25	100%	76	100%	57	100%	403	100%

Table 6. Correlations between collaborations in the areas of innovation and collaborations with specific partners for innovation

	Customers	Suppliers	Competitors	Service organizations	Research institutions, universities
New products	,689 ***	,399 ***	,142	,208	,273
New technical production processes	,277	,566 ***	,174	,332 ***	,300***
New product-related services	,637 ***	,460 ***	,189	,384 ***	,242
New organizational concepts	,395 ***	,375 ***	,284	,580 ***	,395 ***

* p < 0.1; ** p < 0.05; *** p < 0.01

• Companies that practice open innovation for new organizational concepts collaborate more in innovation with customers, suppliers, service organizations, research institutions and universities. Basically, in this area companies are oriented on all partners except competitors. It is interesting to notice that there is no significant correlation with competitors in any innovation area.

4.3.5 Final remarks

It can be concluded that the focus of companies related to their collaboration practice in different innovation areas is diversified. However, from analysis of major sources of innovation ideas (Table 3) we can see that only customers are well recognized collaboration partners. They represent a solid source of innovation

ideas. This fact is not surprising, since customers are widely identified as a key external source of innovation ideas [43] [44]. Suppliers represent a source of ideas that is almost as important as customers for companies [45]. In manufacturing companies from Vojvodina collaboration with suppliers is present, but number of ideas gathered from those collaborations is significantly lower compared to customers. It is important for companies to tighten up their relationship with suppliers because this type of collaboration tends to complement internal R&D efforts [29]. Other collaborating partners have their influence on creation of ideas as well. Service organizations could provide a variety of fresh ideas that are beyond traditional expertise of

manufacturers [28]. The tendency of moving research institutions and universities more closely to industry makes them interesting collaborating partners. Therefore, research institutions and universities are becoming important contributors to new technological knowledge [27].

5. CONCLUSION

This paper is focused on open innovation practice in manufacturing companies from developing country. We used data from EMS to analyse importance of different innovation areas for manufacturing companies from Vojvodina. Also, we have investigated the relationship between internal and external sources of innovation ideas in companies and analysed collaboration of companies with different partners in the innovation field. We have found that manufacturing companies from Vojvodina are more focused on development of new products and implementation of advanced technologies than on improvements related to organisation and services. They are more oriented to internal rather than the external sources of innovation. From external sources, customers are recognized as the most important partner for collaboration.

This paper contributes to the existing literature by confirming that manufacturing companies are more focused on improvements that are related to their products and technologies rather than the organisation and services [36]. Also, in this research we confirm that manufacturing companies from developing countries are using external sources of innovation as a complement to internal sources [40].

Balance between internal and external sources of innovation ideas is adequate [39], but there is a misbalance between different external partners [41]. Collaboration with external partners besides customers exists, but companies do not see those partners as important sources of innovation ideas. Further development of open innovation practice and establishment of synergetic relationship through collaboration with various partners could lead to increased competitiveness of manufacturing companies from Vojvodina on globalized market.

This research is limited only to inbound non-pecuniary form of open innovation practice. Therefore, we propose that further research should cover other forms of openness as well. We also did not make any differentiation between companies based on their size, age, technology level, etc. Analyses based on different characteristics of companies could be found as a good direction for further research.

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Otvorene inovacije u regionima u razvoju: Empirijska analiza prerađivačkog sektora

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Primljen (23.02.2017.); Recenziran (01.06.2017.); Prihvaćen (04.08.2017.)

Apstrakt

Iako je inovacioni potencijal kompanija iz prerađivačkog sektora u zemljama u razvoju prepoznat, on je mnogo više usmeren na interne nego na eksterne izvore inovacija. Eksterni izvori omogućavaju otvorene inovacije, koje predstavljaju značajan oblik inovacija i kojima se sve više pridaje pažnja. Potencijal otvorenih inovacija u kompanijama iz prerađivačkog sektora u zemljama u razvoju bi mogao biti bolje iskorišten. Svrha ovog rada je da istraži inovativnu praksu prerađivačkog sektora Vojvodine. Ovo istraživanje je usmereno na nematerijalne ulazne otvorene inovacije. U istraživanju su korišćeni podaci prikupljeni u okviru projekta Istraživanje evropskih proizvodnih potencijala. Rezultati pokazuju da kompanije iz prerađivačkog sektora Vojvodina sarađuju sa različitim partnerima u oblasti inovacija. Potrošači predstavljaju najčešći izvor inovativnih ideja, iako se generalno posmatrano više ideja prikupi od internih nego od eksternih izvora.

Ključne reči: otvorene inovacije, ulazne inovacije, istraživanje evropskih proizvodnih potencijala, zemlje u razvoju