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## MOTIVATION FOR PATENTING – DELPHI METHOD APPROACH

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**Abstract:** Patenting and commercialization of the patents are one of the important directions of the companies to gain their competitiveness compared to their competition. The aim of this research is to identify the main influential factors for motivation to patenting. It is performed in Macedonian furniture industry and it is focusing on the patenting in existing enterprise. The core of the research methodology is the Delphi method. Auxiliary aim of the research is to compare the results to similar research in more developed countries. The research results show that the most important motivation factor for patenting is commercial exploitation, followed by the licensing and enhance of the ability to raise funds. These results, to certain extent are compatible with the results of the similar research performed in different industries and more developed countries (highest importance of the factors like “Commercial exploitation”, “Prevention of imitation”), but differs from those research in some factors, like “Licensing” and “Enhance ability to raise funds”.

**Keywords:** patenting, motivation, Delphi

### 1. INTRODUCTION

Innovation, which involves the creations and diffusion of new products, processes and methods, is an important driver of economic growth. It provides the foundation for new businesses, new jobs and productivity growth [14].

From enterprise point of view, the main reasons for introducing innovations include: improving manufacturing process, introducing new product that meet customer needs, maintaining competitiveness, increasing market share, preventing technological dependence on other companies' technology and other reasons [4,15,24].

To protect innovations that are based on valuable inventions, enterprises use patent protection as a powerful tool for strengthening invention and innovation [18,20,26]. So, commercialization of patents, which refers to innovation, is the main aim of patent protection through which patent holder generates some income [2,12,21, 23,25].

Because of the opportunities and the advantages that patent protection offers to patent holder, factors that affect motivation for patenting are very important. Different surveys that investigate motivation for patenting show more or less different combination of factors that affect motivation for patenting as well as more or less difference of their importance [10, 13, 22]. It has to be emphasized that all, these surveys are conducted in developed countries. In that direction the main purpose of this research is to conduct similar research in developing countries and to investigate the comparability of the results. So the survey of the Macedonian companies in furniture industry presented in this paper provides not only a research in different geographical area but also offers a comparison between the obtained results in developed countries and developing ones.

Unlike the existing papers which apply interviewing inventors and patent holders, this paper introduces the Delphi method and explains these factors from an expert point of view. In that sense, it is expected, the study presented in this paper to be a base for further research on the motivation for patenting.

The rest of paper is organized as following. Section 2 describes the research methodology and Section 3 deals with the literature review on motivation for patenting as a base for the inducing of the main factors that affects motivation for patenting, given in Section 4, Section 5 presents the applied Delphi method and discussion of the results. In the Section 6 the comparison of the results with the similar studies is shown and Section 7 gives the conclusion and suggestions for further research.

## 2. METHODOLOGY

The methodology used in this paper includes four steps. First, analyses of the literature on the subject of motivation for patenting has been conducted. Identifying the main factors that influence motivation for patenting as a main output from the literature review was the second step. The third step is connected with the application of the Delphi method in order to get an expert opinion considering the importance of the above factors in Macedonian furniture industry and comparison of the results with other similar research mainly in more developed countries/regions. The fourth step is connected with the investigating the relationships with similar research in different countries.

Regarding the implementation of the Delphi method, appropriate submethodology was implemented. Namely, following the steps described in Scapolo and Miles, [19] the Delphi method applied in this research consists of: (1) preparation of the questionnaire; (2) identification of the experts in the questionnaire; (3) implementation of the questionnaire and (4) analysis of the results.

## 3. LITERATURE REVIEW

The patent as an exclusive right granted for an invention offers many advantages to the inventor and patent holder. So, the most valuable innovations are protected by patents [7].

Because of patent protection is a territorial right, obtaining a patent, allows the patent holder to prevent others from obtaining patent for the same invention anywhere in the world [24].

Patent protection is a powerful tool for strengthening invention which brings a strong market position to the patent holder [1,20,26].

