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CZĘSTOCHOWA 2013

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FOREWORD

The Proceedings from international conference entitled "WoodEMA. Visegrad Innovations. Innovation as the source of values in the forestry, wood processing and furniture manufacturing" are published within the 6th edition of this scientific event that is organized by Institute of Production Engineering from Czestochowa University of Technology and the Managers of Quality and Production Association in cooperation with WoodEMA i.e. in 2013.

This scientific event is realized in the frame of the Visegrad Small Grant No 11310223 named "WoodEMA. Visegrad innovations". The conference is held under auspices of Ministry of Science and Higher Education Republic of Poland, The Marshal of the Pomorskie Voivodeship, President of Gdańsk and The State Forests National Forest Holding.

The main goal of the conference is an exchange and the knowledge transfer with regard to innovations in the forestry, woodworking processing and furniture manufacturing that can improve the competitiveness of the economy. Variety of topics covered in the articles resulted in the need for their division into thematic sections: trade and marketing, economics and investments, quality, production and innovation.

The conference material includes articles sent by experts, researchers and industry representatives from 11 countries (Croatia, Czech Republic, Germany, Italy, India, Poland, Slovenia, Slovakia, Spain, Russia, USA). Authors of articles present different points of view to organization, economics, marketing, trade and production management that can be useful for the business practice and can be source of initiatives for international projects connected with strengthening the enterprises and universities capacity.

Prof. techn. & econom. sciences S. Borkowski, PhD.,

editor

CONTENTS

TRADE AND MARKETING

Katarína Ďurková
The use of social media in communication of woodworking business……. **9**

Maja Moro, Darko Motik, Ksenija Šegotić, Andreja Pirc Barčić
Trends in foreign trade of the primary and secondary wood products……. **16**

Darko Motik, Andreja Pirc Barčić, Maja Moro, Kristina Liker
Consumption of selected wood products in Croatian and international markets..... **23**

Leon Oblak, Anton Zupančič, Miha Jukić
Model for the evaluation of television commercials of timber companies..... **30**

Andrea Vadkertiová
The use of information technology in communication between universities and companies of woodworking industry..... **36**

Monika Zajkowska
How to improve the competitiveness of furniture enterprises through clustering process?..... **42**

Ana Dijan, Marijan Kavran
Promotion of wood biomass and pellet in the countries of Southeast Europe……..... **49**

Renata Nováková, Andrea Tománková, Eva Habiňáková
Furniture fair and importance of marketing communication in the furniture industry..... **57**

Vladislav Kaputa, Hubert Paluš, Silvia Blažková, Mikuláš Šupín
Barometer of public opinion in attitudes towards wood products: a methodological approach…… **64**

Stanisław Borkowski, Renata Stasiak-Betlejewska
Forms of knowledge sharing in the woodworking industry on the polish example……. **68**

ECONOMICS AND INVESTMENTS

Jože Kropivšek, Matej Jošt
Financial analysis of Slovenian wood industry..... **77**

Marek Potkány, Gabriel Giertl
The using of operating leverage for the evaluation of investment effectiveness in the layered materials production……..……... **85**

Marek Potkány, Gabriel Giertl, Matej Turkota
Statistical prognosis of value added in the wood and furniture industry of the Slovak Republic..... **92**

Marcin Relich
Multi-project risk assessment for wood product development……..…… **101**

Richard Vlosky, Dek Terrell
Forest-based Bioenergy-Production: Implications for Rural Economic Development in Louisiana, USA……..… **109**

Hubert Paluš, Ján Parobek
Development of roundwood deliveries in Slovakia..... **119**

Agata Kielesińska
Determinants of sustainable development in corporate social responsibility…… **126**

Anna Adamus-Matuszyńska, Izabela Niziałek
Corporate Social Responsibility (CSR) strategies in the Polish wood industry……..... **134**

QUALITY, PRODUCTION AND INNOVATION

Sachin V. Bhalerao, Atul B. Borade, Samir J. Deshmukh
Engineering applications of wood with reference to prototype manufacturing using rapid prototyping technology……. **143**

Kristina Bičanić, Krešimir Greger, Tomislav Grladinović, Miljenko Klarić, Renata Stasiak-Betlejewska
Enteprise content management system (ECM) as an auxiliary tool for implementation of ISO 9001 standard..... **151**

Magdalena Bielawska
Role of the institutional support in boosting innovation in wood-furniture industry. The case of cemer..... **157**

Agapova Elena N., Egorova Elena N., Kuznecova Ulia O.
Overcoming resistance of staff in introduction the quality management system in woodworking industry……..…… **165**

Pavol Gejdoš
Selected attributes of quality management systems certifications in wood processing industry in Slovakia..... **172**

Jarmila Klementová, Anna Šatanová
The quality of the services in the Slovak Library of Forestry and Wood Sciences at the Technical University in Zvolen……..... **178**

Nataša Náprstková, Daniela Kalincová
Testing of the welding blades material for the beams production……..…… **187**

Magdalena Olkowicz, Wacław Szymanowski
Identification of areas to improvement in the new product development process – a case study in the Polish furniture industry…… **193**

Justyna Patalas-Maliszewska, Irene Krebs
Knowledge transfer solution in the enterprises: Business-to-Business Integration Model……..…… **201**

Eduard Prachniar, Drahomíra Prachniarová Bohušová, Rudolf Rybanský
Project management certification in wood industry enterprises…….…… **207**

Ajay Rathod, Avinash Kolhatkar
Bamboo: An Alternative Source for Production of Textiles……..…… **213**

Robert Ulewicz
The use of Kano questionnaire to study the wooden furniture quality attributes..... **221**

Emilia Grzegorzewska
Innovativenees of wood sector enterprises in Poland …… **229**

Alberto di Taranto, Renata Stasiak-Betlejewska
Research about passive wooden houses in a case of earthquake and fire: Dolomiti Pro final results. view about next researches..... **235**

CHAPTER 1

TRADE AND MARKETING

THE USE OF SOCIAL MEDIA IN COMMUNICATION OF WOODWORKING BUSINESS[1]

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ABSTRACT

Using the Internet in Corporate Communications for several years changed the long established practice of communication with the target audience. Article interlace processing results of qualitative observation of social networking businesses in timber industry - furniture stores in Slovakia. I have followed assessment parameters of using social media as a marketing communication tool in the sale of furniture: the number of fans, activity and interactivity of communication, communication flexibility, user activity.

Keywords: marketing communications, social media marketing, social networking, communication activity and interactivity, flexibility of communication

1. INTRODUCTION TO THE THEORY OF SOCIAL MEDIA

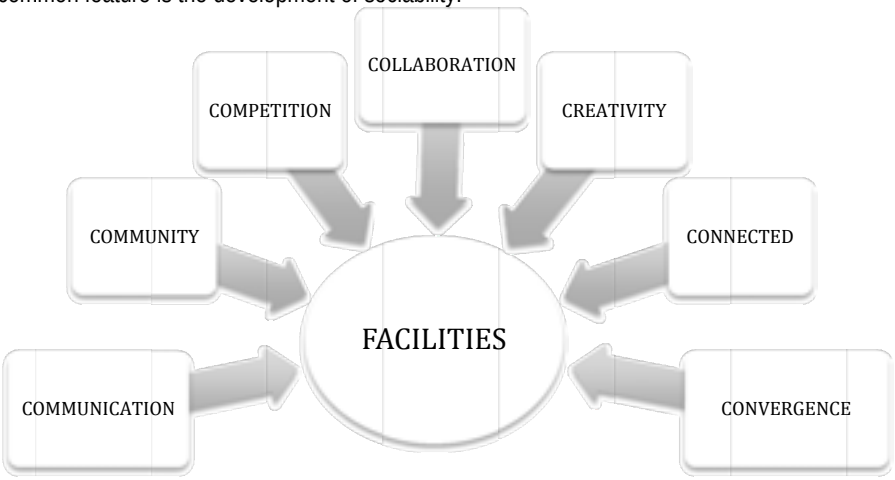
Internet usage in corporate communications for a few years changed a few decades operating procedures used before. Internet not only allows easier access to communicate one-to-one, but changed it to communicate many-to-many. Any information can be delivered to the "infinite" number of persons, each "connected" person can control the message, edit it, give its opinion, complement further. This way interactive communication is referred to Web 2.0 and symbolizes a new generation of Internet services, applications, websites, social networks, blogs and so on. Wider possibilities of using communication tools, however, does not automatically mean easier communication with the target audience. Online space in general brings businesses and their customers many benefits. The main benefit is the online space for the client user experience in selecting and purchasing, the ability to instantly compare prices and overall supply enterprise. The most important benefits to the enterprise can be classified as:

- A wide range of tools,
- Wide content
- Global action,
- Quickly update,
- Multimedia space,
- Precise targeting,
- Good measurability,
- Continuous interactivity,
- Lower cost compared to advertising in traditional media.

2. SOCIAL MEDIA AS A MARKETING TOOL

In theory we can meet with several concepts - social media (an umbrella term for any Web 2.0 formats) and consumer generated media, which are more consumer-oriented. (Přikrylová, Jahodová, 2010).
Under the social media can include a variety of media that people use to assemble and develop social contacts. Scott (2010) identifies the site as a city in which corporate website showcasing perceived as the main street and social media as a place where people associate to have fun.
Among the reasons for the growing use of social media choice of many following:
- Using them more than 70% of the internet population,
- There they are fair people who switched create real relationships,
- More than 50% of social media users is connected with their favorite brands,
- More than 40% of the total number of daily posts on social networks comes from the brand communication.

Characteristics of social media, some authors refer to as the so-called. "Cees". Their common feature is the development of sociability.



Pic. 1. Social media facilities

2.1. Social networking sites

Facebook, Twitter, My Space, LinkedIn, Flickr web clusters are primarily aimed at finding, establishing and maintaining contacts between users to create their own content and share it with your friends. Interconnected people monitor their activities and views and to comment on them. See what others are experiencing exactly what places they visit, who they meet. The population over 14 + years, used under IVO news social networks more than 54% of the population, 25% of them knows, but does not, and only a fifth of the population does not know them. The phenomenon of the popularity of social networking, some authors derive from previous anonymity on the Internet. From a marketing perspective, we characteristics of social networks can be summarized as follows:

- Represent a space for conversation
- Provide content sharing

- They offer space for publishing content formed by its users
- Support the participation of users to create their content.

The combination of these properties and gives space activities and functions such as building relationships, distribution of user-generated content, assessment and marking content as well as entertainment. Allow precise targeting of marketing activities on the basis of accurate (or at the profiles listed) sociodemographic parameters, thereby creating space for effective campaigns.

Create a company profile, brands on social networks has also nekomečný commercial purpose. They can be used to achieve the following objectives:

- Building a PR and corporate reputation, brand
- Creation of community supporters
- Active communication with supporters
- Space for publishing content
- Advertising campaigns with accurate targeting

Through social networks can communicate in particular:

- Current events - interesting information from the internal affairs of the company.
- Important Information - news, announcements, instruction manuals, reviews and the like.
- Surveys and contests - consumer surveys and contests.
- Interesting Photo - Photo of presentations, exhibitions, corporate events and the like.
- Video content - information, instructional videos and reports.

(Http://marketing.krea.sk/clanky/socialne-siete/)

The most widespread social networking is now Facebook. This social network is a great place to keep in touch with which the person or online encounter. Number of users is increasing every year and although most numerous group of just 15 to 35 years generation, increasing its popularity even generations over 35 years. When communicating brand, the company FB is not the direct promotion and certainly not for sale. Facebook allows you to create groups of people who want to be informed and to develop communication with them. For people such communication is convenient - have access to all information communicated, communication does not act violently, makes it a lot easier to pay attention to news and offers before it's through e-mail. On the other hand, it is also true that people often marked by "I like it" spontaneously, without knowing the detailed information, click through just to "friend" back "liknutie".

FB marketing potential, we could summarize do5 category:

1 obtain information about the interests of the target group,
2 precise targeting ads to target group
3 virally spread messages
4 personalize web content according to visitor preferences,
5 communication with target groups and surveys.

2.2. Websites for downloading videos and photos

Communicating through video is an effective way to reach potential customers and support the presentation of products and services just by combining the advantages of television advertising and the biggest advantages of the Internet - interactivity. Audio and video sites also thanks to high-speed internet and simplify the creation and downloading recordings gained great popularity among the people. Video communications posts (link audio and video) for customers interesting than text ads, allow you to communicate much more intense and more personal than text alone, respectively. only visuals. Their advantage is also presenting

the essence of speed and greater clarity contributions. Video posts have a higher potential for viral spread through social networks than text. Benefits of video marketing wrapped up on their site Krea Agency (2012) as follows:

- Low cost of producing videos (I add a low cost of further spread of videos - does not apply to such media landscape. Ads on TV).
- Easy pervasiveness on the internet.
- Ability to effectively inform and engaging.
- Support for PR and communication with customers.
- Attraction of using audiovisual communication.
- Support image as a modern company pursuing new trends in communication.

Increased efficiency in the search results. For customers, are interesting short, engaging and information-rich videos. The aim of the company is through video marketing to encourage customer interest in advertised products, because people appreciate professionally processed videos. I for both video is an important subject and context, to take rather more short works, with specific answers to questions that customers might interest than one long. On the other hand, companies can support the development of video customers on a variety of topics related to the product. E.g. product is known for its cleaning ability without the use of chemicals - customers may be motivated to shooting video on how such. clean the greasy window only with specific cleaning cloth, without the use of thinners. Although video marketing has its risks - freeware contents can be modified to the detriment of, ridicule product

3. RESEARCH METHODOLOGY

The article processing the results of qualitative observations using social media of 20 companies - retailers of furniture in Slovakia, which are located in the first 20 companies displayed through the Google search engine (see 04/20/2013). The reason for this choice was that the sample of enterprises to be active interest in the business view in preferred search engine positions, what precedes SEO website. Instantiation enterprises are presented in a table in the results work. The aim of the research was to identify approaches to the implementation of enterprise social media into the overall business communication activities. The original intention of the activity of enterprises to analyze all the social media I could not wholly fulfilled. These businesses only slightly (as I will present below) using the power of social media to build your imižu and relationships with their customers.

Of social media were monitored social networks (the original intent traceability of activity on all networks has been narrowed to Facebook, as other networks listed companies have not yet benefited). Parameters evaluation Facebook page are as follows:

- Number of fans
- Activity and interactivity business - adding posts, the rate and level of response to stimuli operator users
- Flexibility company
- Users aktivity.

The scale of interactivity:

1. Company responds to all stimuli, both positive and negative, itself generates the content of their site in a way that enhances user experience and strengthens its credibility.
2. The company responds to all stimuli, but it not alone initiative.
3. Company responds only to positive or neutral stimuli, the negative are ignored.
4. Company responds only sporadically to stimuli of social networks.
5. The company is completely unresponsive to stimuli of their customers.

For flexibility, the following scale:

1. Company added content every day, responding to the seasons, offering interesting pictures equipment rooms, refer to it simply to share their day.
2. Company added content once every 2-3 days, responds to the seasons, offering interesting pictures equipment rooms, refer to it simply to share their day.
3. Company added content every 4-10 days. Particular attention to their actions, stock goods (for more frequent communication is objectionable content)
4. Company added content only sporadically, irregularly, the content is largely the information on stock clearance sale
5. the company has more than ½ year did not add any new content.

I also monitored social media connection to the official website of the company. Other social networks are not included because this furniture stores don't use them as communication tool. In using Youtube Channel I have given only descriptive analysis because utilization of this channel is very low.

4. THE RESULTS OF USE SOCIAL MEDIA BY FURNITURE STORES

The following table provides an overview of the use of Facebook by individual companies. Companies are ranked according to their ranking in the search engine Google over keywords: "furniture sales". The first three companies to place given by prepaid space, and thus their claims, however, since all three are actively using social networks to communicate with the target audience.

- Furniture stores while only marginal in its extensive use of social media marketing communications. Half of all monitored shops yet missed the opportunity to brand building and strengthening relationships with customers through social media. These include well-known brands in this segment, such as. Ekoma design, Atrium, Elmina.
- Low level of this communication is Drevona. Its communication is only sporadic, it is not related to the official website, adding frequency content is too low. Creates a bad impression and the sheer number of fans on the site, which is within two years of a profile on FB got to number 5
- The average level of this communication are eg. Mobel Linea design, furniture Galan. The content and method of communication listed companies can be assessed positively, problematic frequency is adding content and in some cases the content itself. The content consists mainly of information about ongoing promotions of a particular company is not communicated to other added value information that would support building a relationship.
- Well done to the social network communicate IKEABratislava, Cult Mobel, UNO Idea Furniture, Furniture and ASKO Albero. Their activity is regular, the contents are different inspirations in the following example. the season, current weather and holidays. They offer inspiration interiors of their stores with direct reference to the visit intenetovej site. If the question asked by the customer during working hours, respond immediately, otherwise within an average of 24 hours. ASKO only communicates more content focused on promoting marketing activities. Those stores have their own website and FB linked in content and design site.

Tab. 1. Results

NAME	FANS	BE ON FACEFOOK FROM	INTERACTIVITY	FLEXIBILITY	NOTES
KULT MOBEL	5.316	From 2012	1	1	Excellent content, link to website
Idea UNO furniture	147	From 2010	1	2	Nice inspiration from shop
ASKO	4.343	From 2012	1	2	Sales content,
VERA furniture	-	-	-	-	-
Galan furniture	2.189	From 2011	1	4	Content added sporadically
IKEA Bratislava	20.215	From 2011	1	1	Excellent use of space
ALBERO	2.234	From 2010	1	2	Articles in combination with actions
Drezy online	-	-			-
ELMINA	-	-			-
Sedačky R1	-	-			-
Ekoma design	-	-			-
DREVONA	5	From 2012	4	5	Unlinked to www pages, only 2 posts
MERITO	-	-			
DECODOM		From 2010	1	3	Competition, events, actions, they answer to questions
Rajčan furniture	-	-			-
ATRIUM	-	-			-
Mobel	10	From 2012	2	4	Actions, only 8 posts
Linea design	88	From 2010	1	4	Irregulatiry
WE-TEC	-	-			-
Top Ratan	-	-			-

- Number of fans surveyed enterprises is different, however, in ¼ limit was exceeded 2,000 fans. The actual activity of the fans is low. Even if IKEABratislava, which has the largest number of outlets all LIKOV on their status, it is activity only at max. 0.01% of users. In response to calls to number ranges mikročíslach. Neither company does not use the status "challenge", occurs rarely question.
- Is problematic in the case of IKEABratislava existence of multiple pages IKEA in Slovak version. Active duplicate sites is low, but customers into thinking that they are official sites, write questions that remain unanswered. If the title page insert after the word IKEA gap, we have official Slovak branch system will not search. Missing answers to customer questions give the impression of indifference and ignorance, which throws the company a bad impression.

Use youtube channel is for furniture stores in Slovakia, while only a marginal component of the marketing communications mix. Of the surveyed stores it until that date only use 3 trades - ASKO, IKEABratislava and Decode. ASKO uses youtube particular posting ads, which does

not bring any added value to the customer. Content youtube channel IKEY and Decodomu is much more interesting for the user. In addition to commercials you like. interior inspection of stores, video instructions on folding furniture, such as haircuts. from opening stores, participation in the exhibition, short lectures on trends and the like. Attractiveness content has a direct effect on the channel's viewership, which is several times higher than in ASKO.

5. CONCLUSION

Research of the use of social networking by furniture stores in Slovakia confirmed the low level of use of these tools in marketing communications listed companies. The most common reasons for this situation can be made from other existing research and practice indicate particular problems of online marketing ignorance, lack of qualified human resources, in some enterprises and budgetary constraints on communication activities. Construction segment is delayed adapt to innovations in marketing communications. Similarly, it is true for traditional industries to which they belong and the timber industry. Businesses that have managed to capture the trend and upgrade their communication activities and the non-traditional and new forms of communication are compared with other competitive advantage. Paying attention to this form of communication can bring long-term trade-loyal customers. Generation Y, which is the typical user of social media, decorate their first home. When selecting products - household device, proceed as with any other product team - through market research in a virtual environment. Neglect of this communication may, in terms of enterprise Long.term weaken. It should also be noted that the main role of communication through social media is not right to sell, but increase the value of the relationship. Any violent communication has the opposite effect.

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TRENDS IN FOREIGN TRADE OF THE PRIMARY AND SECONDARY WOOD PRODUCTS

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ABSTRACT

Wood processing is one of the most significant segments in Croatian wood industry. On the basis of established values for period 2000-2011, in this paper we discuss a possibility to predict trends in foreign trade of primary and secondary wood products. The data of import and export values through analyzed period are gathered from Croatian Bureau of Statistics and include the main countries for foreign trade activity with Croatia. The main import-export markets are Italy, Slovenia, Austria and Germany in which it were achieved almost 65% of total value of import and export of a primary and secondary wood products for period 2000-2011. Nearly 40% of total value of export of Croatian wood processing is realized in the Italian market. Over 50% of total import value makes wood products imported from Slovenia, Austria and Bosnia and Herzegovina. In order to predict a future trends in foreign trade, dynamic economic analysis of time series data was performed.

Key words: wood processing, import, export, trend, forecasting

1. INTRODUCTION

The key to survival and growth of an organization is in ability to adapt its strategy to rapidly changing enviroment (Kotler, 2001). According to Samuelson and Nordhaus (2003), economic theories are dynamic by nature and now we are witnessing almost everydays changes that are caused by the penetration of IT and computer science revolution. In this new and dynamic conditions it is necessary to strive for a new standards using economic theory for the qualitative and quantitative analysis of markets. Interpreting economic data and forecasting the future economic values are under the influence of environment and government policies, starting from the basic economic theories that operate in the market (Fair and Case, 1989). According to Lovrinčević (2001), specific developments in some key macroeconomic variables, such as employment, production, imports, exports, the exchange rate of national currency, etc., characterize different turbulent periods of Croatian history. Knowledge of the market situation with primary and secondary wood products directly affects on all companies in the sector, their development, growth and business success in the future (Motik, 2010.).

This paper discuss a possibility to predict future export and import values of primary and secondary wood products on the basis of established values in the period 2000-2011. Because of a turbulences in this market, as well as a length of the analyzed time series, prediction is limited to the year 2017.

2. MATERIAL AND METHODS

Analysis of Croatian wood processing foreign trade follows the time course of two key macroeconomic variables, export of primary and secondary wood products from Croatia and import to Croatia for period 2000-2011. The data had been gathered from the database of Croatian's State Bureau of Statistics (DSZ), Ministry of Finance and Financial Agency (FINA). The data are shown in Tables 1 and 2.

Table 1. Export of Croatian primary and secondary wood products for period 2000-2011

International State Code	Export (mil. EUR)											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AUT	20,9	16,8	17,1	17,3	17,6	18,8	22,5	31,1	29,2	28,2	32,3	39,8
BEL	6,1	6,5	4,9	5,2	6,9	7,4	5,1	7,6	6,3	5,0	5,8	7,0
BIH	6,4	5,8	8,0	8,2	9,4	12,1	13,0	21,6	24,7	17,4	19,0	19,5
CHN	0,8	0,9	0,8	0,4	0,3	0,4	1,2	1,0	1,7	0,7	1,5	6,6
CZE	0,8	1,0	1,0	1,5	1,3	1,5	1,5	2,0	1,8	2,1	2,8	3,2
EGY	6,7	6,9	7,9	8,5	8,0	11,2	18,2	22,5	34,7	32,5	34,1	34,1
ESP	5,5	8,6	8,8	8,3	7,6	7,6	9,7	9,2	7,1	4,8	3,6	2,4
FRA	3,1	3,6	4,2	5,3	4,2	3,6	5,3	4,3	5,1	4,0	5,1	6,7
GER	26,0	20,4	16,5	19,0	17,6	15,3	17,9	27,0	29,2	27,4	30,3	38,2
HUN	1,1	1,9	3,6	3,2	3,3	3,9	3,5	8,5	10,2	7,8	11,4	16,6
ITA	112,5	107,9	111,5	115,7	119,1	122,1	135,0	151,6	137,4	115,3	137,0	145,8
SLO	29,5	25,8	30,1	31,9	35,8	40,0	42,4	45,2	44,4	36,6	40,4	51,7
SRB						6,0	11,0	14,0	16,8	12,6	10,2	7,9
SUI	3,3	4,2	3,6	6,4	10,2	10,4	10,6	9,7	11,1	10,2	10,6	9,8
SWE	5,6	5,3	3,0	4,5	4,8	6,1	5,3	6,0	4,7	4,7	4,4	4,8
Others	17,0	14,5	14,4	18,5	25,1	25,7	30,6	41,6	36,9	24,6	28,3	45,7
Total	**245,3**	**230,1**	**235,2**	**253,9**	**271,2**	**292,2**	**332,9**	**402,9**	**401,1**	**333,8**	**376,8**	**439,8**

Table 2. Import of primary and secondary wood products in Croatia for period 2000-2011

International State Code	Import (mil. EUR)											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AUT	12,3	19,3	26,3	29,5	31,0	32,7	39,2	49,0	48,8	36,8	33,6	34,6
BEL	1,0	1,3	1,8	1,5	1,8	2,2	2,7	1,7	1,8	1,5	1,1	2,5
BIH	14,9	24,1	28,3	34,9	36,0	28,0	34,7	38,2	33,9	23,2	23,2	24,2
CHN	0,4	0,8	1,6	2,0	3,7	6,4	7,5	12,3	12,8	7,5	6,4	6,7
CZE	2,5	3,5	3,2	4,1	4,3	4,2	6,6	8,2	8,7	5,9	5,6	6,7
ESP	0,1	0,3	0,6	0,5	0,8	0,5	0,6	0,6	0,6	0,4	0,6	0,4
FRA	0,7	1,1	1,0	1,5	1,4	1,2	1,9	2,0	1,7	1,1	0,8	1,4
GER	12,2	14,3	16,7	19,4	21,4	18,9	22,7	24,8	25,0	24,9	20,2	22,3
HUN	7,1	6,4	7,1	7,3	8,3	8,6	7,3	7,2	7,9	6,0	6,2	6,3
ITA	8,4	9,1	12,1	13,4	14,6	17,2	20,2	22,4	25,9	19,6	15,4	16,4
POL	0,9	2,9	4,8	6,2	7,8	9,0	8,1	7,5	7,6	6,7	5,1	4,9
SLO	32,0	37,2	42,7	46,6	43,4	47,3	53,6	54,3	58,8	37,4	29,0	26,5
SRB						2,5	4,2	4,7	5,6	3,3	4,6	4,0
SUI	2,2	1,1	1,0	0,9	0,4	1,2	0,8	0,6	0,4	0,4	0,4	0,2
SWE	0,8	0,8	0,6	1,2	1,0	1,2	1,0	0,6	0,5	0,6	0,7	1,5
Others	10,6	12,8	14,1	18,9	19,7	18,7	20,3	25,9	24,4	17,0	14,0	12,9
Total	**106,2**	**135,0**	**161,9**	**187,9**	**195,7**	**199,8**	**231,3**	**259,9**	**264,4**	**192,4**	**167,0**	**171,5**

The analysis involved 16 countries that were included in both, export and import of primary and secondary wood products in period 2000-2011, and according to share of that trade in total amount. Only exception are Poland were we analyzed only export and Egypt were we analyzed only import of primary and secondary wood products, because the values of import from Poland and export in Egypt were marginal.

For the purposes of forecasting future trends in the indicators of market conditions (export and import of primary and secondary wood products), the dynamic economic analysis of time series data was performed. Three types of time series models were built: models based on average rates of change (models A), linear trend models (models B) and logarithmic trend models (models C). According to Rozga and Grčić (2000), by using models we got a picture of what happened in the (near) past, what is the current situation, and planned and future course of events, i.e. the movement of each indicator in the near future. It is known that future projections of development can not predict the detail movement of market indicators, they are only a rough indication of the future course, assuming that the macroeconomic policies won't change significanty (Hanke and Reitsch, 2001).

3. RESULTS AND DISCUSSION

The main import-export markets are Italy, Slovenia, Austria and Germany in which it were achieved almost 65% of total value of import and export of a primary and secondary wood products for period 2000-2011. In Italy it was achieved 28%, in Slovenia 15,8% and 11,2% in Austria, while other states participated with less than 10% in total amount of export-import trade (Germany 8,7%, Bosnia and Herzegovina 8,4%, Egypt 3,7%, Hungary 2,6% etc.). Shares of export and import foreign trade of a primary and secondary wood products according to countries are shown in Figure 1.

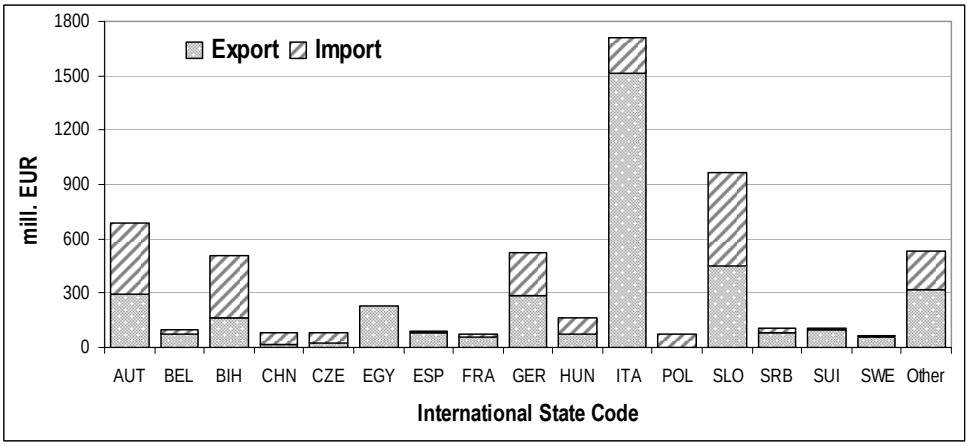

Figure 1. Shares of export and import foreign trade according to countries for period 2000-2011

Nearly 40% of total value of export of Croatian wood processing is realized in the Italian market. Over 50% of total import value makes wood products imported from Slovenia, Austria and Bosnia and Herzegovina. Distribution of export of a primary and secondary wood products from Croatia according to main export markets for period 2000-2011 is shown on Figure 2 and distribution of import in Croatia according to main import markets for the same period is shown on Figure 3.

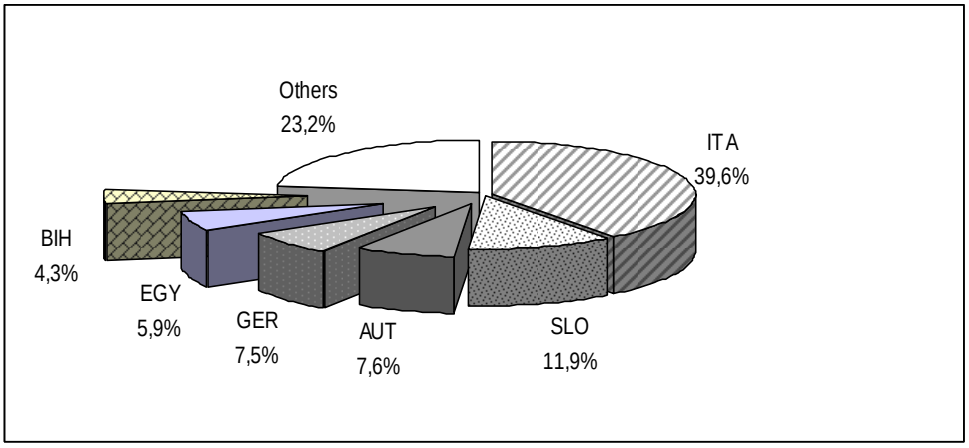

Figure 2. Distribution of export from Croatia according to main export markets for period 2000-2011

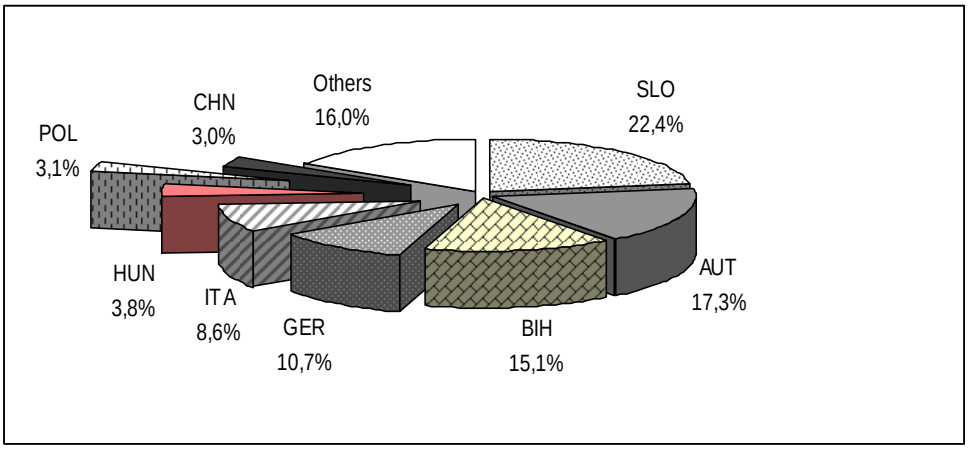

Figure 3. Distribution of import in Croatia according to main import markets for period 2000-2011

According to Blažević (2007), when the rates of change in successive time periods are approximately equal, and assuming that the average rate of change will not change, with the average rate of change can be predict variable values in future period. Based on the average rates of change for export (5,45%) and import (4,45%) of a primary and secondary wood products in the observed period models A for prediction of future values of exports $\hat{E}_A(t)$ and imports $\hat{I}_A(t)$ were developed.

Correlation analysis to determine the degree of correlation between the values of export and import as dependent variables and time (*t*) as independent variable was used. We found that the direction and strength of the correlation relationship was positive and high in both cases, so we developed linear trend models (models B) and logarithmic trend models (models C) for prediction of future values of exports $\hat{E}_B(t)$, $\hat{E}_C(t)$ and imports $\hat{I}_B(t)$, $\hat{I}_C(t)$.

In all models, *t* is mark for the *time*, where *t* = 1 compared to year 2000, *t* = 2 for year 2001; ... , *t* = 14 to year 2013, etc. Units for predict values of import and export are one million €. Constructed models A, B and C for predicting the future values of exports and imports of a primary and secondary wood products are shown in Table 3.

Table 3. Models A, B and C for calculating the future export and import values of a primary and secondary wood products

Models	Export (mil. €)	Import (mil. €)
model A	$\hat{E}_A(t) = E_1 \cdot 1,0545^{t-1}$	$\hat{I}_A(t) = U_1 \cdot 1,0445^{t-1}$
model B	$\hat{E}_B(t) = 18,61 \cdot t + 196,99$	$\hat{I}_B(t) = 6,38 \cdot t + 147,93$
model C	$\hat{E}_C(t) = 80,71 \cdot \ln(t) + 97,03$	$\hat{I}_C(t) = 41,37 \cdot \ln(t) + 120,51$

Comparison of existing and calculated predicted values by models A, B and C for export of Croatian primary and secondary wood products is shown in Figure 4, while the comparison of existing and calculated predicted import values is shown in Figure 5.

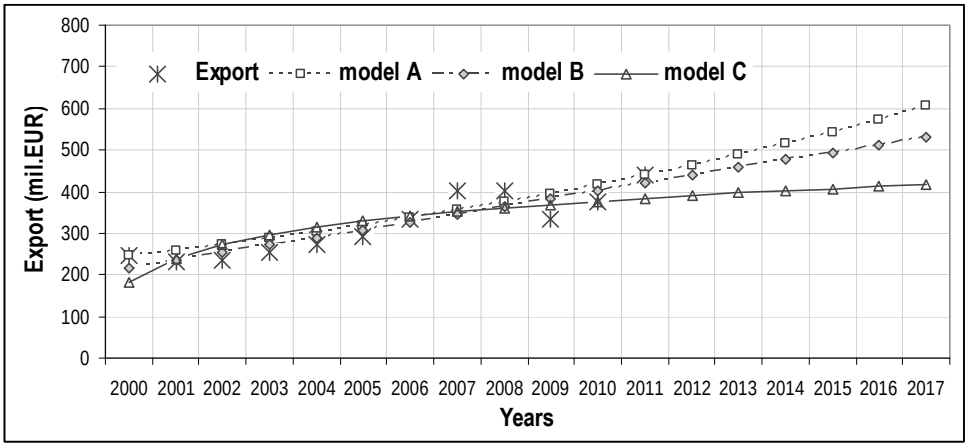

Figure 4. Existing and projected export values of a primary and secondary wood products till 2017

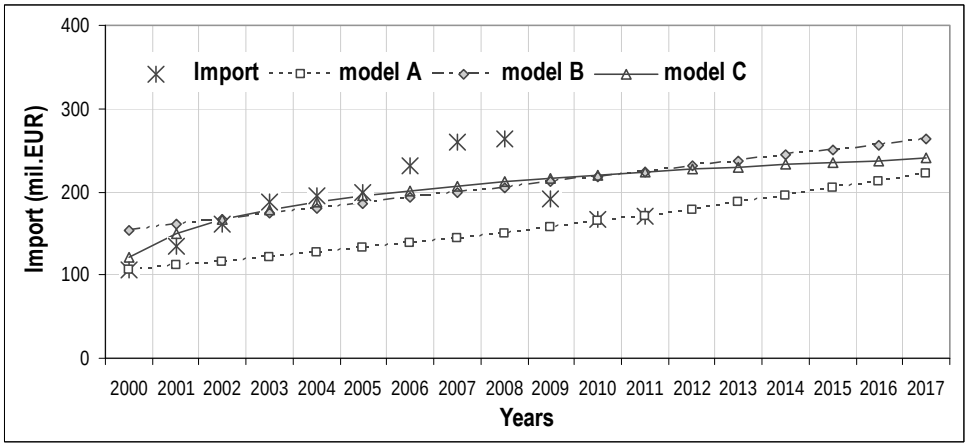

Figure 5. Existing and projected import values of a primary and secondary wood products till 2017

According to the linear trend models (models B), the expected linear increase in the annual export value of Croatian primary and secondary wood products is 18,6 million € and expected linear increase in the annual import value is 6,4 million €. According to constructed logarithmic trend models (models C), we expect 232,5 mil.€ for the value of import in year 2014, while the value of export of a primary and secondary wood products will raise to 402,1 mil.€ .

4. CONCLUSION

Applying methods that have not been traditionally used could be help at the strategic, tactical and/or operational planning level and decision making in the managing of a wood sector, and businesses entities of our timber industry. Assuming that the macroeconomic policies will not be altered, and assuming that the models for predicting future values of export and import of a primary and secondary wood products satisfy all statistical and theoretical terms, constructed models A, B and C could become a great help for a future actions. By applying models companies that deals with a primary

and secondary wood products will be able to define the future business strategy.The paper could also help to research institutions for decision-making and strategy development.

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CONSUMPTION OF SELECTED WOOD PRODUCTS IN CROATIAN AND INTERNATIONAL MARKETS

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ABSTRACT

In the recent years market of wood and wood-based products on the global and European level, and also in Croatia has going through turbulent times. With regard to the economic problems, a decline in consumption of wood product was expected. In days of crisis, when purchasing power of the population decrease, products such as wood based products are not on demand priority list. The goal of this work is to determine the consumption of selected wood products – round wood and sawn wood, in some international markets and in the Republic of Croatia by applying the third method of calculating apparent consumption. Croatia is still lagging behind in regard to the European average consumption and the average consumption of EU-27 countries, especially if we take into consideration countries like Finland and Austria. Although it is an undisputed fact that the consumption of wood products should increase in Croatia, with respect to the global consumption and consumption of surrounding countries Croatia uses wood as material in higher volumes.

Key words: wood products, round wood, sawn wood, consumption, international markets, Croatia

1. INTRODUCTION

In the recent years market of wood and wood-based products has going through turbulent times on the global and European level, and also in Croatia. With regard to the economic problems, a decline in consumption of wood product was expected. In days of crisis, when purchasing power of the population decrease, products such as wood based products are not on demand priority list. According to the Croatian Chamber of Economy, in 2009 the intensity of the global crisis was shown by the fact that the world economic activity achieved a decline first time in more then half of the century. In four of the world's five largest economies, which represent four to five percent of global GDP, there was a significant decrease, while only China withholds a growth rate. In 2012 the world growth was forecast to be 3.5%, a slight decline from 2011, but a minor increase is expected in 2013. During the past years, the eurozone has been moving from one crisis to another. In the European Union, which presents the biggest Croatian economic partner, an economic decline of 4, 2% was note in 2009, which continued also in 2010. In the EU and South-East Europe, real GDP is still below the pre-crisis levels and industrial production is 12% below its mid-2008 peak (UNECE/FAO, 2012). Also according to the same source, UNECE/FAO (2012), the transition countries were the worst affected region of the world during the 2008-2009. As well in Croatia, according to the Central Bureau of Statistics data, economic growth

was slowed down with the total decline in GDP of 6,9% in 2008 and followed in 2009. In overall a decline of Croatian economic activity, is affected by disruption in the global market, on the one hand and on the other by perennial structural problems in Croatian economy. Also in 2010 Croatian economic activity was decreasing, which was continued in 2011 and 2012.

Consumption is the physical use, or the use of products and services for the purposes for which they are intended. Consumption satisfies the needs which have caused the purchase of these same products in the first place (Grbac and Meler, 2007). There are three methods of calculating the consumption of wood and wood products. The first is based on the data collected from wood and wood products sellers on the quantity of wood and wood products sold on the certain market over a specified time period. The second involves surveying wood and wood products consumers using generally accepted consumer survey methods. The third involves calculations with so-called apparent consumption.

The goal of this work is to determine the consumption of selected wood products – round wood and sawn wood, in some international markets and in the Republic of Croatia by applying the third method of calculating apparent consumption.

2. MATERIALS AND METHODS

In the article data on consumption of selected wood products (round wood and sawn wood) per capita were taken from the annual statistical reports of United Economic Commission for Europe (UNECE) and Food and Agriculture Organization of the United Nations (FAO) for the period 2001 to 2010. Paper analysis enclosed consumption per capita and average consumption per capita for: the World, the Europe, the European Union, countries of South-East Europe, selected European countries (Austria, Finland, Italy, Germany, Poland, and Slovakia), and Croatia for period from 2001 to 2010.

Population of the European Union (EU-27) for the purpose of calculation of selected wood products per capita in EU was taken from the official *web-site* of EU. The total of EU population is 501.259.840.

Type of consumption analysed in this article was calculated using so-called 'apparent consumption'.

The obtained results are expressed in quantitative (m^3) values.

3. RESULTS AND DISCUSSION

According to the data shown in Table 1 and Figure 1the world average consumption of round wood per capita was about 0,49 m^3 in the observed period from 2001 to 2010. The highest consumption was achieved in 2005 and 2007 (0,51 m^3 per capita) and the lowest in 2001 and 2009 (0,49 m^3 per capita). At the European level, the average consumption of round-wood per capita (in the observed 10-year period) was about 40% higher in comparison to the global consumption of round-wood (amounted 0,84 m^3). In the Europe the highest consumption of round-wood per capita was reached in 2007 (0,95 m^3) and the lowest was noted six years earlier (in 2001). In addition, in the observed period (2001 – 2010) a relationship between annual round-wood consumption per capita in the Europe and the European Union (EU-27) was almost equal. 2007 both in the Europe and in the European Union was the year with the highest consumption of round-wood per capita with amount of about 1,23 m^3. In the EU-27 the average consumption of round-wood was 0,87 m^3 per capita in the period from 2001 to 2010.

In the Southeast European countries the average consumption of round-wood per capita was almost at the European level of consumption. The lowest level was generate in 2001 and the highest in 2006 (0,72 m^3). Regarding the average consumption of round-wood per capita in the ten- year period it

can be noted that consumption of round-wood in the area of Southeast Europe is higher in comparison to the world average round-wood consumption, but is below the European and the European Union average consumption (Figure 1).

Considering and comparing the consumption of round-wood due to the population between European countries, Finland is outstanding particularly. In Finland, in the observed 10-year period, the average consumption of round-wood per capita was about 13 m^3, which is 26 times more in comparison to the world and 15 times more in comparison to the European and EU-27 average consumption of round-wood per capita.