As patent is the right granted to the patent holder by a state or by a regional office acting for several states in a specific form of administrative procedure therefore the literature review encompassed the surveys commissioned by the Swiss Federal Institute of Intellectual Property, Research Institute of Economy, Trade and Industry in Japan, as well as European Commission with support by European Patent Office (EPO).

A survey conducted in 20 European countries (AT, BE, CH, CZ, DE, DK, ES, FI, FR, UK, GR, HU, IE, IT, LU, NL, NO, PO, SE and SI) and Israel between November 2009 and February 2010, in Japan between October 2010 and July 2011 and in the U.S. between December 2010 and October 2011 investigates the importance of the main reasons for patenting on a Likert scale varying from 1 (not important) to 5 (very important). The survey shows that the most important factors for patenting in all countries are commercial exploitation and prevention of imitation with median score of 5. Blocking competitors is also one of the most important factors in Japan with median score of 5, while in other countries it has median score of 4 as well as pure defense. Licensing has median score of 3 in all countries, while reputation has median score of 2 in Japan and median score of 3 in other countries [22].

In a survey conducted in Japan and the U.S. in 2007 it was obtained that the most important reason for patenting in both countries in terms of percent “high” (4 or 5 on a 0-5 scale) is commercial exploitation of the invention. Blocking competitors and pure defense come next, while licensing and reputation are the last [13].

From the enterprise point of view in a survey conducted among small and medium enterprises in Switzerland in 2007 it was obtained that the main reason for patenting in more than 90% of the companies was blocking the competition, 58% of the companies reported prevention from imitation, 44% of the companies - because of contract negotiation, 28% of the companies - publicity and reputation and 14% of the companies - to signal a potential value to attract financial support as a main reason for patenting [10].

## 4. IDENTIFYING THE MAIN MOTIVATIONAL FACTORS FOR PATENTING

The literature review shows that there are common factors included in all surveys but also there are factors that appear only in one survey. Also, not all common factors have the same level of importance in all surveys. Because of these surveys are conducted in developed countries it was not possible to make a selection of factors and exclude any factor in advance for researching in a

developing country such as Macedonian case. So, it was decided all identified factors to be included in the Delphi questionnaire.

The identified factors are shown in Table 1.

Table 1: Factors that affect motivation for patenting

	Factors that affect motivation for patenting	Literature review
1.	Commercial exploitation	Nagaoka and Walsh; Torrissi [13, 22]
2.	Licensing	Nagaoka and Walsh; Torrissi [13, 22]
3.	Enhance the ability to raise funds	Keup et al, [10]
4.	Prevention of imitation	Keup et al; Nagaoka and Walsh; Torrissi, [10, 13, 22]
5.	Blocking competition	Keup et al; Torrissi [10, 22]
6.	Pure defense	Nagaoka and Walsh; Torrissi [13, 22]
7.	Reputation	Keup et al; Nagaoka and Walsh; Torrissi [10, 13, 22]
8.	Stronger position in contract negotiation	Keup et al, [10]

## 5. DELPHI METHOD

Prepared questionnaire for the first Step of the Delphi’s methodology, consists of eight questions based on the main factors that affect motivation for patenting identified above. To each question the Likert scale with 5 levels was applied. The 1<sup>st</sup> level corresponds to the lowest degree of importance and the 5<sup>th</sup> level to the highest degree of importance [6]. The questionnaire is presented in Table 2.