Table1. Round-wood consumption per capita from 2001 to 2010 (in m^3)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
category	Consumption per capita (in m3)									
WORLD	0,47	0,48	0,48	0,49	**0,51**	0,50	**0,51**	0,49	0,47	0,49
EUROPE	0,74	0,78	0,80	0,82	0,91	0,87	**0,95**	0,87	0,77	0,87
EU-27	0,77	0,78	0,82	0,83	0,94	0,88	**1,23**	0,86	0,77	0,85
SE Europe	0,51	0,63	0,66	0,67	0,70	**0,72**	0,65	0,69	0,60	0,60
Austria	2,41	2,55	2,85	2,93	2,92	3,32	**3,51**	3,41	2,93	3,04
Finland	12,04	12,39	12,61	12,64	12,59	12,25	**13,03**	11,99	8,63	10,73
Germany	0,47	0,49	0,6	0,63	0,66	0,72	**0,91**	0,67	0,6	0,71
Italy	0,23	0,21	0,22	0,23	**0,24**	**0,24**	0,22	0,21	0,19	0,19
Poland	0,67	0,71	0,8	0,86	0,88	0,89	**0,99**	0,94	0,93	0,95
Slovakia	1,07	0,85	0,98	1,16	1,41	1,30	1,29	**1,44**	1,29	1,42
Croatia	0,67	0,71	0,76	0,75	0,79	0,81	0,77	**0,84**	0,79	0,82

Source: FAO/UNECE, 2005, 2006, 2007, 2008, 2009, 2010; FINA; DZS; Motik et al., 2012

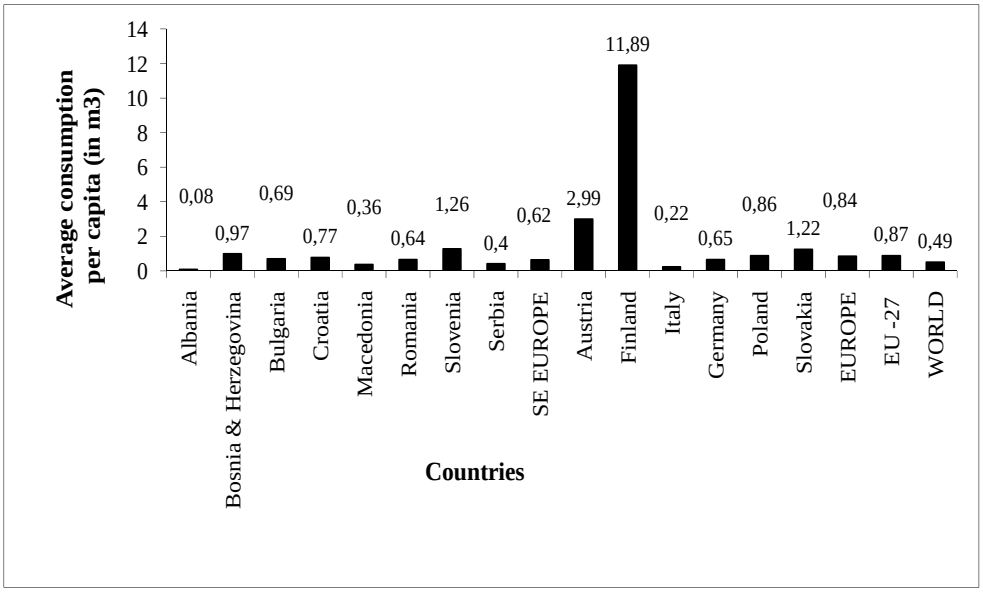

Figure 1. Average consumption of round-wood per capita for 10-year period (2001 – 2010)

In the average round-wood consumption per capita among the major European countries, an accent is also put on Austria with an average consumption of about 3 m^3. In Austria the highest consumption of round-wood per capita was achieved in 2007 (3,51 m^3) and the lowest in 2001 (2,41 m^3). Also, 2007 was indicated as the year with the highest round-wood consumption per capita in Finland (Table 1 and Figure 1). Hereafter, in Slovakia consumption of round-wood was above 1 m^3 on the annual level (excluding 2002 and 2003); the highest amount was reached in 2008 and the lowest was noted in 2002. The average consumption of round-wood per capita was 1,22 m^3

In Germany and Poland, the average consumption of round-wood was 0,65 m^3 and 0,86 m^3 per capita. Observing an annual round-wood consumption in Italy it would be expected that consumption of round wood per capita was on the higher level, but it can be noted that the average consumption of round-wood per capita amounted only 0,22 m^3 in the observed period.

Comparing the consumption of round-wood in Croatia with other research countries and areas, it can be noted that the Croatian consumption of round-wood per capita per year was a higher than world's average and the average of Southeastern Europe, but it was not higher in comparison to European and EU-27 average. In Croatia, round-wood consumption per capita was on the highest level in 2008 (observing the period from 2001 to 2010) – 0,84 m^3, and the lowest consumption was noted in 2001 (0,67 m^3 per capita). The Croatian average round-wood consumption per capita was 0,77 m^3, which is less then is some Southeastern Europe countries, e.g. Slovenia (1,26 m3) and Bosnia and Herzegovina (0,97 m^3).

Table1. Sawn-wood consumption per capita from 2001 to 2010 (in m^3)

	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
category	Consumption per capita (in m3)									
WORLD	0,054	0,056	0,057	0,061	0,062	**0,063**	**0,063**	0,056	0,051	0,056
EUROPE	0,16	0,16	0,16	0,16	0,16	0,16	**0,17**	0,15	0,13	0,15
EU-27	0,19	0,19	**0,36**	0,20	0,20	0,21	0,22	0,18	0,24	0,18
SE Europe	0,026	0,062	0,072	0,062	0,068	0,069	0,081	0,038	0,065	**0,094**
Austria	0,65	0,64	0,61	0,62	0,63	0,66	**0,68**	0,63	0,53	0,63
Finland	0,92	1,03	**1,11**	1,07	0,96	0,95	1,13	0,82	0,65	0,80
Germany	0,21	0,21	0,22	0,23	0,24	0,26	**0,27**	0,15	0,22	0,24
Italy	0,15	**0,16**	0,15	0,15	0,15	**0,16**	0,15	0,13	0,11	0,12
Poland	0,07	0,08	0,07	0,09	0,09	0,09	**0,12**	0,11	0,11	**0,12**
Slovakia	0,23	0,08	0,15	0,27	0,35	0,24	0,33	**0,47**	0,35	0,36
Croatia	0,10	**0,15**	0,14	0,13	0,12	0,13	0,09	0,14	0,1	0,08

Source: FAO/UNECE, 2005, 2006, 2007, 2008, 2009, 2010; FINA; DZS; Motik et al., 2012

The world average consumption of sawn-wood per capita was 0,06 m^3 (in the observed 10-year period), while the highest values were achieved in 2006 and 2007, and the lowest was noted in 2009. At the European level the average consumption of sawn-wood per capita was for about 2,5 times higher (was amounted 0,16 m^3), while in the European Union territory compared to the global average consumption of sawn-wood was approximately 3.5 times higher (was amounted 0,22 m^3).

In the European area the highest sawn-wood consumption was noted in 2007 (0,17 m^3), and the lowest in 2009 (0,13 m^3). The European Union's highest consumption of sawn-wood per capita amounted 0,36 m^3 and was conducted in 2003, while the lowest value was noted five (2008) and seven (2010) years later. In the Southeast Europe the average sawn-wood consumption per capita was about 2 or 3 times lower than the European average and the average of EU-27. 0.094 m^3 denote the highest consumption of sawn-wood per capita in Southeast Europe (Table 2 and Figure 2).

Observing consumption of sawn-wood in some European countries, Finland presents a country with the highest consumption of sawn-wood with an average of 0,94 m^3 per capita, which is about 16

times more than the average world consumption of sawn-wood per capita, or about 13 times more than the average consumption of sawn-wood per capita in the European countries. Although in the observed period (2001 – 2010) in the Southeast European countries the average consumption of sawn-wood per capita was only 0,07 m^3, Slovenia emphasized its sawn-wood consumption in comparison to other SE European countries. In Slovenia the average consumption of sawn-wood per capita was 0,28 m^3 what correspondents to the average consumption of sawn-wood per capita in Slovakia. Furthermore, after Finland, Austria presents a county with rather high values of the average sawn-wood consumption per capita – 0,63 m^3, followed by Slovakia (0,28 m^3), and Germany (0,21 m^3). Italy and Poland, as one of the most important European countries in wood processing industry, achieved the average consumption of sawn-wood per capita of only 0,21 m^3 (Italy) and 0,10 m^3 (Poland) in the observed 10-year period.
In Croatia the average consumption of sawn-wood per capita was equal to the average consumption of SE Europe. The highest consumption per capita was achieved in 2002 (0,15 m^3) and the lowest in 2010 (0,08 m^3), what is about 3 times less in comparison to the European average consumption, or about 2 time less than the EU-27 average consumption of sawn-wood per capita (Table 2 and Figure 2).

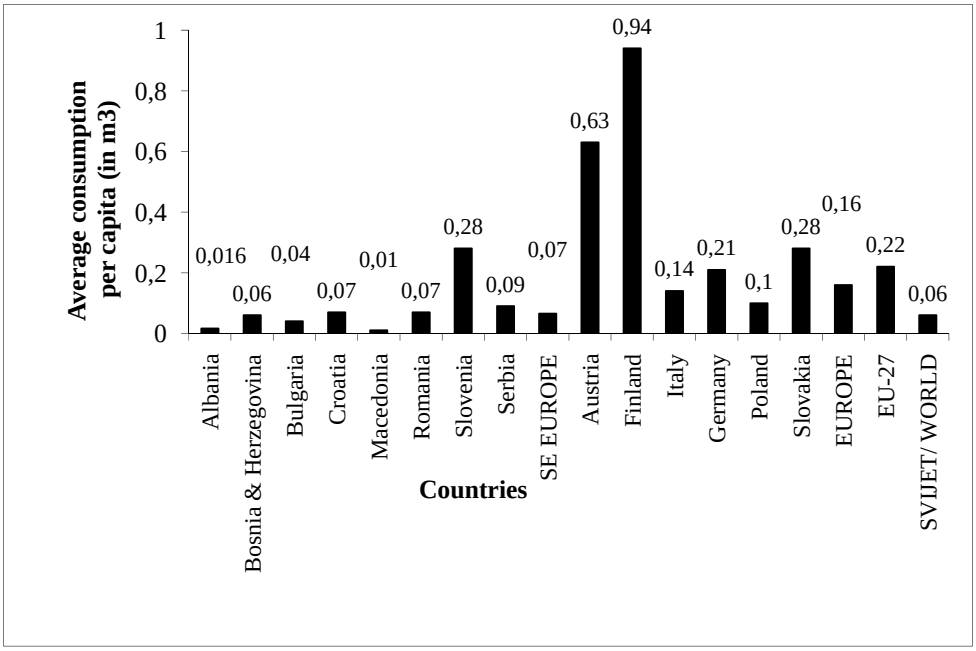

Figure 2. Average consumption of sawn-wood per capita for 10-year period (2001 – 2010)

4. CONCLUSION

The world's average consumption of round-wood per capita was 0,49 m^3. The average the European and the EU-27 average consumption was about 2 times higher compared to the worlds average consumption, while the SE European average consumption of round-wood was 1.2 times higher in comparison to the Worlds one. The European average consumption of round-wood per capita and the average round-wood consumption per capita were approximately equal. In the Southeast European countries the average consumption of round-wood was below the European average, although some countries in this part of Europe stand out in the average consumption of round-wood per

capita, like Slovenia (1,26 m^3) and Bosnia and Herzegovina (0,97 m^3). Among European countries Finland rebounded in the average consumption of round-wood per capita in comparison to the World and European average consumption. In Croatia the average consumption of round-wood per capita was higher than the world average and the average round-wood consumption of Southeast Europe.

The World average consumption of sawn-wood per capita was about 8 times lower in comparison to the World average consumption of round-wood per capita. In the Europe the average consumption of sawn-wood per capita was for about 2,5 times higher and in the European Union compared the average consumption of sawn-wood was approximately 3.5 times higher compared to the world's average sawn-wood consumption. In the Southeast Europe the average sawn-wood consumption per capita was about 2 or 3 times lower than the European average and the average of EU-27. As well as in consumption of round-wood Finland was note as a county with the highest average consumption of sawn-wood in the observed European countries considering period from 2001 to 2010. In Croatia the average consumption of sawn-wood per capita was equal to the average consumption of SE Europe.

Croatia is still lagging behind in regard to the European average consumption and the average consumption of EU-27 countries, especially if we take into consideration countries like Finland and Austria. Although it is an undisputed fact that the consumption of wood products should increase in Croatia, it is possible to conclude that, with respect to the global consumption and consumption of surrounding countries Croatia uses wood as material in higher volumes.

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MODEL FOR THE EVALUATION OF TELEVISION COMMERCIALS OF TIMBER COMPANIES

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ABSTRACT

Timber companies must continually strive to improve or at least maintain its market share. There are several methods to achieve this, among them advertising. The company should prepare such advertisements, which will be attractive to consumers and they will like them. By doing so, it must take into account a number of criteria as well as the fact that some of these are more important than the others. In the project we used the AHP method to determine the market professionals' opinion about the importance of criteria in television advertising of timber products and services. Based on the results we developed a model for evaluating television advertisements and we tested it with random respondents who evaluated sample television advertisement of timber companies.

Keywords: timber company, advertising, television advertisement, AHP method, survey

1. INTRODUCTION

Advertising is the most important and widely used tool of the promotion mix. It is done through mass media such as television, radio, newspapers, magazines, advertising billboards, brochures, catalogues, leaflets and other media. A company provides to consumers information on their products by means of advertisement in the most attractive way possible. Due to the impersonal form of marketing communication, the persuasiveness of advertising messages is of significant importance whether consumers will actually buy the product (Oblak, 2012).

Advertising messages have impact on consumers' purchase decisions; the primarily functions of advertising are the following:

- attractiveness of presentation of products offered by a company in the market,
- directing hesitant buyers how to choose among a number of similar products,

- to influence established habits and customs in the use of products and changing them,
- to inform users about new products or technological achievements that improve current products,
- to create consumers positive attitude and confidence in a company and its products, and
- to indirectly influence the output growth and lowering costs due to increasing sales.

A company has a number of options in choice of the advertising media, namely television, radio, newspapers, magazines, direct mail, commercial billboards, email, etc. The biggest impact among all can be achieved with television, which combines pictures, sounds, colours and movement and by this gives a lot of possibilities for a creative approach. By advertising on television, a company should ensure effective use of its technical advantages and presented information should not be boring.

The objective of the project was to define the importance of the individual evaluation criteria in television advertising and to create a model for evaluating TV commercials of timber companies.

2. WORKING METHODS

2.1. AHP method

The AHP (Analytic Hierarchy Process) method is one of the best known and most popular multiparameter decision-making methods. The components of multiparameter model are not included directly; the direct method of comparison by pairs is used instead. Weights in the AHP method are determined indirectly by comparing pairs of parameters, each to each.

Table 1. Scale of importance levels and preferences of the AHP method (Čančer, 2003)

Numerically Expressed Level	Verbally Expressed Level
1	Both criteria are equally important, the alternatives are equally desirable.
3	The criterion is moderately more important than the comparable criterion; we gave a moderate priority to the alternative.
5	The criterion is strongly more important than the comparable criterion; we gave a strong priority to the alternative.
7	The criterion is very strongly more important than the comparable criterion; we gave a very strong priority to the alternative.
9	The criterion is extremely more important than the comparable criterion; we gave an extreme priority to the alternative.

2.2. Survey

A survey is a method of data collection, which enables to get the data about the views and opinions of respondents. It is economically convenient in nature since by means of a properly formatted survey a large number of information in a short time can be attained. Survey questions can be divided into two categories: open and closed questions. As regards open questions, respondents answer in their own words and regarding closed questions respondent are to choose one of answers offered next to each question.

2.3. Formulation and testing the model

In the project we determined the criteria by which the consumers memorise television advertisements the most. There are several criteria; it is therefore necessary to determine the most important ones. The comparison should be made in pairs, whereby the number of required comparisons has been growing rapidly with a number of criteria. Based on the results of the expert group, which were obtained by means of the AHP method, we defined the criteria according to their importance. The expert group using the AHP method was composed of five experts from different fields: wood science and technology, economics and advertising design. They assessed general advertising attributes. The results were used to formulate the model enabling evaluation of likeability of television commercials. The model was tested; 15 respondents assessed a concrete TV commercial of a timber company.

3. RESULTS AND DISCUSSION

3.1. Results of the AHP method

Advertising experts have defined four parameters which in their opinion have the greatest impact to consumers' emotions in perception of television advertisements. In evaluation with the AHP method they were compared to each other, each by each. Analysis provided identification of the importance of certain criteria for each assessor. After reviewing all the evaluated criteria, all their values distributed by their proportions was obtained. The resulting data, obtained with the help of the expert group, was analysed by a computer program Expert ChoiceTM.

Experts evaluated the following parameters:

1. sound and picture,
2. content or idea,
3. dynamism and
4. humorous.

The AHP method comprises the nine digit evaluation scale, i.e. one parameter on each side of the line, which is subject to a value assigned according to our impression. We compare pairs of advertising parameters with focus on whether any of these parameters is more important than the other and what is the difference in the importance of this parameter in comparison with the compared parameter, on scale from 1 to 9. We assign value to one parameter only.

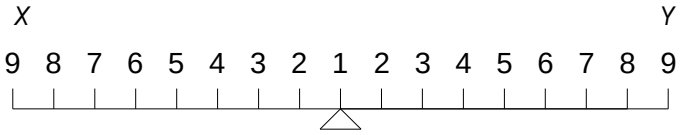

Figure 1. Comparative scale of the AHP method

After executing an inter-comparison of the parameters by means of a mathematical matrix or a computer program, for instance Expert ChoiceTM, the AHP method is carried out. The analysis indicates which evaluated parameter has the greatest weight in evaluation of television advertisements.

Table 2 shows the results of the AHP method for television advertisements in the proportions by experts.

Table 2. Average of the results obtained with the AHP method for television advertisements.

EXPERT / PARAMETER	A	B	C	D	E	*TOTAL*	***AVERAGE***
DYNAMISM	0,052	0,066	0,113	0,093	0,102	0,426	**0,0852**
SOUND AND PICTURE	0,115	0,184	0,09	0,077	0,22	0,686	**0,1372**
HUMOROUS	0,211	0,113	0,446	0,188	0,045	1,003	**0,2006**
CONTENTS/IDEA	0,622	0,637	0,351	0,642	0,633	2,885	**0,5770**

The results show that the content or idea has the highest weight (0.5770) in the evaluation of television advertisements, namely even higher than all the other three criteria together.
It is followed by humorous (0.2006), sound and picture (0.1372) and dynamic (0.0852).

3.2. Survey results

The objective of the survey was to evaluate a concrete television advertisement. Fifteen random people, aged from 18 to 65, viewed a television advertisement of a Slovenian timber company "Jelovica" (http://www.youtube.com/watch?v=_wKe_G18X4g) and were asked to evaluate individual criteria with values ranging from 1 to 5 (1 = lowest rating, 5 = highest rating).

After survey for television advertisement was completed, we got the following values:

Table 3. Survey results

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL	AVERAGE
Sound and picture	4	5	4	3	5	2	4	4	4	5	4	3	3	5	4	**59**	**3,933**
Dynamic of clip	5	5	4	4	5	3	3	3	4	5	3	4	4	4	4	**60**	**4,000**
Content or idea	3	3	5	4	5	4	4	4	5	5	5	3	3	4	5	**62**	**4,133**
Humorous or boldness	4	4	5	5	5	3	2	5	4	5	5	5	4	4	5	**65**	**4,333**

We calculated the average value from individual evaluations and then we multiply it with the weight of the criteria.

Table 4. Evaluation of television advertisement with the model

Parameter	Average rating		Weight		Result
Sound and picture	3,933	x	0,1372	=	0,5396
Dynamism	4,000	x	0,0852	=	0,3408
Content or idea	4,133	x	0,5770	=	2,3847
Humorous	4,333	x	0,2006	=	0,8692
			Σ = 1		***4,1343***

The potential buyers assessed television advertisement with average of 4.134. The highest possible score was 5.

4. CONCLUSION

Consumers are nowadays very demanding and they require as much as possible information about the product to be sure about its quality. Television advertisements represent the most effective way to provide information about the product to a wide audience by combining pictures, sounds, colours and movement. They need to be substantively, informatively and visually coordinated in such way that they convince as many consumers as possible. When creating an advertisement, experts opinions as well as the opinion of the consumers should be taken into account.

By means of the AHP method, based on an expert evaluation, we determined the importance of individual weights and the criteria by which consumers assess television advertisements. We found that the content and the idea of an advertisement is the far most important factor, followed by humorous, sound and dynamism. We elaborated a model enabling us to evaluate these types of advertisements. The model was tested in a survey, whereby random potential buyers evaluated a television advertisement of a Slovenian timber company.

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THE USE OF INFORMATION TECHNOLOGY IN COMMUNICATION BETWEEN UNIVERSITIES AND COMPANIES OF WOODWORKING INDUSTRY

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ABSTRACT

The paper deals with the possibilities of cooperation between company and university sector, with an emphasis on knowledge transfer and use in the woodworking industry. It describes the most important form of marketing communications of universities using information systems and technologies. By selecting the appropriate communication strategy, university can receive more major cooperation partners from the business environment and gain prestige in the eyes of the public.

Key words: company, university, information systems, communication, cooperation

1. INTRODUCTION

Information and communication technologies are now something like a nervous system - are present in all areas of human activity. Interfere significantly in the organization and business processes, so it is imperative that users of these technologies have been able to use them at the time. Otherwise, it is neither in education and businesses wood processing industry. Timber industry in Slovakia is one of the dynamically developing industrial sectors within the EU. At present, its share in total sales of approximately 10% of the manufacturing industry and it is expected that it will grow in the future. If you want to make this sector remains a modern and innovative, we have to adapt to new trends. One possible communication with the external environment is the use of modern information technology.

In today's world we can not compete in terms of low labor costs, but rather in the ability to successfully and purposefully interact with customers, to transfer knowledge into practice, generate greater added value, build and develop the knowledge economy. Communication area of the businesses timber industry is also communication with university departments with a vision of the options for further cooperation.

2. COMMUNICATION BETWEEN UNIVERSITIES AND COMPANIES

The objective existence of the university departments is to prepare enough qualified graduates for economic practice. To achieve this it is necessary to orient the entire university system on two things, the first are the needs of students, and the second are the needs of society. For the identification of the needs and demands of students and future employers is essential communications. This communication can be realized through various forms:

- a personal communication - personal interviews, workshops, participation in conferences, training, interviewing, questionnaires and the like.

- an impersonal communication - communication by telephone, email, written correspondence and the like.

Each of these forms of communication can be formal or informal. The external communication is mostly use between universities and businesses and other organizations. This communication includes the information about the activities and projects of the school, a persuasion and an encouragement to cooperate and build an image in the eyes of business and other public bodies. (Kollárová, D., 2006). Sometimes it is necessary to implement in the communication the third party, as it is shown in the following diagram.

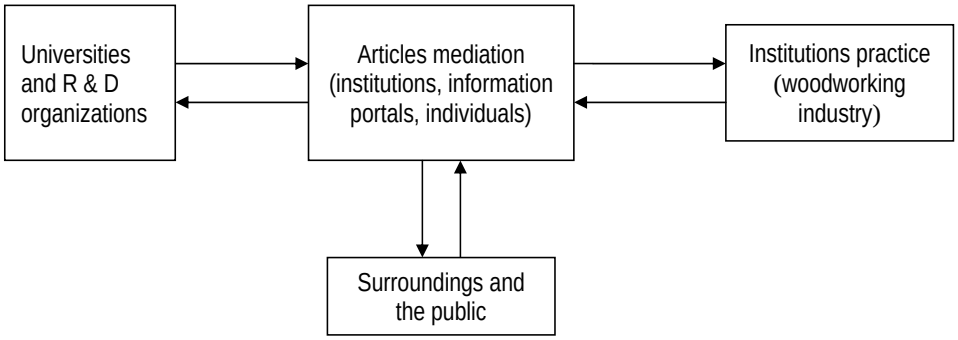

Fig. 1. Schematic representation of cooperation and communication (own processing)

Although the issue of communication is theoretical treated in great detail, its practical use has many shortcomings. In an environment of higher learning it can be a lack of awareness of competent staff (study departments, secretariats), unwillingness, lack of empathy, at weak ties on a corporate practice and a lack of knowledge of their problems, direct communication barriers and the like. In another part of the article it is focused on the concept of information and communications technologies and their use in communication between the universities and the of businesses.

3. INFORMATION AND COMMUNICATION TECHNOLOGIES

The ownership of information is for all organizations and individuals significant competitive advantage. One of the ways how the information can be obtained is to use the communication offered by modern information technology. The concept of information and communications technology (ICT) is quite known and often used, therefore can be interpreted as:

- the set of tools, methods and knowledge, which can process data in order to gain information
- the system, which includes hardware elements (technical equipments such as computers, servers, mobile telephony, smart phones), software (operating systems, different applications, network protocols, search engines, etc.) together with staffing elements of the organization,
- the integrated set of information and communication equipment used only for the preparation and processing of data, but also to manage information and processes in order to achieve effective and efficient results by the optimalization of management resources, distribution of information and know-how.

In terms of modern communication tools, at present, it is already relatively common to use of modern information and communication tools such as computer and internet - e-mail discussion forums, chat rooms, mobile phones, smartphones and the like. The first place in the modern forms of communication between organizations currently belongs to the email communications which common obstacles of its effectiveness are presented in the following table.

Table 1. The most common obstacles to e-mail communication

Type barriers	share
the anti-spam and others filters	63%
the crowded e-mail inbox	60%
the content of e-mail communication	53%
the lack of integration with other forms of communication	20%
the ineffective breakdown of communication partners	18%
the lack of personalization	17%
the lack of time to peruse the contents	16%
the other obstacles	6%

No form of communication is not perfect and must therefore take into account the human factor, the technological and communication skills, which often affects the overall result of the communication.

3.1. ICT level at university station

The universities are now under tremendous pressure to meet high demands, whether in the number of students, the quality of education, the needs of professionals and business practice or the economic development. The resources available for higher education institutions, however, are still restraining.

The main issues and trends that affect today's universities are:

- the overpopulation and the digitization,
- the globalization and the internationalization,
- the distance learning,
- the requirements for the better education and the application of students,
- the evaluation of research institutions and the phenomenon of "world class universities",
- the quality of assurance,
- the increasement of the importance of collaboration between the universities and industry.

We saw how organizational changes increase the impact of ICT in education and communication areas, along with the transformation of schools into the open learning centers, the transformation of the universities into the educational services and the last the trasformation of the society into the educational organization. ICT supports virtually every aspect of higher education, including finance, teaching, research, safety and sustainability. IT professionals and policy makers in universities must understand the extent of problems of their institutions in order to apply ICT there it will bring most benefit. For this purpose, the university workplaces usually create a strategy of using ICT. The development of policy and coordination for the implementation of ICT strategies are probably the most sensitive political role in education. It is no surprise that this responsibility lies primarily on the central administrative level of the education ministries. The current situation in our universities, supported by various development projects and EU structural funds, is characterized by intensive development of hardware and software and by the creation of the conditions for the introduction of new technologies using at the university. The purpose and function of good ICT infrastructure is to create an environment that provides users with secure and convenient access to applications, services and information which they need. The basic requirements for ICT infrastructure of the universities can therefore be summarized as follows:

- flexible with respect to changing requirements
- accessible and easy to use
- safe and reliable
- continuous in terms of functionality.

The most important elements of modern information technology is currently hardware, software and communications technologies. Preferred form of marketing tool for new forms of communication most of the universities is based on the results of several analyses of just the internet. Hypertext Information System (World Wide Web) has made available Internet options for the masses. Use of the Internet currently affects the operation of universities. Internet and information and communication technologies have become a common part of our daily work and private life. This is confirmed by research carried out at the Slovak University in 2010. Most of the respondents from the university setting indicated that the computer spends an average of 6.5 hours per day. (Vadkertiová, A., 2012). About half of that time accounted for private purposes and 60-80% of the time users spend surfing the Internet. As the most important social media has proven to Facebook and it's not just for the fact that it uses more than 93% of respondents. The importance of marketing is supported by the fact that social networks in general enjoy much popularity in adopting and communicating with references to specific products and organizations. Facebook account not only private individuals. He became a marketing and advertising space for many institutions, including universities and their branches. Number of users of social media is in some cases, as well as enormous opportunities that the media is offered, and the university is a huge potential for their use as a tool for internet marketing. This type of communication medium used by nearly all young people, which is great for our university students to gain importance, awareness and positive image of the university. Nowadays it is not enough just to have a web site should be used with other forms of modern communications.

The development of ICT infrastructure of the university in the longer term is (Mužík, 2011):

- the consolidation and the optimization of IT university environment (virtualization, internal cloud, enterprise content management, document management, integration and automation of ICT processes, dynamic IT infrastructure, implementation of management policies and standards for hardware and software and manage their lifecycle)
- the support key (business processes) and the support (service) processes of the university (SOFIA, AIS, Library Information System, access and attendance system, property passport and other supporting applications)
- the safety and the reliability (network security, data security, identity management, digital certificates, storage management, data backup, disasterrecovery, archive)
- the promotion of the cooperation (sharing of knowledge and content, workflow, unified communications, social networking) with emphasis on mobility and access to services regardless of time and place (WiFi, dominant computer gradually replaced by a new generation of mobile devices)
- the care of the user (HelpDesk work and skills of users)
- the creation and the maintenance of university data center and server consolidation.

The mentioned areas of problem are not solved separately and isolated, but as a group of activities that are interdependent and integrated. The achieving goals in one area make the implementation of solutions in other areas. Information technology has become a normal part of university processes. They can not therefore be seen only as a cost optimization and ICT as reduction of the development and operation cost. The current intensive development and with it induced changes in ICT infrastructure requires a new approach to service and intensive support for users. The implemented, ongoing and planned projects in this area thus create the conditions for the further development of university ICT infrastructure.

3.2. Possibilities of using ICT in enterprises of the wood Industry

The use of information technology takes place in all sectors of human activity. The information systems and technologies allow to make innovative changes in managerial work, integrate the management of specialized activities within the company, to acquire new strategic opportunities,

effectively change the organizational structure of the company and to communicate effectively with the surroundings. The management of each company must follow relevant factors operating in its area and must be able to adequately respond to them. This required to build and maintain the system of date information through various applications of database systems. The need of information for business managers puts these following trends:

- the transition from local to global action
- the transition from implementation of customer needs to fulfill customer wishes
- shift from price to non-price competition.

For business enterprises are not alone applications of information systems and technologies objective. They are an effective way how to better facilitate and make more efficient choices. However, ICT is not used only in business but also in production management, supply chain, customer relationship management, supplier, product lifecycle management, and so on. The following section therefore briefly explain the issue of the use of ICT in various business activities.

CRM - Customer relationship management is database of the technologies supported by the process of collecting, processing and using about customer information company. It allows you to identify, understand and anticipate the needs, desires and buying habits of customers and supports two-way communication between the company and its customers. As CRM, in a figurative sense, it also includes the software, the hardware and the staff equipment of the company that is charged with carrying out these tasks.

SCM - Supply Chain Management is the label for both business supply chain management and software that support this activity. Usually this is a whole package of software tools that enables connections between cells supply chain (supplier - manufacturer - distributor - retailer - customer), significantly improves its ability to respond to customer requirements, eg. shortening delivery times. SCM is nowadays often only one of the modules of a comprehensive ERP system. Supply chain management has become more sophisticated and includes more aspects, and the same applies to marketing technology solutions.

SRM - Supplier Relationship Management is a management disciplineof the work with suppliers that are vital for the success of private organizations to maximize the value of these relationships. Supplier Relationship Management is a holistic approach to business management, an interaction with organizations that supply goods and services which are needed. The goal of supplier relationship management (SRM) is to streamline and make more effective the processes between an enterprise and its suppliers just as customer relationship management (CRM) does. The objective of supplier relationship management is then to simplify and streamline the processes between the company and its suppliers and according to the proponents, the use of SRM software can lead to lower production costs and a higher quality and lower price of the end product. Also according to the proponents of this method, the use of SRM software lead to the reduced production costs, to the higher quality and to a lower cost of the final product.

PLM - Product Lifecycle Management is the process of managing the entire product lifecycle from its invention, through design and construction, commission to the final disposal. PLM integrates people, data, processes and business systems and provides product information for the company, respectively their management to the level that is integrated into the IS management. The manufacturers are increasingly focused on the managing of the entire lifecycle of products. The growing pressure to reduce costs, shorten development time and continuously improve the quality and increase the complexity of products is caused by an increasing share of electronics and software in the whole process. Only full integration of processes and data, starting with design and ending after-sales service and maintenance and along with the corresponding IT solutions, allows manufacturers to meet the demands of today's and tomorrow's market.

Those database tools currently represent particular components of an integrated management information system of the enterprise and their use greatly improves communication and business competitive in the wood processing industry. The continuous development of ICT and practical needs

place high demands on the flexibility of communication between entities, thus are created the new opportunities and applications for management information systems.

4. CONCLUSIONS

The issue of ICT is nowadays discussed and solved in all types of organizations – the companies, the institutions, the public administration, the education, the health care and in various fields of industry. For the development of the innovation and the infrastructure is essential used that ICT on a larger scale in communication between the universities and the businesses. The information and communication technologies have enormous potential for economic growth and post-crisis economic recovery. According to a study led by SAS, the increasement by 1% in information technology causes real GDP growth of 0.11%. The European strategy, called Digital Agenda 2020 ICT, attributes a half of the Union's growth for the past 15 years and sees this sector as the main engine post-crisis recovery. The engine which is also in accordance to the requirements for the sustainable development of society.

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HOW TO IMPROVE THE COMPETITIVENESS OF FURNITURE ENTERPRISES THROUGH CLUSTERING PROCESS?

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ABSTRACT

In the article, the author identifies the key benefits of membership in a cluster in the context of building competitiveness in the furniture sector. In both industrialized and developing countries, there is evidence providing that clustering can help its affiliated companies in enhancing their competitiveness. Companies associated with each other in clusters have got more than acting alone, opportunities for development, identify production niches, access to export markets and employment policy. This trend is also observed in the furniture enterprises in Poland. Cooperation at the same time specialized group of companies provides greater joint efficiency, increases the ability to modernization of processes and products. All of this also attracts new businesses from outside, including foreign investors. The paper presents also the tools and activities carried out in the cluster, the results translate to the competitive position of the associated companies.

Key words: cluster, clustering, competitiveness, furniture enterprises

1. THEORETICAL BACKGROUND OF THE CLUSTERING PROCESS

Business and technology clusters have become the focus of a vast literature on regional and national economic development. They have received considerable attention from scholars, policy makers, city and regional planners, and those in the public policy arena. Cluster development initiative is an important new direction in the economical policy of the regions, aiming on building stabilization on the bigger scale, market enlargement, and reducing the costs of doing business.

In economic and enterprises activity clustering was first analyzed by Alfred Marshall (1890). He provided the early basement of cluster theory, focusing on traditional socio-cultural factors that concern the quality of the social environment of industrial districts, and that only indirectly affect the profits of firms. Among such factors Marshall emphasized in particular: (1) The mutual knowledge and trust that reduces transaction costs in the local production system; (2) The industrial atmosphere that facilitates the generation and transfer of skill and qualifications of the workforce required by local industry; and (3) The effect of both of these aspects in promoting innovations and innovation diffusion among small firms in industrial districts.

The most famous Porter's Diamond model (Porter 1998) remains the paradigms model for work in this area. According to him, "clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, and associated institutions in a particular field that are present in a nation or region". Clusters arise because of cooperation of experienced specialists who try to find solution for rising productivity and profitability of the companies.

UNIDO defines clusters as "sectoral and geographical concentrations of enterprises that produce and sell a range of related or complementary products and, thus, face common challenges and opportunities. These concentrations can give rise to external economies such as emergence of

specialized suppliers of raw materials and components or growth of a pool of sector-specific skills and foster development of specialized services in technical, managerial and financial matters" (UNIDO 2010).

The EU policy require taking step towards cooperation, which will take into account many players playing to a common goal, which are assumed in Europe 2020 objectives. Such cooperation requires collaboration with clear-cut benefits for all participants. In the European Union there has occurred a particular style of cooperation, resulting in formation over the past few years of a number of networks and clusters. Elimination of geographic barriers through opening of borders within the European Union opens up a whole new stage in development of clusters – stage of expansion of foreign and transnational cooperation.

The trend is recognized by the European Commission, promoting various forms of cooperation of clusters in the international arena and seeing in this action a chance to boost the growth process of innovation and competitiveness of European economy. It is worth in this context to recall a number of EU documents, from which the real shape of the EU cluster policy emerges:

- In the document "Industrial Policy in an Enlarged Europe" from 2002 the European Commission refers to the concept of clusters, especially created by small and medium enterprises as a special factor for the development of the new economic policy;
- In the communication "Key Issue in Europe's Competitiveness – Towards an Integrated Approach" the European Commission stresses that one of the purposes of implementation the concept of European Area of Innovation in terms of implementing the concept of European Area of Innovation in terms of the Lisbon Strategy is, inter alia, increase in the number of clusters and improving their effectiveness;
- The European Commission document Innovate for a competitive Europe in Action 4.2 states that the Structural Funds are to support the internationalization of regional clusters, since, according to the Commission, clusters and networks proved to be an effective tool for stimulating innovation.

The strategic objective of the European Commission is to introduce clustering to the next, higher level of development – clusters from the local and regional cooperation are to go to the level of international cooperation. This is achieved also through activity of the European Cluster Alliance, established in 2006, a network of institutions representing central and regional authorities and development agencies, which support the further deepening of transnational cooperation between regions in the development of cluster policy. Its aim is to develop a plan of joint actions aimed at strengthening transnational cooperation between clusters.

2. BENEFITS AND RISKS OF OPERATING IN CLUSTER

Experience worldwide shows that companies operating in clusters due to manual connection network, as well as close cooperation with institutions from the field of science, education or administration, become more competitive and achieve greater success. The same statement refers to furniture industry, where entrepreneurs looking for competitiveness and long-term sustainable development. The main purpose of the furniture industry cluster should be strengthen co-operation between furniture sector and all related industries taking into account important aspects for improving competitiveness of this industry. Activities of the furniture industry cluster should be targeted at competitive and sustainable development of its companies to promote their export capacity and to increase proportion of added value in their output. The main benefits for companies from the cluster framework are the following:

- Possibility of co-operation between similar companies which are natural competitors, possibility to find new partners.
- Access to specialized services.

- Possibility to participate in co-operation networks with other competitive export oriented companies, related associations, institutions of education and research, as well as other related institutions.
- Possibility for practical co-operation and for joining forces in bigger projects than it would be possible if acting alone.
- Reducing uncertainty and risk.
- Effective cluster management system which facilitates and speeds up access of companies to new technologies.
- Improved access to new information (e.g. about the current needs of buyers or new technologies).
- Improved knowledge and information on external markets, possibility to participate in joint marketing and branding activities which helps to reduce individual costs.
- More friendly business environment, as well as support for creation of new companies.
- Possibility to increase turnover and income, as well as to improve export capacity.
- Improved access to specialised labour force and specific knowledge.
- Improved competitiveness of all respective industry and individual companies which provides greater benefits for companies themselves, as well as for the national economy.

The presented considerations supports the hypothesis that companies can achieve practical use and benefits implementing the concept of clusters, because they stimulate competitiveness and rising of innovation capacity. Cluster can strengthen the potential of their own members, but must also create an external offer for business, government and science to clearly set out benefits that can be derived from activities in the cluster. Not clearly formulated strategy of cluster or inadequate offer for individual cluster participants may provide to the negative impact of clusters on companies. More common are adverse results of clustering process on the macroeconomic level, which include: (1) competition in the market of production factors (human resources, real estate), (2) competition in the sales market (demand side), (3) problems with defining IPR – the problem of "free rider".

In process of cluster development the key role plays to ensure effective cluster management. It provides necessary co-ordination, co-operation and information exchange within the cluster and with external partners. Therefore, quality and professionalism of the cluster management are significant factors for analyzing cluster performance indicators. One of the most important challenge for cluster management is ability to provide a platform for interaction and exchange for companies with similar business interests which are natural competitors. The next activity for increasing innovation capacity is creation of collaboration and information exchange involving education and research institutions. Enterprises associated in cluster initiative can optimize their expenses by exploiting an opportunity to participate in joint international activities, to implement joint marketing activities, to benefit from an access to specialized labour force, to receive regular specific information important for activities in global market. Strong cluster initiative can help to strengthen the whole furniture industry which, in turn, has positively influenced competitiveness of enterprises and increased the proportion of the furniture industry added value in the GDP of country.

The concept of clustering is to create a cooperative connections between companies, raw material suppliers, equipment suppliers, contractors, customers and service providers. The cluster formed locally available cost, specialized and unique resources - including knowledge and human capital - and the right infrastructure. The accumulation of different entities in the cluster makes it easy to find the right partners (suppliers, contractor or service provider) and enables specialization and concentration of activity in the area of key competences (and thus the formation of flexible chains production). Clusters are also seen as drivers of foreign direct investment by creating favorable conditions for invest. The inflow of foreign investment to the region stimulates the development of local enterprises, so it is important to facilitate the transfer flow of investments and appropriate use of in this connection.

3. CLUSTER INITIATIVE AS A CHANCE FOR POLISH FURNITURE MARKET

Despite the difficult situation in the global market size of the export of Polish furniture industry in 2012 probably reached a record high. It is estimated that a total export together with micro companies will be about 28 billion PLN (GUS 2013). Despite the record-breaking results situation in the Polish furniture industry is very diverse. The share of large and medium companies in the structure of sold production is a long time still close to 80%. It is these companies decide mostly on potential Polish furniture.

The difficult situation in the domestic market and the crisis in the European Union causes that Polish furniture manufacturers also have interest in distant markets (such as Brazil, Mexico, Turkey). There are still not significant increases in sales in these markets, but it is expected that interest in the more distant export markets will continue to expand.

In Poland there are nearly 24 000 enterprises producing furniture. Of this number, about 100 there is a group of large companies employing more than 249 employees, about 350 group of companies medium-sized (50-249 employees), 1 500 small firms and close to 22 000 to micro-enterprises or fewer than nine people.

Table 1. Structure-size of furniture enterprises in Poland

Size	Unit	2010	2011	2012	Balance 2012-2011	Balance 2011
Sum	n/c	24840	24157	23810	- 347	-1,4%
	y/y	1,0	0,97	0,99		
Micro	n/c	22546	21939	21817	-122	-0,6%
	y/y	1,06	0,97	0,99		
Small	n/c	1781	1725	1544	-181	-10,5%
	y/y	1,01	0,97	0,90		
Medium	n/c	405	385	349	-36	-9,3%
	y/y	0,99	0,95	0,91		
Large	n/c	108	108	100	-8	-7.4%
	y/y		1,00	0,93		

Source: Registration REGON, GUS 2012 (n/c-number of companies, y/y-year on year)

In examining the data on the number of companies operating in late 2012 is striking that a significant reduce the number of companies in different size ranges. This does not mean though definite liquidation of companies, but partly the result of job cuts, and consequently moving companies from higher to lower classes. Nothing less that this situation is clearly due to the difficult situation of the furniture industry and the fact that not all companies are able to meet the cost pressures and competition in the economic downturn. The value of sold production of furniture companies of all size classes in 2012 was estimated at 29.4 billion PLN which represents a decrease of 7.3% compared to 2011. The cooperation within the cluster initiative is the big chance especially for SMEs and micro-enterprises from a furniture industry, which have fewer employees and a smaller financial potential. Unlike major companies, SMEs do not have own R&D departments, but need external services tailored to their needs. During last years SMEs in Poland have been massively improving the efficiency through cost reduction, business process re-engineering etc. SMEs and micro-enterprises need innovations and qualifications which requires an intensive cooperation with science and public administration, what is possible in clustering process. By an improved this cooperation, transfer of technologies and knowledge can be been fortified lastingly and used development potentials.

In terms of value in 2011 Poland was on the fourth place after China, Germany and Italy. In the ranking of export volume, only China had greater mass of exported furniture. This ranking confirms

staked above argument that Poland is a major player in the global furniture market, although its role is mainly the implementation of commissioned production.

Clustering process on the furniture market in Poland can lead to the more internationalization of existing companies. Increasingly common option is to build clusters of smaller companies focusing around a large company, which acts as a coordinator. The result of the internationalization of cluster development should be using their development potentials through increased coverage, expansion of markets, establishing business contacts with foreign partners. The key to the process of internationalization of the clusters is their specialization. Not all clusters have a realistic chance to effective functioning on the international market. In a privileged situation will be those that prove to be the best in a specific, chosen field, which – in this narrow scope of activity – are able to implement innovative solutions. The specialization will also stimulate international cooperation of clusters, since being excellent in one area, one must cooperate with someone who has the knowledge and skills complementary to ours.

4. PRACTICAL APPLICATION OF CLUSTER CONCEPT ON THE EXAMPLE OF WIELKOPOLSKI CLUSTER FURNITURE DESIGN

The initiator of the cluster called Wielkopolski Cluster Furniture Design taken to strengthen cooperation between companies of the furniture industry was company Metalmex. The experience gained in meetings organized by the Cluster and the constant search for innovative solutions to enhance the competitiveness of its companies mobilized Metalmex company to start cooperate with local chamber of commerce. Participation in Projects Metalmex Companies "Kignet Innovation" and "Center for the Advancement and Support Enterprise Organizational Innovation - encouraging cooperative relations and cooperation between the companies" allowed the promotion and transfer of knowledge of business networking and co-operating companies to obtain approval of a formal cooperation network companies furniture industry and consulting company.

The main objective of the Cluster is to promote the light furniture and environmentally friendly lightweight board. The tool will support the development of specific furniture design, displaying high quality and originality associated with regional cultural and scientific values. The joint venture will build upon the achievements of the Faculty of Wood Technology from the Technical University for the research on the properties of the cell plate and to undertake research in order to obtain alternative solutions. In creating new design will share their experience industrial designers from Faculty of Architecture, University of Technology. The common goal is to develop innovative environmental projects furniture of distinctive character associated with the image of the furniture sector in this region. Subject is associated with the development strategy of the Cluster, tied by the companies of the furniture industry, the consulting firm, Faculty of Wood Technology University of Life Sciences, Faculty of Architecture, University of Technology and the local Chamber of Commerce as Coordinator of the Cluster. Participation in the Project Cluster is related to the involvement of scientists in research on the properties of the cell plate.

The Cluster plans to build on these achievements of Faculty of Wood Technology and taking additional studies of cellular boards to raise alternatives. The main objective of the Cluster is the launch of an innovative and competitive products, expand markets and increase the competitiveness of member companies. The purpose of the Initiative is to strengthen the furniture sector SMEs from the region and entrepreneurs interested in networking. Information on the activities carried out by the Cluster and the results will be forwarded electronically to the furniture companies, organizations and institutions, partnerships and by organizing meetings. These activities will support the construction and promotion of the brand cluster to highlight the regional furniture design and strengthening of the common marketing strategy for domestic and foreign markets.

The innovative nature of the actions taken by the Cluster is related to the prevalence of a little-known even in Poland, light green plate cell for the production of modern home furniture. The plan is to use a cluster developments in the field of the Faculty of Wood Technology. It was also planned to undertake research in order to obtain alternatives. Tool for promoting cellular boards will be furniture design. Together they created innovative furniture design, in collaboration with the Department of Design, Faculty of Architecture, University of Technology, will be an asset in an increasingly difficult competitive environment furniture manufacturers. Innovative furniture distinctive character associated with the region is to strengthen the image of the regional furniture industry.