Table 2: First round Delphi questionnaire

FIELD OF STUDY	COMMERCIALIZATION OF PATENTS				
EXPERT IDENTIFICATION CODE					
DATE					
Factors that affect motivation for patenting	Rating level of the factor according its importance 1 (least important) to 5 (most important)				
	1	2	3	4	5
1. <b>Commercial exploitation</b> (obtain exclusive rights to gain profit from manufacturing the patented invention in own new or existing enterprise)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. <b>Licensing</b> (obtain exclusive rights to license the patented invention in order to generate licensing revenues)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. <b>Enhance the ability to raise funds</b> (provide an advantage to get grants or financial support from banks )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. <b>Prevention of imitation</b> (provide a basis to stop competitors from copying the invention unlawfully)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. <b>Blocking competition</b> (stop others to patent similar inventions)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. <b>Pure defense</b> (prevent competitors from claiming patent infringements)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. <b>Reputation</b> (boosting the image of the enterprise, i.e. patent as an element of evaluation of the enterprise)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. <b>Stronger position in contract negotiation</b> (as a negotiation tool in licensing contracts or collaboration with other companies)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Step 2 consists of determination of the number of rounds as well as identification of the experts in the field of commercialization of patented innovation.

There is no ideal number of the experts in Delphi method and it depends on the researcher’s decision. According to Riggs, [16] the number of 4 to 5 participants was enough, while some authors operate with larger number such as Doyl and Izaryk, [8] with 10 and Jolson and Rossow, [9] with 14 experts. However, the most of authors had decided on the number between 5 and 8 experts [3,5,11,17]. So, according Dalkey and Helmer, [3] in this research the number of 7 experts was chosen.

One of the main requirements in applying the Delphi method is the selection of the participants as knowledgeable persons or experts on the field of study. Therefore the participants in this research were chosen in that manner: one University professor in innovation, three inventors that are responsible only for the invention process and three inventors that are the responsible for the management of the patented invention in the same time.

Also the number of rounds in different studies varies from 2 to 5 [3,5,11,17]. According to Dalkey and Helmer, [3] the number of 3 rounds is acceptable.

After their agreement to participate in this research, the 1<sup>st</sup> round questionnaire was sent by e-mail to all of them. The response rate was 100%. The most commonly used techniques to identify the level of consensus are used in this research: mean, mode, median and interquartile ranges. The 2<sup>nd</sup> round questionnaire was made up of the same questions of the 1<sup>st</sup> round questionnaire including the mean, mode, median and interquartile of the 1<sup>st</sup> round questionnaire, so that the respondents could compare their answers with those of other experts in order to maintain or change their answers in the 2<sup>nd</sup> round questionnaire. After analyzing the answers to the 2<sup>nd</sup> round questionnaire, the 3<sup>rd</sup> round questionnaire was prepared.

In the same manner the 3<sup>rd</sup> round questionnaire contained the same questions of the 1<sup>st</sup> and the 2<sup>nd</sup> round including the mean, mode, median and interquartile ranges of the 2<sup>nd</sup> round questionnaire. Also, in the 3<sup>rd</sup> round experts had a chance to change or maintain their answers.

All three rounds results are shown in Table 3.