Projects planned by companies participating in the cluster structures reinforced by complementary competencies, collaboration with universities, with specialists in the area of their activities (studies, reports) increase the opportunities for innovation, faster diffusion of new technologies and their deployment into production. Expertise, meetings will allow acceleration of the implementation of planned activities and dissemination of program assumptions cluster of companies from furniture industry, as well as knowledge transfer, integrate and exchange of experience and good practice. The opportunity to deepen their knowledge by the participants Cluster and companies interested in cooperation in the field of networks on the organization, management, financing of cooperation and internal aspects of the company's activities in the area of business process and structural allow free access to innovative consulting services.

A common vision, building a common marketing strategy, innovative solutions contribute indirectly to enhance the image of the furniture sector, increasing by its specific features furniture sales on the domestic and foreign markets. Presentation of good practices in the field of innovative solutions will be beneficial for all businesses who want to develop their creativity and competitiveness. Best practices mobilized. Strengthen the image of the furniture sector is to strengthen the image of the region, and implemented innovation inherent in creating the Regional Innovation Strategy.

5. CONCLUSIONS

In recent turbulent time the promotion of the development of industry clusters consisting of companies, education institutions and other related organisations is an internationally recognized form for improving competitiveness and innovation of companies, especially for those searching for entry into international markets. Companies from furniture industry sector looking for increased competitiveness and innovation capacity should really consider possibility for creating cluster initiative. The findings research indicate that for achieving success in building the network there are two important and helped factors:

- The management of cluster, which plays an important role in facilitating co-operation, co-ordination and free information flow from inside and outside of cluster.
- The national policy fostering cluster development, which can advance the development of cluster initiatives and influence their performance.

Companies more and more are aware of the benefits of clustering. Independently of the difficulties they are faced with increasingly cooperate than compete. But the most important problem of these activities is to overcome the level of business confidence, which comes from mutual competition manufacturers and realizing the need for integration and cooperation between companies of the industry.

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PROMOTION OF WOOD BIOMASS AND PELLET IN CROATIA AND OTHER COUNTRIES OF SOUTHEAST EUROPE

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ABSTRACT

In spite of good results of using pellet in EU, especially in the countries with developed wood processing industry (Austria, Germany and Italy), wood pellet and biomass is often marginalized in Croatian energy strategies and documents, as well as in other Southeast European countries, especially regarding the field of renewable energy sources (RES). This results with a symbolic interest of media in promotion of this ecological fuel. Croatian biomass and pellet producers (Association of Croatian Pellet, Briquette and Wood Biomass Producers) have therefore started a promotional campaign, with the help of domestic pellet stove producers. The campaign emphasizes the pellet advantages for potential customers.

The campaign has been presented during the Ambienta fair 2012, and the pellet producers donated half of a kilogram of pellets to each visitor. Till autumn 2012 95% of produced quantities have been exported so this campaign aims to create and strengthen of Croatian pellet market. After only few months of promotional activities, some changes can be observed regarding pellet selling and consumption. Also, some new projects of biomass distance heating are started as a direct result of this promotion. The data and other indicators in this paper will show the real market situation and potentials in Southeast Europe.

Key words: *wood biomass, pellets, promotion, Southeast Europe, distance heating*

1. INTRODUCTION

Pellet is a domestic product, made of national resource. The use of pellet brings many advantages: it replaces import of fossil fuels, balances account deficit, increases employment in rural areas and contributes to Kyoto protocol and EU strategy tasks (20:20:20).

The media campaign will include large specter of promotional activities and the goal is to popularize the pellet among general population. The Association of pellet producers will also suggest to the institutions competent for public procurement to plan the heating on pellet in the new public buildings, which should become an ecological standard. It will also suggest the horizontal aid that should encourage general population to switch on modern pellet heating systems.

The pellet and other wood biomass production become more and more lucrative business. The European Commission proposal is to maintain the EU's position as a world leader in renewable energy (Peksa-Blanchard et al., 2007). It has an important role in the forestry and wood processing industry. Wood processing industry represents an important sector and more and more investors choose wood energy projects. Forestry on the other hand, disposes with great amount of wood, thanks to the sustainable forest management.

The campaign objectives are:

- To highlight the nature and advantage of the wood pellet production in Croatia;
- To develop a better understanding of wood pellets and their increasing role in the development of renewable energy in the Croatian economy
- To explain the campaign, the necessary activities and the structure of financial funds.

1.1. Methodology

Consultation and research process was done in order to establish this document. Institutions and industry representatives were consulted in order to draw upon their knowledge and opinion of the wood pellet sector (professional associations, Croatian Chamber of Economy, experts from Forestry Faculty of University in Zagreb etc.)

1.2. Basic Data about the Association of Croatian Pellet, Briquette and Wood Biomass Producers

The Association is registered in the Register of Association of City of Zagreb and in the Register of non-profit associations (Ministry of Finance – see attachment). The main goals of this leading Croatian professional association in the field of pellet, briquette and wood biomass production is the affirmation of using RES as well as to influence on sector policies and relations with domestic pellet stove producers and producers of similar equipment.

1.3. The activities of the Association in the upcoming period

The Association of Croatian Pellet, Briquette and Wood Biomass Producers will initiate subventions of national programs and activities such as:

- Installation of small wood biomass and pellet stoves for residential heating;
- Construction of the district heating system for bigger buildings and smaller communities;
- Modernization of industrial boilers and replacement of fossil fuel cauldrons with wood biomass cauldrons.

1.4. What is pellet

Wood pellet is a type of wood fuel, generally made from compacted sawdust or other wastes from sawmilling. The humidity of the wood pellets is only 10 percent and that is the reason for high energetic efficiency of the pellet. The pellet is mostly used in North America and Scandinavia but also in Austria, Italy and Germany. It is suitable for residential and public heating and also for big industrial plants.

1.5. The Benefits of Using Wood Pellets

The whole potential of using biomass in the production of energy (electricity or heath) can highly contribute to the consumption of RES, the meeting of Kyoto goals and the rural development because the production is mostly situated in rural areas. The bigger consumption of biomass will not affect ecological balance and biodiversity because the forest management in Croatia is being organized according to the strict rules and the possible amounts of biomass are currently being exported.

In many of the rural areas the buildings for public purpose like schools, kindergartens, public libraries etc. use old energy fossil fuels systems and the unstable oil prices often increase the heating costs, which further burdens public budget of the communities.

According to the results of the research conducted by Croatian Wood Cluster, the price of the

heating of public buildings that use gas, are more than 100% higher. This fact is a very good reason for the orientation toward wood energy and pellet as one of the most modern fuel.

1.6. Pellet Production as Part of Wood Processing Industry – Raw Potential Material

The main types of wood used in the Croatia are: beech, oak, fir, ash, hornbeam, alder, maple and other types of wood, mainly non-coniferous. In 2010, the wood processing sector counted 3,127 companies that employed over 25,000 workers, generating a total revenue of approximately 1 billion EUR, while the exported goods amounted to 600 million EUR. The export numbers show that wood-processing industry represents almost 8 percent of the Croatian manufacturing industry exports.

Overall Croatian potential of wood biomass in the production of energy and heat is immense and it can significantly contribute to increase of utilization of renewable energy resources (RES) in Croatia, to rural development (since most of the projects will be implemented in rural areas) and to meet the Kyoto protocol requirements. Currently most of the wood biomass raw material ends up in exports. More than 40 trucks of biomass are every day exported from Slavonia region to Slovenia, Austria, Italy and Hungary.

Most of the Croatian pellets producers are situated in the areas rich with wood: Primorsko-goranska, Vukovarsko-srijemska and Licka County. Today, 48 percent of the Croatian territory is covered with forests and forestland. The main characteristics:

- The Croatian forests are natural, which is rare in Europe nowadays;
- Total 2 million ha of the Croatian forestland holds the world famous FSC certificate;
- Forest management offers constant growth of wood reserves. Only 80 percent of annual growth gets cut down;
- Beech is dominant type of specie, with predominantly economical forests;
- The overall reserve of wood in Croatia amounts to 394 million cubic meters.

The state company Hrvatske sume d.o.o. (Croatian Forests Ltd. / CF) has been managing around 78% of the national forestland and private forest owners in Croatia possess less than 22% of all forestland today (around 460.000 ha).

1.7. RES Policy and Legal Framework of Forestry and Wood Processing Industry in Croatia

The strategy for the development of energy sector of the Republic of Croatia covers the period until 2030, focusing on improvement in energy efficiency as its primary objective. It has been estimated that the share of forest and wood biomass as potential energy source in the Republic of Croatia might range between 50 to 80 PJ by 2030. The Croatian Government has recognized the importance of renewable energy sources by adopting the industrial wood-processing development program in 2004.

Bigger consumption of wood biomass is one of the most important priorities in this program (especially pellets).

1.8. National Forestry Policy and Strategy

In 2003, the Croatian National Forestry Strategy was adopted by the Parliament. It is estimated that approximately 1.3 million m^3 of wood biomass is annually available for energy purposes, half of which is derived from the wood processing industry.

2. MARKET ANALYSIS

2.1. Pellet Production and Consumption on European Markets

The wood pellet market has experienced a large growth in the last five years. In 2006 the production of wood pellets was estimated between 6 and 7 million tons worldwide (not including Asia, Latin America and Australia). In 2010 the global wood pellet production reached 14.3 million tons, including the mentioned countries, while the consumption was close to 13.5 million tons[2] thus recording an increase of more than 110 percent if compared to 2006.

The European Union is still the main market for wood pellets. Between 2008 and 2010 the EU wood pellet consumption increased by 43.5 percent to reach over 11.4 million tons in 2010, equal to nearly 85 percent of the global wood pellet demand. The large increase in the demand for industrial pellets is being noticed in Northern European countries such as the Netherlands, Belgium, Denmark and Switzerland. In the segment of residential heating the main consumers are Italy, Austria, Germany and Denmark. Exactly those countries have extensive multi-annual campaigns. The result is bigger pellet consumption and that is a good example how to develop pellet market in Croatia.

Pellet Production and Consumption on Croatian Market. Croatian pellet factories produce almost 270.000 t of wood pellet annually and the market consumption amounts hardly 2.000 t.

2.2. The Role of Institutions in Promotion and Development of RES Market

- **The project "Drvo je prvo" (Wood Comes First).** In October 2007, the Croatian Chamber of Economy, in cooperation with the company Croatian Forests and the former Ministry of Agriculture, Forestry and Water Management, launched the campaign "Wood comes first!" The main goal of the campaign was to increase wood consumption in Croatia and consumer awareness about benefits of wood and wood products, also about wood biomass and pellets.
- **Grant Aid and Direct State Funding.** Once a year, the Croatian Ministry of Agriculture publishes bids in the area of strengthening competitiveness of the wood processing sector for small and medium-sized enterprises (8 million EUR). However, this funding is not available to professional associations or promotion of products or subsectors.
- **The Croatian Bank for Reconstruction and Development.** Till today, the Bank has financed projects in the wood processing industry with over 380 million EUR, mostly small and medium-sized enterprises (SMEs), also most of the pellet production plants.
- **IPARD**. The Croatian companies, which produce renewable energy from wood, may finance their programs by means of the IPARD program, placing a bid for non-refundable funds. Areas of priority (wood energy production, distance heating systems, etc.) are defined within the measures (301 and 302) through the component of rural development.
- **Fund for Environmental Protection and Energy Efficiency.** This Fund is established for the purpose of financing programs, projects and other activities in the field of environmental protection, energy efficiency (EE) and renewable energy sources (RES). Many wood processing companies have already used the Eco Fund sources for financing projects regarding environment and wood energy exploitation.
- **Faculty of Forestry Zagreb.** The Faculty has the laboratory and equipment for biomass research.
- **Croatian Forestry Institute.** The Institute participates in many European projects, like RoK-FOR, that analyses the potential of forestry in using RES.

- **Wood Cluster.** There are three wood clusters in Croatia: Croatian Wood Cluster, Wood Cluster of North-western Croatia and Wood Cluster of Vukovarsko-srijemska county. All cluster participate in EU projects, like ID WOOD, ECOMOVEL etc

2.3. Why does Croatia Need a Promotional Campaign

According to Peksa-Blanchard et al. (2007), wood fuels (including wood pellets) are the most readily available biomass form in most of the European countries and they will play a crucial role in achieving the 2020 objective. Countries such as Austria, Germany, Latvia and Poland exports a large share of their wood pellets production, while countries such as Denmark, Netherland and Belgium are major wood pellets importers in the EU (Sikkema et al., 2011).

The general public in Croatia doesn't still recognize all the benefits, advantages and potentials of using RES and pellet heating systems. The wood biomass and pellets as possible district heating fuel have many advantages like the environment protection and the safety supply. It also contributes to the development of local economy and to creating of new jobs.

The promotional campaign presented in this document should be implemented during 2013 (01.01. - 31.12.2013). However, in long-terms the goals can be achieved only with continuous campaign and the intensity of the activities and the structure of the short-term goals will depend on current market situation and the state of mind of the potential and existing pellet users.

3. THEMES AND GOALS

3.1. Themes

The promotional campaign on wood pellet in 2013 is about expanding of traditional knowledge of wood use according to the following topics:

- Savings in regard to fossil fuels
- Environmental protection
- Biomass and sustainable forest management
- Smaller emissions of CO_2
- Socially responsible public procurement
- Adjustments to the EU legislation.

3.2. Proposals For Activities And Communication Channels

A) Tools

In order to implement the proposed action, the use of the following tools is provided (depending on the target group and the message):

- Creating websites and profiles on the social networks and forums

Web sites today are the ID cards, regardless of whether the company, association, institution, etc. Web site must be informative and the amount, level and type of information should be specifically designed for each target group. It is important to regularly fill the website with new information. Also, the presence on social networks is becoming an increasingly important tool in terms of the presence of the public, and it is not to be ignored, especially when it comes to children and young people as a target group;

- Designing and production of audio-visual materials and attachments

Radio jingles, TV spots, short informational films etc. are traditional marketing media tools; despite the Internet, they are not losing on popularity and they still have a big influence on public opinion;

- Designing and printing of information booklets, pamphlets and promotional materials

Printed marketing materials are also traditional tools with still remarkable achievement. These so-called "tangible" materials are one of the easiest ways of creating interest and sympathy among all target groups. They ensure that the messages of the campaign remain in the minds of the target audience through a physical presence.

B) Activities

In order to realize the set goals of the campaign the following activities are proposed:

- Market research and analysis of data (research of the initial state)

It is the first research aiming to determine the initial state of awareness among all target groups, as well as the level of knowledge on the campaign or other data that can be used to measure the success of the campaign.

- Media coverage (preparation and publishing of announcements, interviews)

Continuous appearances in the media (TV, radio, print, online) ensure the continuous presence of pellet with an emphasis on its economic and environmental benefits. If it is a professional media, the emphasis will be on specific messages depending on the target groups;

- Implementation of an educational and informative action "The Pellets Day in My Town"

The goal of this project is to demonstrate the use of pellets live, where a vehicle with a installed pellet stove visits the major Croatian cities (parking near the town square with live demonstration how the pellet stove works - information booklets, flyers and other promotional materials will be distributed).

- Organization of thematic roundtables for professionals (regionally)

Thematic round tables intended for designers, engineers, architects, hoteliers and other disciplines that aims to encourage the greater use of pellets. In order to attract as many of the participants, it is anticipated that these meetings are organized regionally (Rijeka, Split, Zagreb and Slavonski Brod).

- Organization of the 4. International professional conference on wood biomass

International professional conference is a professional gathering of the representatives of biomass production, forestry, local government, institutions, planners, media, and all who want to be informed about the latest trends, legislation, resources and opportunities ensured by increased use of pellets and wood and forest biomass

- Organization of a study tour for the media and institutions

Study tour aims to motivate the media (as creators of public opinion) and institutions (such as decision-making affecting the society as a whole). The emphasis is on ecological and economic benefits of the use of pellets as well as a better knowledge of this energy source and its characteristics.

- Internal meetings and coordination among members of the Association prepares

In order to achieve the best possible realization of the campaign activities, the Association members will continue with the regular meeting, exchange of information and coordination.

4. EXPECTED EFFECTS AND MEASURING OF SUCCESS

In accordance with the practices and results of similar foreign promotional campaigns, the following effects of the national campaign in 2013 are expected:

- Creation of the domestic market of pellets
- Rational and increased use of renewable energy sources
- Approaching to targets of Kyoto Protocol and EU regulations
- Greater representation of pellet stoves and pellet heating technology in the projects of new housing and public buildings
- More responsible approach to the environment, forest, wood and products from renewable sources
- Raising awareness of the relevant institutions for the problems of production and marketing of pellets in Croatia.

4.1. Measuring of Success

By conducting of the baseline researches by the Faculty of Forestry, University of Zagreb, before the start of the campaign and after the campaign, it is possible to determine the initial state and the results of the implementation of the campaign.

According to the practice of countries with developed pellet markets, it is proposed to involve in the campaign other relevant institutions and actors in the field of energy sector:

- Fund for Environmental Protection and Energy Efficiency
- Promotional campaign "Wood Comes First" (Croatian Chamber of Economy)
- Croatian Ministry of Economy; Department for Industry Policies, Energy and Mining
- Croatian Ministry of Environmental Protection
- Energy Institute Hrvoje Pozar
- HEP d.d. (Croatian Electricity Company)
- Center for Monitoring Business Activities in the Energy Sector and Investments.

5. CONCLUSION

It is known that in the European wood processing sector in the last decade all real income derives only from the economics of wood waste as the cost of traditional wood product reached its commercial zenith, often under the impact of competition from Asian countries. At the same time increases the need for responsible approach to environment and reducing of CO_2 emissions. Therefore in Croatia the culture of using RES occupies the reasons of many investors who turn to the use of wood and biomass energy as a strategic material.

For this reason wood processing companies have the opportunity to earn much more and to develop socially responsible business, especially if using wood waste energy or produce energy fuels such as pellets or briquettes. On the other hand, there is great potential that the part of the heat produced from wood can be sold to the wider community through district heating systems, which has not often been the case in Croatia.

Pellet consumption in Croatia is in the beginning so manufacturers turn to pellet promotion with the support of competent institutions. To provide these activities in 2013 the Association needs funds in the amount of 102.700 EUR. The funds should be raised through membership fees and donations as

well as through participation in national and European projects. The measurement of the success (carried out by Faculty of Forestry, University of Zagreb) will be parallel with the implementation of the activities, which will allow continuous monitoring of the campaign results and its improvement in future periods.

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FURNITURE FAIR AND IMPORTANCE OF MARKETING COMMUNICATION IN THE FURNITURE INDUSTRY

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ABSTRACT

Trade fairs are part of the PR communication of companies with the external environment. On the global markets they significantly participate in the penetration of foreign and domestic furniture industry products to target customers. In the paper the authors further characterize the phenomenon of the fair, its advantages and disadvantages within the current marketing communication environment.

Key words: fair, communication, external environment, global markets

1. INTRODUCTION

The development within the areas of company´s communication with the internal and external environment has been recently influenced by various economic and non-economic events. The overall character of trading has been changed radically as well – the competition increases, there are more business opportunities and the trade environment is subjected to constant changes. These basic indications must be taken into consideration within the communication of companies active in furniture industry with their customers, suppliers and purchasers, who represent the connecting link in the retail chain. Some professionals in the area of marketing recommend abandoning the notoriously known tools and techniques of communication and instead of that suggest focusing on new trends. These trends which should help them become different within the competitive environment. The others prefer integrated marketing communication and there are many traditionally thinking professionals who emphasize the return to classic proved forms of communication. From the studies in professional literature we know about the communication tools such as advertising, sales promotion, public relations and personal selling. Within the mentioned communication tools there are various communication techniques, which might mutually overlap or they are specifically given for a particular tool out of those mentioned. In our paper we would like to deal with the industry branch which ranks among the traditional branches of the Slovak national economy - the furniture industry.

The furniture industry has been recently in the doldrums, which is to be reasoned by the influence of the crisis development. The competition within the global environment has been severe and the market prefers producers from Poland, who can offer cheap products, or producers form Italy, who offer exclusive products. The perception of a product in the furniture industry is significantly focused upon its visualization and therefore the communication is focused more or less on areas which make this product visualization possible. We believe that the fairs and exhibitions, even though we speak about well-known form of communication, might raise the product awareness within the furniture industry. Fairs and exhibitions are not cheap matters; they may represent an effective way of external communication with customers and other subjects. Dealing with the position of fairs and exhibitions in

communication mix, their running and various views of professionals on such a form of communication, we will try to generate the positives and negatives of exhibitions and fairs and their importance for the furniture companies.

Position of fairs and exhibitions in communication mix of furniture companies

Fairs and exhibitions are popular and frequently used communication mix tools of furniture companies. However, in professional literature there is no clear classification into one of the communication mix tools. Without mentioning the names, we would like to emphasize the fact, that some professionals rank this communication technique among the sales promotion, others to personal selling and there are those who speak about public relations or about an independent communication tool. We identify ourselves with the statement that ***fairs and exhibitions are not independent communication tools, but they represent a combination of several communication techniques.***
On basis of this fact they can not be labelled under any of the above mentioned communication mix tools. If we would like to make a relevant classification, we would have to focus more on characteristics and main objective and goal of an exhibition or a fair.

From the historic point of view fairs and exhibitions have been shaped as an independent and fast growing branch and new institutions established on the international scale took patronage of the international activity. To mention some examples: UFI, established in 1925 in Milan or IFEZ established in 1985 in Belgium, Germany and France. Among the oldest and most important organizations there is the Bureau International des Expositions – BIE, which was established in Paris, 1928. In the former Czechoslovak republic important and internationally acknowledged organizations were established, e.g. BVV - Brnenské výstavy a veľtrhy (Brno fairs and exhibitions), Agrokomplex – Výstavníctvo Nitra (Exhibitions Nitra), etc. Activities of these institutions have remained in existence up to present days.
Before we start dealing with the specificities of fairs and exhibitions as such, we should define the terminology which will be used in the article further on.
The term exhibition is in literature sources defined as systematic, clearly arranged and in advance well-considered presentation of exhibits which are part of the given thematic whole (in our case furniture and housing) and are in accordance with the overall intention.
The term fair is a business exhibition event with rules and possibility of international attendance. It is here where the business contracts are signed and the small sale of exhibits is not allowed. It is important to add that it is an international economic exhibition of samples, not depending on its name and following the habits of a country where the event takes place, represents a big market of consumable goods and devices. It takes place in specifically given period, in the same location and the exhibitors can present samples of their production with the purpose to conclude business contracts on national and international scale. Fairs might be general or specialized.

Typical features for exhibitions and fairs are:

- specifically set goal,
- precisely set duration period,
- clearly set location,
- accessibility of the public,
- commodities must be in accordance with the goals of the event,
- marking with specific name,
- promotion.

Among the most important functions of exhibitions and fairs we list:

1. *Economic function* **–** resulting from the fact that each exhibition stimulates the efficiency of the reproduction process and from the international point of view it is considered to be the so called 'mirror' of economic politics of a particular country.
2. *Social function* – closely related to *informational function.*

3. *Contact and promotional function* - their importance is to be seen in the context of marketing and promotional policies.
4. *Research function* – has been recently gaining more importance for various types of analyses and researches.

In practice there are several classification possibilities of exhibitions and fairs. We have chosen the following ones:

Classification of exhibitions:

- World exhibition – international exhibition presentation of non-commercial type, which might have wide universal content focus, or it can be specialized on a specific
- International exhibition – exhibition event, the participating exhibitors are from several countries
- Regional exhibition - exhibition event of a geographic, economic or political region
- National exhibition – an independent exhibition event of one country in another, with the focus to point out the possibilities of mutual cooperation
- Official participation – an independent state exposition on an international exhibition, or a fair abroad. It consists of partial expositions of individuals which are connected with an idea, architectonics and graphics into one whole
- Trade exhibition – common exhibition of exhibits accompanied by retail
- Specialized exhibition – exhibition event focus on a particular branch

Classification of fairs:

- Universal fair
- Multispecialty fair
- Professional fairs
- Congressional fairs
- Regional fairs.

Recommendations for the presentation of furniture producing companies on fairs and exhibitions

As it has been already mentioned in the introduction the nature of fairs and exhibitions has changed a lot recently. Many exhibitors perceive these activities as a social event only; they put emphasis on the social function and do not realize the possibility of participating with the business goal. The reason, why they keep participating in fairs and exhibitions is their will not to fall behind their competition. It is a bit strange perception as nowadays it is not enough just 'to be there'. The participation in a fair or exhibition should bring some positive results for the company. Not to mention the fact that the participation in a fair or exhibition always means some expenses for the company. The decision to participate in such an activity should therefore be part of long-term communication strategy of a furniture company. In this case it is not important whether the company participates in one or two dominant events a year. Important is to be well-prepared for the event, manage the whole organization and try to use several marketing possibilities.

Before a furniture company decides to participate, it has to clarify which of the following goals should be achieved:

- Presentation of the company
- Introduction of new products – awaken interests of new markets in a product
- Sale – strengthen the sales
- Exchange of experience
- Exploration of export possibilities
- Exploration of competitiveness

- Development of personal contacts
- Acquisition of new customers
- Collection of new data about market
- Check up on price margin
- Service on market
- Development of distribution ways
- Search for new sales representatives
- Testing the acceptance rate of goods on
- Introduction of a prototype
- Introduction of product innovations
- Extension of range of goods, etc.

We could list even more goals or motivational reasons. The surveys among the visitors of established fairs and exhibitions in the Czech Republic and Slovak Republic show that 11% of visitors go to the exhibition or fair with the goal to buy or order - if not on the spot, then shortly afterwards. Many exhibitors underrate this fact and the worst mistake they make most often is that they do not collect contacts to which they could subsequently answer or communicate via them.

On the basis of the above mentioned survey we have found out the most frequent mistakes the exhibitors make:

a) *low activity* **–** the staff of the exhibition stand waits passively for the visitors to talk to them or come up with a demand.
b) *no fast diagnostics* **–** salesmen have the tendency to deal with each customer. It is not a problem if the attendance is low. However, once there are several visitors or potential customers at the same time, the salesmen have to be able to select who deserves their attention and who does not.
c) *no orders are made* **–** the salesmen do not try make a deal. The task for the staff in the exhibition stand is not only to inform but also to make business.
d) *no contact data are collected* **–** many visitors are not willing to give their personal data to the staff. The serious ones usually are. It is always good to reason to the visitors why it is worth to give the staff a contact, e.g. you could inform them about the prepared interesting events after the fair and your intention to send them more information about it.
e) *the contacts are not monitored* **–** once we have collected the contacts it is important to contact the potential customers within few days after the event (one week the latest). If you do not do it, your competition will.
f) *no surveys are done* **–** on a fair or exhibitions there are your potential customers and competitors at the same place and time. It is important to utilize this situation. It is recommended to do a questionnaire with customers and check the products of one´s competitors.

Exhibitions of furniture industry in Slovakia and their importance for marketing communication

In Slovakia there are several exhibitions focused on furniture, interior accessories and interior design events held annually. The best known are MODDOM, taking place on 16 October - 20 October in Incheba, Bratislava. This year it is already the 18th. The International fair of furniture and interior design takes place in March (5 March – 10 March 2013) on Exhibition Grounds Agrokomplex in Nitra. This year it was the 23rd. Both events are accompanied by numerous marketing activities which cumulate several tools and techniques of communication mix. For better explanation we will use in our paper detailed information about the 23rd International fair of furniture and interior designs Agrokomplex.

1. Characteristics of the event, topics of the fair

New trends in design, interior culture by the Slovak designers and producers, ecology and housing, nature and technology, progressive wood materials for creative industry – these were the main topics of the important furniture fair 'Furniture and Housing' which took place in Nitra (Agrokomplex, 5 - 10 March 2013) for the 23rd time. This furniture presentation and interior accessories is very popular among the fans of beauty, design and cosy homes. It is associated with the beginning of spring and it represents a strong impulse for the beginning of a new furniture business season in Slovakia.

The fair of furniture and interior design 'Furniture and Housing' started in 1991 in Nitra with more than 50 exhibiting companies. Nowadays it counts more than 400 companies from several countries of the world on the area of 20 000 m².

As such it ranks among the most important furniture events in Central and Eastern Europe. Regular annual participation of more than 70 000 visitors proves that the fair is both communication and presentation possibility for companies and it is very attractive for the wide public.

23rd year of the international fair followed its previous successful years. The furniture fair offered modern world design presented by the dominant European designers and producers. Regarding the structure of goods the fair focused mainly on furniture for living rooms, sitting and kitchen furniture, hall furniture and not to forget the style furniture. The interest of exhibitors increased in presentation of materials for interior and lounge furnishings which is proportionate to the growing demand of users who ask not only for goods but for particular designer service as well.

In 2013 various furniture innovations characterized by the elements of Slovak designers were introduced. These designers had more chances to prove successful abroad than they did in Slovakia as the low-income groups prefer cheaper furniture imported from Asia with no regard to quality and design.

2. Design Forum

An inseparable part of the fair is also the 16th year of the furniture design exhibition **Design Forum.** Design Forum is a project of the Design Department at the Academy of Fine Arts and Design in Bratislava, respectively Research-Implementation Centre. The project originated more than 16 years ago. Its establishment was supported by Agrokomplex -Výstavníctvo Nitra, which organizes this non-commercial activity together with the Academy of Fine Arts and Design and with the Slovak Design Centre. The primary goal of this event is to support the author design, its creators – designers and quality domestic series production.

Design Forum creates special space for young authors and students of schools focused on furniture design. All the exhibition years were given a particular idea. During the 16th year of Design Forum exhibition the Slovak designers worked with the 'Harmony and Contrast' topic. Current period offers to designers and producers various materials and technological possibilities of their processing. This fact is reflected also in their use in interiors. It is mainly the combination of materials applied in designs, furniture production and interior accessories which may add interest to interiors and exteriors evoke new emotions and mediate new experience to customers. The exclusive Design Forum exhibition 2013 showed new approaches of designers, architects and design students when using various materials and their combinations in housing.

The organizers introduced products, prototypes or functional models of furniture, interior and exterior components and interior accessories. For all the innovations we can mention some of those which were exhibited this year in Nitra.

Picture No. 1: Harmony and Contrast – combination of materials in interior

Picture No 2: Collection Ottoman – amusing furniture into every flat, by Dušan Voštenák

3. Student studies of veneer

Centrum súčasnej architektúry ARCHA matériO (The Centre of Current Architecture ARCHA matériO) introduced a collection of student work of veneer on the Furniture and Housing Fair 2013 in Nitra in cooperation with FA STU (Faculty of Architecture, Slovak University of Technology in Bratislava). The handwork with material is really necessary and enriching experience for the students of architecture, design and applied arts. Within the workshop focused on research of veneer shape possibilities the architecture students of FA STU created several charming designs – 3D studies which were introduced to the professional and non-professional public on the Furniture and Housing Fair 2013.

4. Specialized events

The 23rd year of the Furniture and Housing Fair was accompanied by professional specialized events and discussion forums, which reacted to the current topics of furniture industry.
We also present the division of exhibition halls according to commodities.

Table No 1: Division of exhibition halls according to commodities

Division of exhibition halls according to commodities		Biggest exhibitors in 2013:
A **B** **C**	Style furniture and interior accessories, interior and garden furniture, Interior furniture Interior furniture, mattresses	Bakero Export – Import , s.r.o. Říčany Bianca , s.r.o. , Liptovský Mikuláš
F	Furniture for living rooms, bedrooms, rooms for children	Blum Július GmbH Höchst
G	Bathrooms, saunas, swimming pools	Brik , a.s. Kremnica
K	Fair opening	Damil S.R.O. Pezinok
M1	Soft furnishings, doors, floors, interior accessories, fireplaces	DSM , s.r.o. Banská Štiavnica
M2	Interior furniture	Fines , a.s. Žilina
M3	DESIGN FORUM	INREBYT s.r.o., Bratislava
M4	Kitchen, appliances, furniture fittings, interior furniture, light fitting	IN – ELIS SK, s.r.o. , Brezno MEUBLE , s.r..o Dubnica nad Váhom
M5	Interior furniture	
S	Sale of interior accessories **Vp** Garden and interior furniture	

To conclude we may state that the furniture and housing fairs represent an important place for the presentation of furniture and interior accessories of domestic (Slovak) and foreign producers and sellers. The professional public has a chance to acquire new knowledge and confront them with the reality presented in the exhibited goods. It is the confrontation and comparison of domestic and foreign furniture which helps the producers find the position with their production on consumer markets.

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BAROMETER OF PUBLIC OPINION IN ATTITUDES TOWARDS WOOD PRODUCTS: A METHODOLOGICAL APPROACH

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ABSTRACT

Choosing the right methodology is critical for successful application of idea to design the barometer of public opinion in a chosen field. This paper presents a methodology for the implementation of barometer of public opinions applied in the research of public attitudes towards certain category of wood products. Products of pulp and paper industry were chosen in this case. Pilot polls used the standard procedures of empirical sociology, which are carried out using the implemented CATI (Computer Assisted Telephone Interviewing) system. This step needs to be preceded by the determination of the relevant sociological, economic and political theories that serve as the theoretical basis for the formulation of questions in a subsequent survey.

Key words: barometer, public opinion, CATI, wood products, pulp and paper

1. INTRODUCTION

The paper is based on the methodology of research activity "Forest barometer of public opinion and the valuation of public functions of forest ecosystems", carried out under the EU project "Extension of the centre of excellence: Adaptive Forest Ecosystems". The objective of this activity is the implementation of a public opinion evaluation system in forestry and determining the value of the public functions of forest ecosystems. There are the three research teams involved in the activity which aim at the following specific areas: forestry, hunting and forest/wood products.

Competitive advantage of wood processing industry depends on changes in consumers' behaviour. Regarding this fact different studies often deal with an acceptation and preferences of consumers for wood products comparing to its material substitutes. This paper presents a methodology of pilot implementation of the public opinion barometer aimed at wood products. In particular, paper and paper products were chosen out of the wide portfolio of wood products due to the new possibilities of paper utilisation and ongoing changes in end-users' behaviour (e.g. rapidly growing interest of consumers for digital media and digital information). Another reason was that the relevant systematic research of the consumers' preferences for any forest products group absent in the Slovak Republic.

2. RECENT PULP AND PAPER MARKET DEVELOPMENT

The total surface of closed forests which are or could be used for timber production is about 2, 95 million ha or 22 % of the total land area and the total volume of world growing stock is more than 380 billion m^3. Industrially utilised part of such growing stock represents large material base for forest-based sector. Annually more than 3 billion m^3 of wood is produced and consumed world-wide (Borota, Parobek, 2011). Moreover, biomass represents highly preferred renewable resource. The demand for wood biomass has undergone significant changes. Behind the rapidly growing consumption there are traditional industrial sectors such as pulp and paper and wood based panel industries as well as companies of energy sector utilising wood biomass as an input. Parobek (2010) stated that the global markets for pulp, paper and paperboard pass a series of unexpected twists. Yet in the begging of 2008 the economic development of the pulp and paper industry (PPI) was optimistic. In the second half of 2008 and the first half of 2009 global demand fell sharply. PPI has been strong affected by the financial crisis. Especially, decreasing consumers' expenses, slowing international trade and industrial production had the significant negative impacts. The largest drop occurred in the production of graphic paper, packaging paper and cardboard, while the area of hygienic paper was affected only slightly. Major paper and paperboard trade flows within the UNECE region in the recent years reflected ongoing developments in competitiveness and growth, influenced also by shifts in currency exchange rates.

3. METHODOLOGY DESCRIPTION

Fodrek and Šálka (2013) reviewed the barometers applied in Slovakia. Political barometers as *Euro barometer* (since 1973) and *New Europe Barometer* (1991-2005) belong to the best known. A barometer considering the illegal cutting and trade with wood carried out by WWF in 2012 is important for forestry sector. This barometer proved that regulation of illegal cutting is still at insufficient level.

3.1. Sampling method, sample size and methods of data processing

Processing and interpretation of research data can be carried out on the basis of a well determined research methodology. Generally, the methods of descriptive and inductive statistics can be used. Random sampling is a basic assumption for using the inductive statistical method. It is recommended not to use the inductive statistics for samples which were not gained through random sampling (e.g. quota sampling) or for census where the entire population is questioned. In cases of census any proved relation represents a real and so that a significant relation. The methods of descriptive statistics, including multifactorial survey techniques can be used in cases of non-random sampling (Rimarčík, 2007).

The sample size depends on the type of the research. Quantitative research (we mostly collect interval and ordinal data) often needs large sample size and qualitative research (we mostly collect nominal, ratio and binary data) mainly needs small sample size. The reality is that we need quantitative and also qualitative data for our research, that's why we also combine the sampling methods (Maťová et al., 2008).

The structure of the data depends on the research purpose itself. It is recommended to use quota sampling methods. Some research results showed that there are no significant differences between the quota sampling and probability sampling (Richterová et al., 20047). Therefore, the inductive statistics can be also used.

3.2. Computer Assisted Telephone Interviewing

Computer Assisted Telephone Interviewing (CATI) was chosen to carry out the survey. This methodology of data collection will serve for the systematic research of public attitudes towards certain categories of wood products. The pilot survey is preceded by a pre-test carried out by a selected professional agency. This allows verifying the success of the survey implemented through the CATI.

CATI is an interactive front-end computer system that aids interviewers to ask questions over the telephone. The answers are then keyed into the computer system immediately by the interviewer. Originally CATI would be employed centrally using a minicomputer system. Each interviewer is sitting behind a terminal and asks the questions that appear on the screen. The respondent's answer is then typed into computer by the interviewer (ESCAP, 2013). Comparing to the traditional data collection (via face to face interview) is CATI considered to be more productive approach for data collection which reduces manpower needs, lowering costs and speed up the process of data collection. Comparing to mail/e-mail data collection has CATI not any delay in completing the form or returning it what has severe implications for the response rate.

The interviewer initiates the interview sessions and save the information directly into the computer system. The computer program controls branching to or skipping among questions, and validates the data as it is entered. The interviews are more personalized, probing questing is standardized, use of historic data is standardized, and the questions can be more sophisticated than those on paper questionnaires. More complex questionnaire design is possible since the program controls branching and logic.

A simplified scheme of CATI system (Figure 1) described by Fodrek and Šálka (2013) is used for barometer implementation. Dialling of phone numbers is not automatic, but the server display phone numbers on a screen, put out incorrect numbers, postpone missing calls etc. IBM SPSS data collection software is used for barometer implementation. Important components of IBM SPSS data collection server are *Interview Server Administration* and *Author*. First one serves for setting up of the CATI system. *Author* allows construction of questionnaire/interview. It can be created in application *Author* directly or in MS Excel and then imported to *Author*. This application allows editing questions with different types of answers. So, if questions are in multiple-choice format, the interviewer needs only to point and click on the right answer. The answer is translated directly into a code by the CATI system and updated in the database. Another component of the software is application Data collection desktop which is installed to the PC's appointed for data collection.

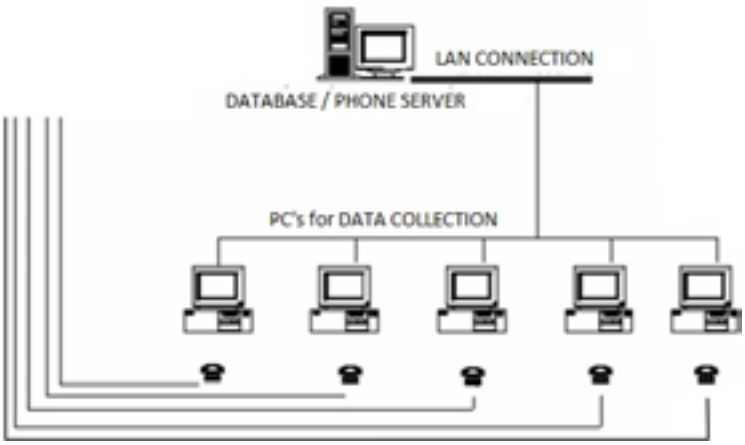

Figure 1 Adapted CATI schema for pilot forestry barometer
Source: Fodrek, Šálka (2013)

4. UTILISATION OF RESEACH RESULTS

There are several possibilities to use the results of the research. The national barometer can be regularly updated and the results can be compared in time. The authors of the paper also participate in the COST Grant System Action FP 1104 "New possibilities for print media and packaging – combining print with digital". To give the forest industry a competitive edge this action focus on new innovations by combining knowledge of the end users with most recent technological achievements. It is possible to explore new business opportunities for the fibre based products and the value chains of print media and packaging through novel, innovative uses. Benefits may be also achieved from new combinations of print and digital. Several examples exist where successful combinations have been achieved e.g. through the use of image recognition, augmented reality or printed electronics to bring interactivity into fibre based products. To be successful, any new and innovative solutions shall be accepted by the final consumers. Therefore, the results achieved by carrying out barometer could contribute to the discussion about consumers' behaviour and preferences for that specific wood products group.

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FORMS OF KNOWLEDGE SHARING IN THE WOODWORKING INDUSTRY ON THE POLISH EXAMPLE

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ABSTRACT

Knowledge sharing is the basic source of innovations in the industry. Woodworking industry applies different forms of knowledge improvement through different forms of its sharing. Knowledge sharing is based on the cooperation between science and industry units with supportive role of the local authorities. One of the most popular form of the knowledge sharing is cooperation in technological parks. The article presents review of knowledge cooperation on woodworking industry in Poland.

Key words: knowledge, innovation, research centres, technological parks

1. INTRODUCTION

One of the major challenges for contemporary civilization is to create a knowledge-based economy, which governs the scientific – technical progress. It is possible thanks to the continuous development of modern technologies and industrial areas, which are often initiated in the research centres. The research findings that are the result of painstaking and time-consuming process of research (basic research, applied research and experimental development) are the basis for the development of innovations or inventions.

In many cases, the research suggests new directions of technological progress. Research centres are precursors of technological development in many important sectors, among others, the woodworking industry.

The role of university research centres in the research system increases in not only essential but also in the applied and development research. Industry benefits from university laboratories and expertise of researchers who are in possession of not only the knowledge of the processes, its properties, and the course, but also the possibilities of using the results of these processes. Conducting research by universities on behalf of the industry results in not only the commercialization of research results, but above all, the formation and development of the so-called technology transfer centres.

A very important role in supporting the scientific – technical progress, which is the basis for innovation policy, belongs to the local authorities, which are necessary for the stable development of new technologies and products in the region. Hence, involvement of research centres in collaboration with local industry and local authorities, resulting in the creation of trade organization focused on regional economic development. It should be noted, that this type of initiative between science and industry supported by the local authorities are the foundation of the European Union policy, which task is not only the integration of the Community countries, but also concern interests of individual regions. The interaction of science, industry and local authorities contributes itself to the creation of these socio -

economic developments projects, that fit not only in local politics but above all aim to create what is the most attractive and unique to the region, compared to other.

Innovation associated with cooperation between science and industry, according to the theory of Joseph A. Schumpeter, who first introduced the concept of innovation to economic science in 1911, means creating fundamental or radical changes, including the transformation of a new idea or invention to market technological product or process. According to Schumpeter, innovation is a new product, a new process of production or a new organization.

According to Peter Drucker, sources of innovation are: internal sources (company, industry) and external sources (from outside the industry and companies) in the form of demographic change, economic transformation and scientific and non-scientific knowledge. Thus, as the important role of the environment in which innovation arises and tools with the help of which it is popularized and implemented in industry. It is reason which underlines the significant role of science and industry cooperation on the joint projects aimed to finding problems solutions and innovative ideas.

2. CHARACTERISTICS OF POLISH WOODWORKING INDUSTRY

Wood is that kind of resource that is used mainly in industries such as: woodworking industry, furniture industry, sawmill and wooden board industry and packages as well. The sawmill industry deals with supporting woodworking industry with the large wooden items. The furniture industry dominates in terms of the woodworking sold production share (57%). The other positions are occupied by industries related to: wood-based panels, wooden joinery, sawmilling, packaging and others. The high position on the woodworking industry is occupied by wooden packages and match industry.

Wood and furniture industry in Poland is characterized by high exports, which is far above the average for the total industry. The value of exports of Polish furniture 2006 amounted to 19.48 billion PLN. Polish woodworking industry exports more than 89.8% of domestic furniture production and the furniture is the second largest commodity group of the Polish exports (6.5%). Export results clearly demonstrate the adjustment of Polish wood and furniture products to high quality standards, technical requirements force in the world and possibilities of competing producers in the market internationally. Export of furniture is much higher than import (in 2004 more than eight times). Despite the fact that since 2003 it has greater import growth than export, the balance of foreign trade furniture is still positive: in 2005 it amounted to more than 14 billion PLN, while in 2006 - more than 16.4 billion PLN.

Development of Polish woodworking industry is determined by the following factors: possibilities of financing of investment projects (financing project by own capital is very difficult), the wood purchase costs (dynamics of costs increase and policy of the main wood supplier – The State Forests), tax for wooden resources, efficiency of the wooden products export. Mentioned factors influence on the innovativeness of the enterprise with different power. Financial potential of the company is one of the most important factor that create innovativeness of the enterprise. The other factor which results from financial aspect of enterprise activity is cost of innovative idea implementation which concerns among others costs of laboratory equipment maintenance and high qualified workers.

The crucial factor of the Polish woodworking enterprises innovativeness increase is foreign capital which is supportive for innovations implementation. The weakness is low level of laboratory research and the competitive advantage of the woodworking industry is not quality but price of sold products. This situation was the basis of interests increase in European operational programmes concern innovative economy, where role of the knowledge sharing in the group of enterprises increase. Role of institutions that support knowledge share process is crucial for the success in innovations generating. One of the form of knowledge share group that support innovation creating process is technological parks or scientific – technological parks, that are initiative of companies and research or scientific centres (such as universities, laboratories, scientific institutes) supported by the local authority which guarantees safe development in accordance to region's policy.

In the result of using European project on innovative economy, Polish woodworking industry focuses on the quality achieved through innovations that becomes one of the main factors of the woodworking industry development. Research shows that companies in this industry make an effort and try to improve their products to match EU standards and customer expectations. Unfortunately, it is difficult surveyed innovate and new technologies, mainly for financial reasons. As respondents argue, the problem is access to innovation and new technologies and capital dedicated to the scientific and research activity. An example of this is the attitude of the respondents to the research institutions. In the opinion of companies operating in West Pomerania region in Poland, technological parks enables companies to develop (20% of respondents). There are 50% of respondetns that disagree or completely disagree (10% of them) with statement mentioned above. These data are presented in the following graph (Figure 1).