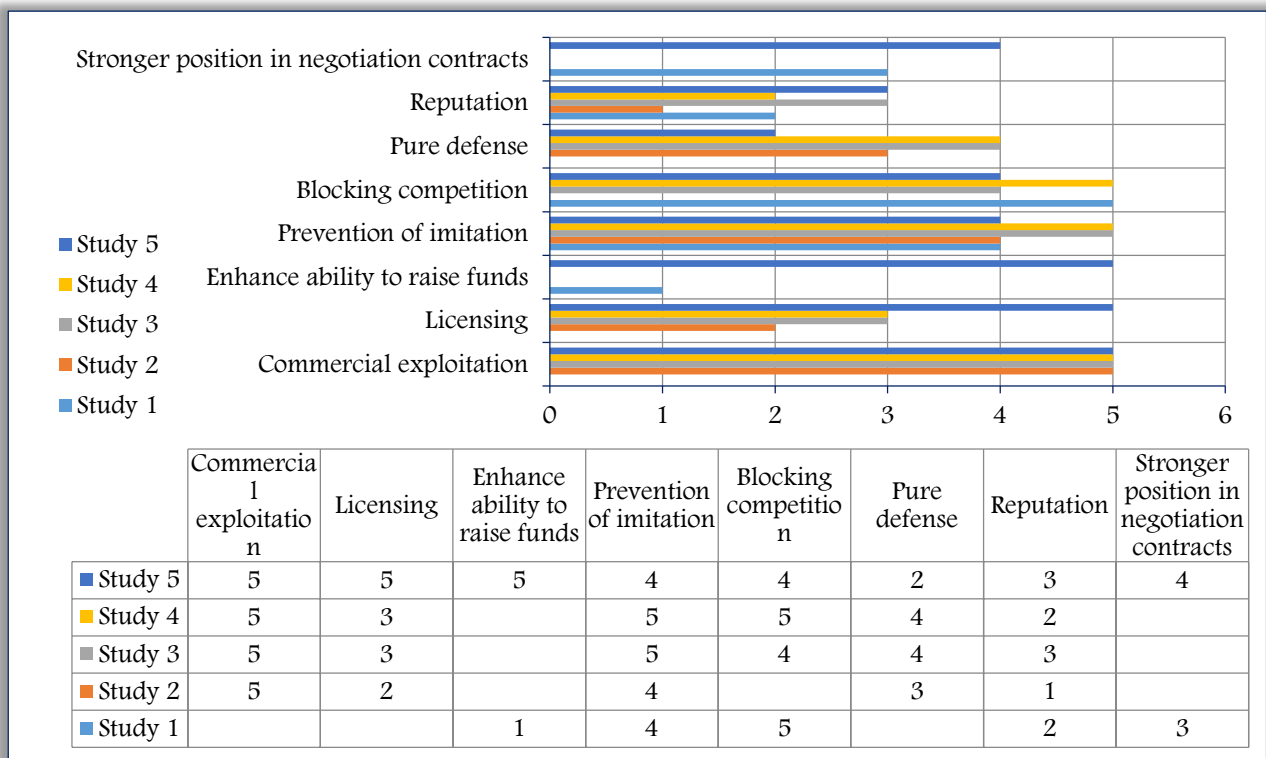
Table 3: Results from all three rounds in Delphi

Factors	Rating level of the factors															Level of importance	
	1 <sup>st</sup> round					2 <sup>nd</sup> round					3 <sup>rd</sup> round						
	mean	mediane	mode	interquartile		mean	mediane	mode	interquartile		mean	mediane	mode	interquartile			
				min	max				min	max				min	max		
Commercial exploitation	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5
Licensing	4.71	5.00	5.00	4.00	5.00	4.71	5.00	5.00	4.00	5.00	4.71	5.00	5.00	4.00	5.00	5.00	5
Enhance ability to raise funds	4.57	5.00	5.00	4.00	5.00	4.57	5.00	5.00	4.00	5.00	4.86	5.00	5.00	4.00	5.00	5.00	5
Prevention of imitation	4.43	5.00	5.00	3.00	5.00	4.43	4.00	4.00	4.00	5.00	4.43	4.00	4.00	4.00	5.00	5.00	4
Blocking competition	3.57	4.00	4.00	3.00	4.00	3.57	4.00	4.00	3.00	4.00	3.57	4.00	4.00	3.00	4.00	4.00	4
Pure defense	2.29	3.00	3.00	1.00	3.00	2.00	2.00	2.00	1.00	3.00	2.00	2.00	2.00	1.00	3.00	3.00	2
Reputation	3.71	4.00	4.00	3.00	4.00	3.43	3.00	3.00	3.00	4.00	3.43	3.00	3.00	3.00	4.00	4.00	3
Stronger position in negotiation contracts	4.43	4.00	4.00	4.00	5.00	4.29	4.00	4.00	4.00	5.00	4.29	4.00	4.00	4.00	5.00	5.00	4

The last step of the Delphi method was the analysis of the results.