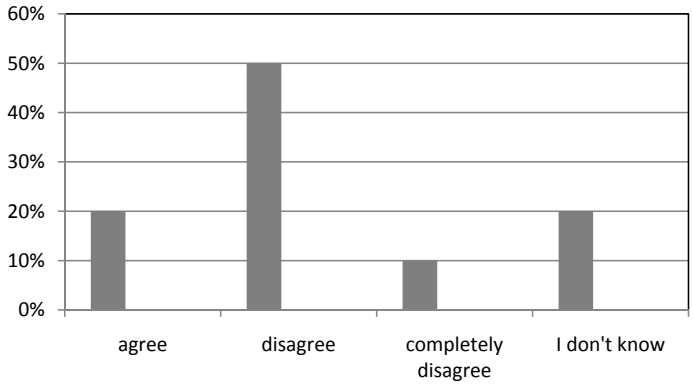

Figure 1. Opinion of Polish companies on the role of technological parks in the woodworking industry development.

It also appears that the perception of research institutions is under the influence of functioning length on the market in the wood and furniture industry. The longer a company has been operating on the market, including views on science and technology parks is more negative. Experience of companies indicate that such institutions do not meet their expectations and facilitate the development of and access to new technology and innovation. In spite of the subjective feelings of the respondents regarding the lack of cooperation with scientific research institutions, half of the surveyed companies assess their potential for development as large. Based on the analysis results, it can be concluded, that the opinion of respondents about science and technology parks does not matter in the assessment of their potential for development. Respondents were asked to assess their capacity building, and research results presented in the following graph (Figure 2).

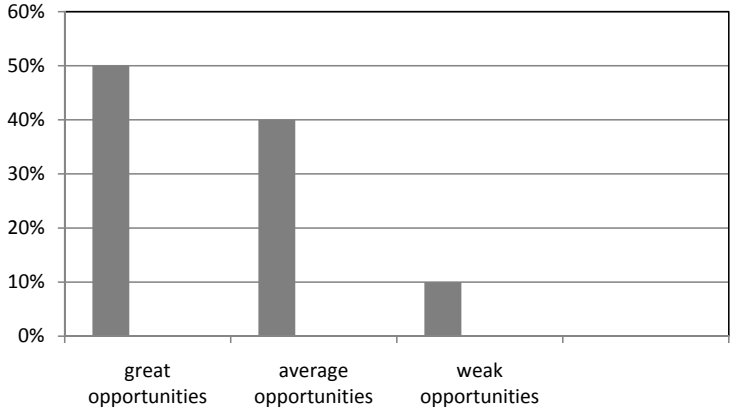

Figure 2. The assessment of the development opportunities of companies in the Polish woodworking industry.

The other problem that concerns innovative activity of contemporary woodworking industry is connected with the access to the scientific potential that support innovative plans of enterprises (Table 1).

Innovative plans of enterprises	**indications percentage**
New products	39.5%
New product brands	21.3%
Upgraded products produced previously	18.9%
New distribution channels	15.0%
New products being imitations of competitors products	14.3%
Entry into new market segments	14.0%
New production processes (technologies)	12.0%
Upgraded production processes	12.0%
Access to new resources, components and elements	12.0%
New post-sale services (guarantee, service etc)	10.6%
Entry to new geographical markets	6.6%
New packages	6.3%
New technologies being copy of the competitors production processes	5.6%
Patented inventions	5.3%
The organizational structure change	4.7%
Outsourcing	3.3%
Implementing of the resources planning system	2.0%
Implementing of the quality management system	1.7%
Reaching domestic strategic investor	1.7%
Implementing advanced information system supporting management system	1.3%
Implementing the system of result measurement	1.3%

Innovative plans of enterprises are aimed to implementing new products and new production solutions that are supportive for the production development. There should be system that implement stable research system being the content of the production system management based on the quality management system. Research potential of companies in Polish woodworking industry is quite weak because of the laboratories lack and R&D departments in enterprises, what is basic for knowledge development and innovative processes.

3. INSTITUTIONS OF BUSINESS SURROUNDING SUPPORTING WOODWORKING INDUSTRY

Analysis of the market's situation for business in Polish woodworking industry was prepared within the European project concerning the knowledge sharing in the region through cooperation network development in the frame of project activity called *the knowledge transfer* financed from the European Social Fund. Supportive role in the knowledge transfer belongs to institutions of business surrounding, which has influence on the enterprises development. Cooperation between those institutions and companies of woodworking industry can result in significant results and development for both individual companies and the industry.

The woodworking industry in Poland can find research support in the following institutions:

1. **Institute of Wood Technology in Poznan**, which is the only one in the country a scientific – research unit that deals in a comprehensive and holistic issues in the field of wood processing, its applications and the creation of new wood-based composites.

Research carried out by the institute aimed to produce new materials, improved production technology and processing techniques. They also aim to achieve balanced and sustainable development of the timber industry and the highly competitive Polish wood sector in the international market. Its mission is to implement research results into the practice in the form of innovative, energy-efficient and hygienic material using both lumber and wood waste. The Institute aims to create a modern wood sector that meets the requirements of modern society. As part of the organizational structure of the institute operates an accredited laboratory test timber related materials, packaging, furniture, construction, machine tools. The Institute also works for Product Certification Centre of Wood Industry, which is entitled to issue certificates for products. The object of the Institute is also a training activity for the wood industry. Institute is also involved in scientific publications, which is a promotional tool for companies cooperating with the Institute of Wood Technology.

2. **The Polish Economic Chamber of Wood Industry**- almost all of the major enterprises and institutions of the branch belong to the Chamber and the wood processing capacity of the member enterprises constitutes the best part of the Polish woodworking industry`s processing capacity.

The statutory tasks of the Chamber, among other things, is to protect and represent the interests of members in terms of their economic activity, in particular against state agencies, local and foreign, and active cooperation in the development of modern economic activities. Another task of the Chamber is to disseminate information to support business members, in particular the technical, financial - economic and marketing, as well as the promotion and dissemination of scientific, technical and organizational conditions for the development and creation of economic life.

3. **Institute of Industrial Design** is a strategic advisor in the area of design. It advises companies in every industry, designers, institutions and governments. It is the only institution in Poland, that has the status of a scientific and R & D Centre dealing with systemically-activity patterns and to improve the competitiveness of Polish enterprises, including the timber industry.

The Institute conducts research projects in the field of design and ergonomics, and advises on strategy and management of design, preparation and implementation of new products. The Institute is a member of the International Council of Societies of Industrial Design (ICSID) - an international non-profit organization that promotes design, with more than 150 institutions in over 50 countries. ICSID also conducts standardization activities, promoting good practice and supporting cooperation between

designers and business. Institute of Industrial Design is also a member of the Design Management Institute (DMI) - an international organization of business environment institutions and cultures that operate in the field of education, research and development and design in all areas of design.
The Institute is regarded as a strategic advisor to companies, public administrations and designers in the development of design and implementation of new design products on the market. Its mission is to promote design by providing professional services and consulting - expert.
As part of promotional activities of the institute there should be mentioned organization of the industry conferences for representatives of woodworking enterprises, which main aim is to exchange knowledge and experience between participants. The Institute also organizes promotional events in the field of design.

4. **Clusters Initiatives in regions** – that is supported by the regional government authorities that have set a high priority for region competitiveness improvement by supporting cluster development.

The starting point for the pro-cluster policy is the provisions in the Regional Strategy developer in July 2005 which highlights the need to establish "organizational, administrative, legal and financial conditions for creating groups of co-operating companies, including sector groups and clusters". Additionally, the regional government in its clusters support activities may refer to the priorities and measures definied in the Regional Innovation Strategy (Priority 1 – Increasing companies capacity to implement innovations and Priority 2 – Increasing use and potential of R&D). The example of such initiative is Regional Cluster Support Programme for 2009 – 2015 that was established in 2009 by Regional Board in Pomorskie region in Poland.

The programme is also a reflection of recommendations for the cluster supporting policy in Pomorskie developed under the project "Stimulating innovations in the Pomorskie economy by supporting cluster development – policy concept and pilot measures". Pursued by the regional government and the Gdańsk Institute for Market Economics in the years 2005-2008. The project was co-financed from the European Social Fund and from the national budget within the Integrated Regional Operational Programme. The cluster stimulation policy expressed in the programme assumes support for three types of cluster: key clusters, sub-regional (local) clusters and embryonic (technological networks) clusters. The support goes to projects designed to co-ordinate cluster development – soft measures such as networking, knowledge and innovation transfer, advice and consulting, technical monitoring, strategic planning, etc. – done by cluster co-ordinators. One of the priorities in the programme is concentration of support on the most promising projects – key clusters with a significant role in the regional economy, high dynamics or good growth potential and international competitiveness, i.e. clusters which may become strong drivers of regional development. A cluster may fall into the category of a key cluster after a competition organized by the Regional Board.

The programme intends to select not more than 6 key cluster by 2015. The selected clusters receive the status of key clusters for the current EU programming period and will receive financing under Structural Funds by 2013. The key cluster status does not provide any direct guarantee for financing from the regional government for the selected key clusters.

The key cluster status enables certain preferential treatment during evaluation of cluster development projects applying for funding from the Regional Operational Fund and from the Human Capital Operational Fund (the regional component). After the first competition in 2009 the key cluster status was granted to two cluster, the Pomeranian ICT Cluster and the Baltic Eco-energy Cluster, while in the second competition of 2010 status was granted to the Gdańsk Construction Cluster.

5. Education centres and research and scientific centres that educate enterprises of the woodworking industry (universities and vocational schools, Forest Research Institute, The State Forests).

4. CONCLUSION

Nowadays woodworking industry needs financial and research support to reach business and innovative plans connected with new products development. The pursuit of high economic efficiency

force enterprises to find new technologies and solutions for production reorganization towards costs reduction. The competitive advantage can be achieved mostly with the help of innovative product or innovative technology implementing. Supportive elements for innovations creating concern financial support and appropriate knowledge about processes organization.
Cooperation with other enterprises in the form of partnership or cooperation with institutes or research centres can result in knowledge transfer that can be useful for innovative products creating.

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CHAPTER 2

ECONOMICS AND INVESTMENTS

FINANCIAL ANALYSIS OF SLOVENIAN WOOD INDUSTRY

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ABSTRACT

Financial analysis, which includes in-depth monitoring of financial indicators, is crucial for the development of companies and the economy as a whole. Knowledge of the financial indicators greatly reduces business risk. The aim of the research was to assess the state of solvency and the degree of financial risk for the entire Slovenian wood industry in the period 2007 - 2011. It was found out that the values of the studied financial indicators worsened considerably at the beginning of the economic crisis, therefore it can be deduced to decreased solvency and increased business risk. Some indicators slightly improved in the last four years, but not much. This indicates a high risk of both sectors (C16 and C31), both for creditors and owners. However, there are little differences between the two sectors, what was also statistically approved.

Key words: financial analysis, economic indicators, wood industry, Slovenia

1. INTRODUCTION

In today's rapidly evolving business environment, which has strongly changed in recent years due to the global economic crisis, the monitoring of economic and financial indicators is crucial for the maintenance and development of business for the companies and the economy as a whole. Financial analysis is an important tool for assessing the financial position and successfulness of a company because of the two main features: it reduces a large number of data in the financial statements on a few key parameters and it ensures the comparability of financial statements of different sized companies (Slapničar, 2004). Many authors (Elliot and Elliot, 1996; Rees, 1995) at this point are emphasizing the insufficiency of this analysis as an example that such an analysis multiplies the deficiency of financial statements and that the indicators are not distributed normally. That makes problems not only for the statistical analysis but also for the interpretation and comparability of indicators.

Knowledge of the selected financial indicators is very important especially in business to business operations and at searching for fresh capital on the market, as this greatly reduces business risk. Financial indicators must enable to assess past business performance to business partners and owners in order to create expectations about the future performance of the company and on this basis, formulate decisions regarding their attitude to the company. For this purpose, the companies for many years (in particular, also the banks) are using rating reports, which are generally related to the risk of non-payment (i.e. the system Basel II) (Slapničar, 2004).

On the other hand, with the analysis of financial indicators the estimation of the performance of the branch can be done, which is key information for the creation and modification of sectorial strategies. Financial analysis shows disadvantages (weaknesses) and risks, and viewed as a whole for the entire branch can greatly affect the development and performance of the sector in the future. In the implementation of financial analysis must be taken into account that there is a great variability in the data and individual indicators among companies in the sector.

The aim of the research is to assess the state of solvency and the degree of financial risk for the entire Slovenian wood industry on the basis of selected financial indicators. Indicators were analysed for the recent 5 years (from 2007-2011), and therefore the impact of the economic recession on these indicators or on the state of Slovenian wood industry was established and determined.

2. METHODS AND MATERIALS

The key issue of successful financial analysis is in the right selection of indicators (selection of key performance economic / financial indicators). It is important that indicators are adapted to the intended use, and that the number of indicators is small, since an excessive number of indicators saturate the information. Moreover, some of the indicators may be in the strong correlation with each other, which complicates the interpretation (Slapničar, 2004). In order to facilitate focused and purposeful selection of indicators some authors (for example: Rees, 1995; Higgins, 1995; Brigham, Huston, 2009; Elliot and Elliot, 1996; Pratt, 1990; Mramor, 2002) classify indicators into different groups, taking into account the content connectivity of indicators. Other authors take into account the mutual correlation of the indicators (adapted from Slapničar, 2004). The most common sets of indicators are: profitability, solvency, structure of funding, turning assets and indicators of market values. Some authors formed the sets differently: certain indicators were putted in group on the different way (Slapničar, 2004).

For the purpose of this research, the analysed indicators were selected from the group of profitability, solvency, asset turnover and structures of funding. The indicators that have been used in similar studies (Ajpes FIPO, 2013; Slapničar, 2004; Peršak, 2011; Rebernik 2008; Hornby, Gammie, Wall, 1997), are selected:

1. **'Return On Sales – ROS:** A ratio widely used to evaluate a company's operational efficiency. ROS is also known as a firm's "operating profit margin".

$$ROS = \frac{\text{Net Income}}{\text{Sales}}$$

2. **Return On Assets (ROA):** An indicator of how profitable a company is relative to its total assets. The higher the ROA number, the better, because the company is earning more money on less investment.

$$ROA = \frac{\text{Net Income}}{\text{Total Assets}}$$

3. **Asset Turnover Ratio (ATR):** The indicator ATR measures a firm's efficiency at using its assets in generating revenue. A high asset turnover ratio indicates greater efficiency. A low asset turnover ratio indicates inefficiency, or high capital-intensive nature of the business.

$$ATR = \frac{\text{Revenue}}{\text{Total Assets}}$$

4. **Receivables Turnover Ratio (RTR):** The receivables turnover ratio is an activity ratio, measuring how efficiently a firm uses its assets. A high ratio implies either that a company operates on a cash basis or that its extension of credit and collection of accounts receivable is efficient. A low ratio implies the company should re-assess its credit policies in order to ensure the timely collection of imparted credit that is not earning interest for the firm.

$$RTR = \frac{\text{Net Credit Sales}}{\text{Average Accounts Receivable}}$$

5. **Long Term Debt to Long Term Assets Ratio (LDA):** It shows long-term financing of long-term assets and normal stocks. The indicator is a conservative indicator of payment ability, since it assumes that stocks cannot be converted into cash within a short period of time.

$$LDA = \frac{\text{Long term Debt}}{\text{Long term Assets}}$$

6. **Accounts Receivable to Current Liabilities Ratio (ARL):** It shows how many short-term accounts receivables are covered by short-term operating liabilities and/or how much short-term operating liabilities could be settled by the realization of short-term accounts receivables.

$$ARL = \frac{\text{Accounts Receivable}}{\text{Current Liabilities}}$$

7. **Current Ratio (CR):** A liquidity ratio that measures a company's ability to pay short-term obligations. Also known as "liquidity ratio", "cash asset ratio" and "cash ratio". The ratio shows the ability to pay back its short-term liabilities (debt and payables) with its short-term assets (cash, inventory, receivables). The higher the current ratio, the more capable the company is of paying its obligations. A ratio under 1 suggests that the company would be unable to pay off its obligations if they came due at that point.

$$CR = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

8. **Quick Ratio (QR):** An indicator of a company's short-term liquidity; also known as the "acid-test ratio" or the "quick assets ratio". The quick ratio measures a company's ability to meet its short-term obligations with its most liquid assets. The quick ratio is more conservative than the current ratio, a more well-known liquidity measure, because it excludes inventory from current assets. The higher the quick ratio, the better the position of the company.

$$QR = \frac{\text{Current Assets - Stocks (ali inventories)}}{\text{Current Liabilities}}$$

9. **Equity-to-Fixed-Assets Ratio (EFR):** It represents the amount of assets on which shareholders have an equity claim. Empirical analyses of the indicators for Slovenian companies prove that the structure of assets and liabilities are really strongly connected: if among the assets there is a large share of long-term assets, is also among the sources of financing higher share of long-term funds. Such a ratio only ensures the solvency of the company.

$$EFR = \frac{\text{Equity Capital}}{\text{Fixed Assets}}$$

10. **Total Debt to Total Assets (TDA):** A metric used to measure a company's financial risk by determining how much of the company's assets have been financed by debt.

$$TDA = \frac{\text{Short Therm Debt+Long Term Debt}}{\text{Total Assets}}$$

11. **Fixed Asset Ratio (FAR):** Fixed Asset Ratio shows how much the company depend on fixed asset to run their business. But the link between the way of financing and the value of the indicator is not a direct one, though more long-term (fixed) assets in total assets requires a coordinated long-term financing.

$$FAR = \frac{\text{Fixed Asset}}{\text{Total Assets}}$$

In calculating the indicators, the data for sector C16 (wood processing – except furniture) and C31 (manufacture of furniture) were considered; according to the classification of economic activities (Ajpes, 2013). The indicators were calculated for the period 2007 to 2011 (5 years). For all indicators the mutual correlation (Pearson correlation coefficient) was calculated and on its basis the indicators that were highly correlated with each other, were eliminated and were not taken into account in the analysis. For the comparison of values of indicators for sector C16 and sector C31, the Student's T-test was used. If the calculated two-tailed p-values were smaller than 0.05, they were considered as statistically significant (Košmelj, 2001).

The sample was consisted of all companies and sole proprietors operating in sectors C16 and C31. The research was based on searching and preparing data from official statistical databases (Ajpes, 2013). The sample size differs in different years according to the various changes in the number of companies in sectors, but in every year all registered (and functioning) companies in that year were included (Table 1).

Table 1. Number of companies in sample

Sector / Year	**2007**	**2008**	**2009**	**2010**	**2011**
C 16	930	1.543	1.507	1.467	1.489
C 31	1.004	1.052	1.053	1.057	1.050
TOTAL	**1.934**	**2.595**	**2.560**	**2.524**	**2.539**

The majority (more than two-thirds) of companies in each sector were representing sole proprietors. Number of enterprises in sector C31 did not change over the last years, while the number of companies in the business of C16 in 2008 increased by 66% in comparison with the previous year. The increase can be related to the introduction of the new classification of economic activities in the year 2008, which especially in the sector C16 introduces some new sub-categories.

3. RESULTS

Table 2 provides data on selected indicators for the sector C 16 and C 31. For all indicators, there is significant decline in 2008, while in some cases the situation improves in recent years.

Table 2. Values of the calculated indicators for both sectors: C16 and C31 (2007 to 2011)

indicators \ year	C 16					C 31				
	2007	2008	2009	2010	2011	2007	2008	2009	2010	2011
ROS	5,63%	0,14%	-0,55%	-0,76%	-0,62%	1,12%	0,09%	-3,87%	-4,82%	-4,48%
ROA	6,45%	0,14%	-0,48%	-0,69%	-0,59%	1,27%	0,10%	-3,36%	-4,49%	-4,15%
ATR	1,065	1,006	0,831	0,872	0,925	1,094	1,026	0,837	0,884	0,886
RTR	5,392	5,222	4,266	4,539	5,127	5,260	5,199	4,274	4,493	4,667
LDA	0,985	1,004	1,043	1,038	1,025	1,036	1,062	1,082	1,002	1,014
ARL	0,512	0,504	0,578	0,552	0,493	0,494	0,490	0,517	0,468	0,495
CR	0,976	0,991	1,067	1,051	1,029	1,034	1,070	1,090	0,989	1,010
QR	0,631	0,626	0,716	0,713	0,653	0,644	0,663	0,654	0,607	0,630
EFR	0,648	0,634	0,706	0,700	0,714	0,826	0,797	0,778	0,687	0,681
TDA	63,1%	63,6%	60,6%	60,9%	60,4%	58,6%	58,8%	59,4%	63,4%	62,0%
FAR	54,6%	55,4%	54,2%	54,3%	53,8%	47,8%	49,3%	50,1%	50,8%	53,7%

Note: for the interpretation and meaning of abbreviations see chapter Methods

Calculation of Pearson correlation coefficients between the individual indicators showed that there was very strong correlation among some indicators. Therefore, for a more detailed analysis the following indicators were used:

- Return On Sales (ROS)
- Long Term Debt to Long Term Assets Ratio (LDA)
- Current Ratio (CR)
- Total Debt to Total Assets (TDA)

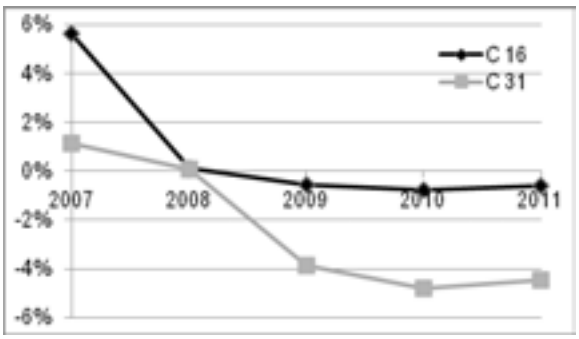

Figure 1. Return On Sales (ROS) for C 16 and C 31 (2007-2011)

Over the last three years both sectors exhibit a real loss, so the indicator “Return On Sales (ROS)” was negative for both (Figure 1). The drop was greater in sector C31 , while a minimum in the both sectors appeared in 2010. In the last year the indicator in the both sectors improved slightly, but they still stays

on the negative side. This indicator also affects the “Return On Assets (ROA)” and “Return On Equity (ROE)”, their close relationship with ROS is also evident from Table 2.

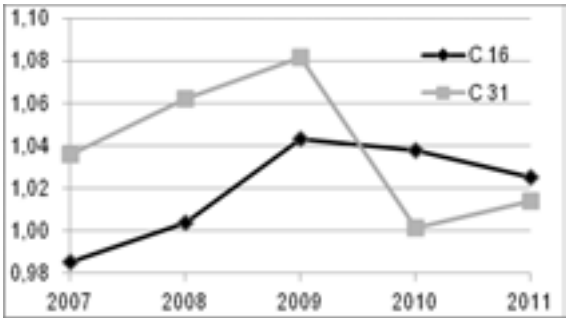

Figure 2. Long Term Debt to Long Term Assets Ratio (LDA) for C 16 and C 31 (2007-2011)

The indicator “Long Term Long Term Debt to Assets Ratio (LDA)” was mainly only a little more than 1 (Figure 2). This indicates a slight threat to long-term solvency which is problematic both sectors. At C31 the value of the indicator in 2011 slightly improved, while the C16 is in declined for last two years.