Analysis of the results shows that the full consensus exists only for the first factor -“commercial exploitation”. Namely, all experts rate this factor as the most important through all three rounds. “Licensing”, “enhance ability to raise funds” and “stronger position in negotiation contracts” in the

first round have close mean values between 4 and 5 and interquartile range is 1, which means that experts rate them with 4 or 5 on the Likert scale. “Prevention of imitation” has the same mean of 4.43 together with “stronger position in negotiation” but the interquartile range of the “prevention of imitation” is 2 which means that the experts opinions are not very close and the highest rating is 5 while the lowest is 3. “Blocking competition” and “reputation” are very close with mean values between 3 and 4 as well as the interquartile range which is 1. “Pure defense” is the factor which is last and with the lowest importance among all experts with mean value in the first round of 2.29 and interquartile range between 1 and 3. After the third round there are no serious differences in the experts opinions. As said above the factor with the highest importance stays “commercial exploitation” with full consensus. On the second place of importance which means one level higher, is “enhance ability to raise funds”, while “licensing” is on the third place of importance. While “prevention of imitation” and “stronger position in negotiation” were with the same mean in the first round, however considering “prevention of imitation” the experts had closer opinions and it ended up on the fourth place while “stronger position in negotiation” on the fifth place of importance. “Blocking competition” had slightly lower mean value than “reputation” in the first round, but finally it ended up one level above, which means on the sixth place while “reputation” is on the seventh place of importance. Considering “pure defense”, it is on the last place of importance with the last score slightly lower than in the first round but the experts’ opinions are not closer, so interquartile range stays 2.



Legend: Study 1-Switzerland 2007, common outcome of 14 sectors  
 Study 2-U.S. and Japan 2007, common outcome of 6 main NBER technology classes  
 Study 3-EU countries 2010, common outcome of 6 industries  
 Study 4-Japan 2011, common outcome of 6 industries  
 Study 5-Macedonian furniture industry 2019  
 Figure 1: Comparison of factors among countries

By comparing the ratings among different countries/regions it could be concluded that “commercial exploitation” (where it was investigated in all countries excluding Switzerland) is the most important factor in all countries. “Prevention of imitation” is rated with high and very high level of importance in all countries including Switzerland. It is followed by “blocking competition” which is also rated as factor with high and very high level of importance, while other factors have mixed ratings among different countries. “Pure defense” has low level of importance in the Macedonian case while it has a high level of importance in other countries excluding Switzerland. “Reputation” is very low rated, from not important to medium in all countries, while two factors “enhance ability to raise funds” and “stronger position in negotiation contracts” are investigated

only in two countries. “Stronger position in negotiation contracts” is rated similarly in both countries, medium and high importance, while “enhance ability to raise funds” has the largest difference in ratings. It is less valued in Swiss study but it is one of the three most important factors in Macedonian case. The Figure 1 shows comparison of factors in all countries.

## 6. CONCLUSION

This paper investigates factors that affect motivation to patenting. Different studies in different countries show more or less different factors as well as different level of their importance. So, it was necessary to investigate all the factors that are mentioned in the surveys. For that purpose, as well as to get an expert opinion the Delphi method is used. Finally, comparison of factors and their importance among all countries is done. The most important factors in Macedonian case are “commercial exploitation”, “licensing” and “enhance ability to raise funds”. The first factor- “commercial exploitation” is on the first place of importance in all countries where it is investigated and there is no difference between developed countries and Macedonian case as a representative of developing ones. For the second factor “licensing” there is a difference among countries, but the most important difference is for the third factor – “enhance ability to raise funds”. Namely, this factor is on the last place in Swiss study but on the first place in Macedonian case. This means that Macedonian companies need external funds as a financial support in order to remain their competitiveness. It is expected that this paper will contribute to better understanding of factors that affect motivation for patenting. Also, because of the highest level of importance of the first three factors it will be useful to determine the contribution of each factor separately as well as their cumulative contribution. So, this paper is a base for further research on the motivation for patenting.

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**ANNALS of Faculty Engineering Hunedoara – International Journal of Engineering**  
ISSN 1584 - 2665 (printed version); ISSN 2601 - 2332 (online); ISSN-L 1584 - 2665  
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