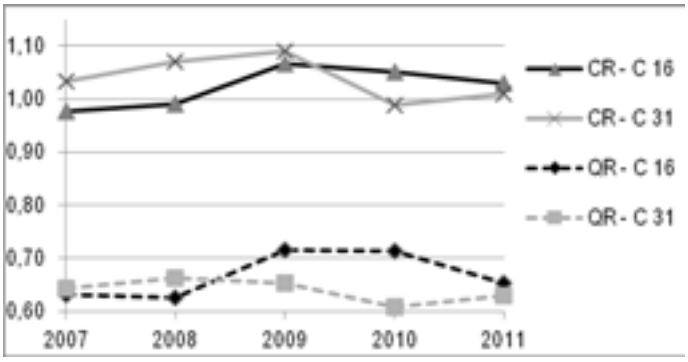

Figure 3. Current Ratio (CR) and Quick Ratio (QR) for C 16 and C 31 (2007-2011)

The “Current Ratio (CR)” has the values a little above 1 for both sectors (Figure 3). It means that on average in the companies there were more current assets than current liabilities. However, when compared CR with the “Quick Ratio (QR)” (the values of QR were much smaller than 1), it can be assumed the significant risk of short-term liquidity. Situation in the C31 was much worse than in the sector the C16, although in the C31 the situation was slightly better in the last year.

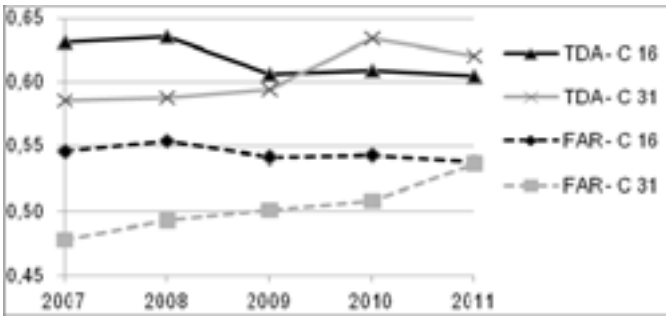

Figure 4. Total Debt to Total Assets (TDA) and Fixed Asset Ratio (FAR) for C 16 and C 31 (2007-2011)

Indicator “Debt to Total Assets (TDA)" showed that in most cases more than half of the assets in the financing structure of funding were in debts (Figure 4). This is relatively unfavourable in terms of both risk investment and long-term solvency. Similarly the indicator "Fixed Asset Ratio (FAR)" also shows unfavourable picture. It indicates a relatively low coverage of current liabilities with current assets (values around 0.5 - ideally more than one). At the same time, the indicator "Long Term Long Term Debt to Assets Ratio (LDA)" shows the problem of covering stocks with long-term sources. According to all three indicators it can be concluded that the short-term liquidity of companies was poor, which may be the result of excessive receivables and / or stocks and inadequate funding of operations. Similarly unfavourable picture shows also the indicator “Equity to Fixed Assets Ratio (EFR)" which values specifically in C31 strongly decrease, was also in the C16 somewhere around 0.7. This means that a substantial part of fixed assets are financed by debt capital, what may the creditors pose a greater risk.

By calculating the t-test, which was used to determine statistical differences of the time series of each indicator, it was proven that for the observed period of time the differences among the values of all the individual indicators were not statistically significant.

4. CONCLUSION

Based on the analysis of financial indicators it can be found out that the values of the studied indicators worsened considerably at the beginning of the economic crisis, therefore it can be deduced to decreased solvency and increased business risk. In the sector of C16 some of the indicators improved in the last four years, what is indicating a recovery, although the sector is still showing an increased risk for certain creditors, as well as for owners, especially in terms of the coverage of assets with appropriate funds, as well as short-term liquidity. These are the main threats to this sector. In the sector of C31 the situation is not (much) better from the beginning of the crisis. This indicates a high risk of this sector, both for creditors and owners. However, there are little differences between the two sectors, what was also statistically approved.

In this context, the radical measures are necessary for the improvement of the situation and development potential of Slovenian wood industry. Some of them are written in a Platform for the restructuring of Slovenian wood industry (Humar et al., 2012). Besides the urgent providing of higher added value, which would increase the Return on Sales, there is particularly urgent to improve the capital structure, in particular by seeking foreign direct investments in the wood industry companies. In this way the companies would acquire fresh capital for the development and modernization of fixed assets and reduce dependence on long-term debt financing, which would guarantee them a smaller long-term risk. In the economy in general there is a need for improvement of payment discipline, which would reduce the share of accounts receivables in total assets and subsequently improve the short-term liquidity of the companies.

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THE USING OF OPERATING LEVERAGE FOR THE EVALUATION OF INVESTMENT EFFECTIVENESS IN THE LAYERED MATERIALS PRODUCTION

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ABSTRACT

The production of layered materials belongs, due to the technological process of production, to the intensive capital investments. The proportion of the fixed costs to variable costs is evaluated by operating leverage, which is one of the basic tools of the strategic decisions in case of the investment implementation. The target of this article is to present the methodology of operating leverage using for evaluation of potential alternatives of investment plans in the layered materials production.

Key words: layered materials, operating leverage, costs, investment, production

1. INTRODUCTION

Nowadays, when the most of the states in the world is marked by economic crisis, the investment decisions making has increasing importance. The decisions making about investments belongs to the most important activities that a company should perform. The importance of the decisions is conditional at the fact, that the effect of investments is persistent in long term. It means that capital committed in investments consists from funds which are committed in long-term assets of company. During investment decisions making is important to follow two basic criteria (Drábek, 2008):

1. profitability criterion;
2. criterion of financial stability.

The costs structure, particularly the relationship and the proportion between fixed and variable costs can affect the level of operational risk (Tumpach, 2008). Investments increase the proportion of fixed costs on the total costs and through this step caused higher business risk. Business risk can be expressed by operating leverage, based on the comparison of level of fixed and variable costs.

Production of layered materials is characterized as a complex of difficult technological processes. These processes require high initial investments, mainly to the machinery. It causes, that in the structure of total costs of production is a high proportion of fixed costs. This fact significantly affects the overall business risk in the production of layered materials.

2. MATERIAL AND METHODS

Production of layered materials, which is based exclusively on wood substances, has their limitations. Although the production has been constantly developed, the significant progress could be achieved with refinement of wood by various methods. One of the significant methods is the ***wood***

lamination in combination with other and different non-wood components (Lukowsky, 2000). The features of such - layered materials are affected by individual input elements which are: wood and other materials (adhesives, plastics, ...). The features of layered materials are also affected by structural layout of individual input components which are defined above. Important meaning has also technology of production. Through appropriate structural arrangement of input components arises the precondition for weight reducing and for increased strength and stiffness parameters. The weight reducing of output materials is an important and significant technological, qualitative and economic indicator.

Production of such layered materials requires some economic difficulty, where is necessary to quantify the costs of the proposed variants of solutions (Davies, Pain, 2002). Each product has plenty of qualitative and quantitative characteristics with own value. The final quality of the product is given by the synergy effect of these characteristics and by the variance of their values (Nenadál, 2008). The economic assessment of production of layered composites, with desired functional characteristics, can be performed by quantification of economic difficulty and by ratio of production costs.

It is necessary to design such method for producing of material that satisfies required utility, qualitative and also technological requirements and the demands of market participants. Economic aspect of the layered materials production is therefore focused on the application of a comprehensive and innovative approach. It means that the efficient production of solid wood panels is based on the harmony of techniques, technology, production, economy and quality. Through the innovative approach has been achieved the purpose of the company to succeed in a competitive environment through the production of high-quality, economically effective bonded wood materials. On the other hand it is necessary to keep in the mind a risk that is associated with investment into the layered materials production. Business risk is influenced by numerous factors, including sales volume, per-unit price, input costs, competition and overall economic climate. The business risk also depends from the initial high investment to the technology that increases the proportion of fixed costs. Therefore it is necessary to choose the best strategy of manufacturing, to achieve not only the competition in the costs but also to minimize the business risk. Reducing of business risk can be influenced by increasing the volume of production (Q), thus the proportion of fixed costs to total costs be decreased. Another important aspect is that the increasing volume of production can reduce costs per unit (learning curve effect).

To calculate business risk is generally used 2 simple ratios:

1. ***contribution margin;***
2. ***leverage effect*** (operational, financial and total).

For more complex calculations, analysts can incorporate statistical methods. Level of operational risk depends from the structure of total production costs, particularly proportion between fixed and variable costs. This risk is expressed by the operating leverage. For better and detailed interpretation of individual economic terms is used the following Figure 1:

<table>
<tr><td colspan="3">R E V E N U E</td></tr>
<tr><td rowspan="2">VARIABLE COSTS
„VC“</td><td>FIXED COSTS
„FC“</td><td>EARING
before income and taxes
„EBIT“</td></tr>
<tr><td colspan="2">CONTRIBUTION MARGIN
„CM“</td></tr>
</table>

Figure 1. Graphical representation of the relationships among COSTS, EBIT and REVENUE
Source: Tumpach, 2008

Level of business risk is the term which depends from the structure of production costs, particularly proportion between fixed and variable costs. Degree of operating leverage (DOL) quantifies what percentage will change profit (EBIT) if sales (REVENUE) change of one percent.

Operating leverage expresses the sensibility of profit to changes in revenues. It is calculated by compare the revenues and EBIT by following formula:

$$DOL = \frac{\Delta EBIT(\%)}{\Delta REVENUE(\%)} \tag{1.1}$$

Above formula requires information from 2 periods, at least. Based on this fact is calculation sometimes difficult, therefore is modified to the more useful and general form:

$$DOL = \frac{CM}{EBIT} \tag{1.2}$$

Degree of operating leverage (DOL) expresses the impact on business risk as follows:

1. ***high operating leverage of company***, in case that other conditions are unchanged, indicates higher business risk (linear dependence). Strong operating leverage is dominant especially for highly automated processes, technology with high initial investments, thus it has high break-even point;
2. ***low operating leverage*** indicates lower business risk. Weak operating leverage causes zero break-even point, because it is characterized by low rate of fixed costs. Through the operating leverage is possible to evaluate the extent of the fact how is profit responsive to changes in sales volume (Q);

3. THE EVALUATION OF INVESTMENTS PROJECTS BY OPERATING LEVERAGE

In consideration of wide range of technological processes of layered materials production, in this paper we deal with selected and specific technological process of solid wood panel production. For production processes of solid wood panels has been used expensive technology line, which consists of several blocks. Among financially demanding units of line include mainly (Zemiar, 2003):

- ***conveyor belt;***
- ***line for production of infinite joint (saw optimization, line for linear bonding);***
- ***quadrilateral planning-milling machine;***
- ***glue applicator;***
- ***pressing machine (conveyor, saw, pressure roller, photocell, hydraulic roller);***
- ***wide-band calibration grinder;***

The purchasing of technologies for the production of solid wood panels the most companies evaluate as a capital intensive investment. Based on this fact, we discuss in this paper with two models how can be this investment financed. Technological machine, needed for layered materials production may be procured by two the most common forms:

1. ***purchase of technologies*** *(from internal or external company´s financial resources);*
2. ***operational rent;***

In the ***first variant***, where the technology will be ***acquired by buying***, the significant part of fixed costs (FC) generates costs of depreciation. These costs are associated with the procurement of the production technologies. The price of production technology is transformed to the fixed costs through the form of depreciation. These costs arise from the need to ensure efficient operation of the production process. At the same time fixed costs also include the costs which in a certain extent of done outputs and activities are not changed. This part of fixed costs is named constant costs and does not depend on the production volume (maintenance, fixed payments, administration, etc.). The amount of this constant

costs is modelled at level 100 000 € in both variants of this paper. On the other hand, the ***second alternative*** – ***operational rent*** does not create the costs associated with the procurement of the production technologies. Based on this fact the amount of fixed costs is just at the level 100 000 € (constant costs, mentioned above). But the amount of variable costs (VC) must be increased by cost of rent for production technologies, every year. The operational rent can be understand as a variable cost, because depends on the extent of the use of technologies.

If we want to select better alternative for financing the production technologies it is necessary to get wide portfolio of economic information about costs. Within decisions making is important to dispose with information about planned volume production (Q) and costs structure (fixed costs, variable costs, total costs).

In the second variant is the amount of annual rent considered as a variable cost, based on the fact that volume production directly affects the amount of these costs. But on the other hand, in the first variant (purchase) will be fixed costs increased by 150 000 € - modelled and expected amount of annual cost of depreciation, cost which does not depend on the production volume. Variable costs are mainly composed by following items (direct costs): wages of employers in production, beech – as a raw material (we consider in this paper the measurement of solid wood panel is 600x3950x45 mm) and polyvinyl acetate (PVAc) adhesive with application 200grams per square meter. Direct production costs (variable costs) per 1 square meter of glued panels are approximately 40 €. Financial report for decisions making of company is modelled in the following Table 1:

Table 1. The plan of production volume and costs structure of company

Variant		Q	Costs (€)			FC / VC
			FC	VC	TC	
1	purchase	10 000	250 000	950 000	1 200 000	26,32 %
2	operational rent	10 000	100 000	1 100 000	1 200 000	9,10 %

Source: own study

Even though are total costs (TC) in both variants same, they have the different structure. The amount of fixed costs is in the both variants same, at the level 100 000 €. These costs can be considered as a constant cost, mentioned above. The different costs structure is caused mainly due to the compare of characteristics in selected variants:

- In the **Variant 1** is the production technologies acquired by purchase. The fixed costs will be annual increased by 150 000 €, this amount represents costs of depreciation for technologies.
- **Variant 2** - Operational rent has no costs of depreciation for technologies, so has lower rate of fixed costs, just at the level 100 000 € (Table 1). The amount of operational rent depends on the extent of the technologies using therefore these costs have variable character.

Based on the above information and from costs structure in Table 1 can be calculation of DOL (degree of operating leverage) apply as follow Table 2:

Table 2. DOL calculation

Variant		Údaje (€)			DOL *CM / EBIT*
		REVENUE (plan)	**EBIT** (revenue – TC)	**CM** (EBIT + FC)	
1	purchase	1 400 000	200 000	450 000	2,25
2	operational rent	1 400 000	200 000	300 000	1,5

Source: own study

Variant 1, where is the production technologies acquired by purchase, creates a higher rate of fixed costs, which is reflected by a higher degree of operating leverage (Tab. 2). The costs structure has also influence to the EBIT, which is in the both variants different sensitive to changes in sales volume. That argument is applied through the using of following formula (1.3):

Change of sales volume = % rate of sale volume change x DOL x EBIT (1.3)

The calculation based on above formula (1.3) is closer interpreted by following Table 3:

Table 3. Influence of sales volume changes to EBIT

VARIANT		Change of sales volume	
		+ 25 %	**- 25 %**
1	purchase	+ 25% x 2,25 x 200 000 = + 112 500 €	- 25% x 2,25 x 200 000 = - 112 500 €
	EBIT = 200 000 €	**= 312 500 €**	**= 87 500 €**
2	operational rent	+ 25% x 1,5 x 200 000= = + 75 000 €	- 25% x 1,5 x 200 000 = = - 75 000 €
	EBIT = 200 000 €	**= 275 000 €**	**= 125 000 €**

Source: own study

4. RESULTS AND DISCUSSION

Based on the calculation in chapter 2 we can conclude, that Variant 2 (operational rent) characterized by a lower degree of operating leverage (DOL = 1,5) and characterized by lower rate of fixed costs (Table 3):

- increase of sales volume produces lower increase of EBIT, in compare with Variant 1;
- decline in sales volume produces lower decrease of EBIT, in compare with Variant 1.

This statement can be graphically interpreted on the basis of data from Table 3 through the following picture (Figure 2):

Figure 2. Graphical interpretation of changes in both variants of financing

Source: own study

The results about the degree of operating leverage in both variants (Table 2, Table 3, Figure 2) can be used for evaluation of business risk to investment in the layered materials production. These calculations could be generalized as follows:

1. higher degree of operating leverage is associated with higher prospective of profit growth, but also with higher business risk;
2. lower degree of operating leverage indicates lower level of business risk, but in the case of industry growth produces lower profit also;
3. if is a degree of operating leverage higher, the change in sales volume are more sensitive and also business risk has been increased.

As we can seen the production of layered materials belongs among capital intensive investments. In the production of these materials creates fixed costs a significant portion of total costs, which in some extent of the company´s performance and activities remain unchanged in short term. Usually these costs are incurred by the need to ensure the efficient running of the business processes and it is precisely through the acquisition of production technology. If is the degree of automation and mechanization higher, the rate of human labour is lower and this situation causes decrease costs for wages which belong to variable costs. Increases the difference between price and variable costs, a significant proportion of the total costs are fixed costs, for acquisition of technologies (Table 1), and the operating leverage is becoming stronger (Table 2). It means, the higher and stronger operating leverage, the higher rate of EBIT growth per 1 unit (Figure 2). The difference between the price per unit and costs per unit is larger, the operating leverage is higher. Increase in production volume by one unit caused the additional EBIT increase by more than one unit (Figure 2). At the same time by increasing of production volume arise the economies of scale and ratio of fixed costs are proportional reduced to each product. On the other hand, the smaller difference between costs per unit and price per unit reflects a lower and weaker degree of operating leverage.

It is necessary to know that higher operating leverage, if other conditions are unchanged, indicates a higher business risk. It means that in the case of industry growth leads this situation to expansion of the company, in case of recession analogy to the company´s rapid decline. Scholleová (2009) states that higher degree of operating leverage, the higher sensitivity of EBIT to changes in the sales volume. In case of growth has company better preconditions for prosperity, but in the time of recession have many businesses bigger problems with reducing of production volume. It is caused because at the time of the growth have companies decided to implement the vision of positive changes of technologies with higher degree of operating leverage.

4. CONCLUSION

This paper deals with evaluation of the effectiveness of two investment variants for procured the production technologies for layered materials production. We used the method of operating leverage for evaluation of planed investment. This investment belongs to the capital intensive so it is necessary to evaluate all of the potential business risks and also benefits from particular variants of financing investment. Procurement of technologies for the production of solid wood panels through a purchase is capital intensive investment. In case of purchase of technologies from company´s internal or external financial resources generates this investment in corporate cost structure high proportion of fixed costs. It increases the business risk but on the other hand in case of development of wood processing and furniture industry may just this decision bring the higher profit through increasing production volume. Production of solid wood panels creates a presumption of production expanding in smaller flexible companies in Slovak Republic. Each company should be aware of, whether in this time of economic

crisis, choose the path of lower business growth that brings lower business risks, or choose the path of achieving the quick business growth and profit for high business risk and fix the assets in long term capital. Through the expansion and diversification of production creates the assumption for increasing of value added in wood materials and this step can support employment in the wood processing and furniture industry.

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STATISTICAL PROGNOSIS OF VALUE ADDED LEVEL IN THE WOOD AND FURNITURE INDUSTRY OF THE SLOVAK REPUBLIC

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ABSTRACT

Successful decision in the economic practice is not possible at least without minimal knowledge and applications of statistical methods. The demand for the application of these methods and their results increasing also within economic indicators and management of companies. The main goal of this article is to present selected statistical tools (correlation and regression analysis, time series theory and extrapolation), whereby it is possible to predict the level of any economic value. In this case, it will be the level of value added in the wood and furniture industry of the Slovak Republic, based on the level of the average monthly wage.

Key words: value added, correlation and regression analysis, time series forecasting

1. INTRODUCTION

Each company faces the question of monitoring its performance and comparison with the competition. Company performance can be monitored on the level of basic and relatively simple indicators (sales, profit, productivity, value added), but also through complex systems of monitoring (balance scorecard, or indicator of economic value added). The improvement of statistical surveys and analysis in the economic practice can has a beneficial effect to the monitoring of performance in each company. To know how to use the appropriate theory and practical statistical and analytical tools for data processing and studies preparation as a supporting material for decision making in business management, represents an organic component of economic education. The using of spreadsheets and statistical software with applications in the field is in this age of ICT more desirable and obvious.

2. BUSINESS PERFORMANCE

The term "performance" is used very often, but nowhere in the legislative act is precisely defined. European Foundation for Quality Management defines "performance" as "a rate of achievement by individuals, groups, organizations and processes" *(EFQM Excellence Model).*

If we would like to measure the performance, we have to act in relation to a defined target value result. According to Lesáková (*Lesáková, 2004*) performance of the company is the company's ability to achieve the desired effects or outputs, and preferably in measurable units. By this statement is the problem of performance divided into two issues:

1. *What are the required outputs?*
2. *How to evaluate (how to measure) their performance (in which units of measurement)?*

The term performance is necessary understand as the ability of the company to the best capitalize of investments in business activities *(Frost, 2005).* As reported Neumaierová and Neumaier *(Závadský, 2005),* the value of the company is determined by its performance. If we want to increase the value of the company, it is necessary to improve its performance. It means, if we want to increase business performance, we should to increase the performance of business processes, and particular in the main processes.

The essence of performance as an economic category, are three elements. The first is to define the target value which is compared with the actual performance to required performance. The second elements are criteria for goals evaluation - an indicator or set of indicators. The third element of performance is the system of performance measurement and evaluation, which defines the rules for measurement parameters and methods of evaluation. The basic precondition of performance evaluation is to identify indicators that the company wants to achieve and these indicators represent a certain level of expected results. This is followed by the measurement of this parameters, it means measurement of the actual results, which achieve the company by the comparing with the expected performance. Subsequently are determined the differences - deviations from expected values, and then for these deviations is necessary to determine their causes. Basic indicators of performance measurement are follows: (Franko, J., Losonczy P., Németh, L.., Strelcová, S., 2005):

- **Sales:** Revenues of the company, the company receives them from the sale of its output to the customer, respectively external customer.
- **Economic result**: by using this indicator is usually measured profit of enterprise. Basically, the difference between revenues and costs of the company.
- **Labor productivity:** labor productivity is generally understood as the amount of production made for the company by one employee per unit time. It is expressed as the efficiency of human labor, thus some degree realized the ability to create the values. Labor productivity is expressed as the ratio between the volume of production, made for a certain amount of time and amount of labor spent on it.
- **Value Added (VA):** is currently one of the most advanced forms of expression profitable business. In this indicator is the profit increased by the amount of depreciation and wages, which would ensure the future long-term development of the company and its prosperity. The value-added means:

$$VA = \text{production value} - \text{intermediate consumption} \quad (1)$$

where:

- VA = wages + benefits + social operating surplus (ie. depreciation + / - profit before paying interest and taxes, or loss),

- Production value - for the production of revenues (sales), intermediate consumption (the cost of raw materials and services).

All items (except the labour productivity) are relatively easily identifiable from the outputs of the financial statement and statistical annuals, so their values are relatively easily available.

3. STATISTICAL TOOLS OF PERFORMANCE INDICATORS ANALYSIS

The basic statistical tools that can be used for analysis and forecasting of performance include regression and correlation analysis and the time series theory.

Regression and correlation analysis are currently one of the most commonly used statistical methods in economics. The essence is based in the expression by suitable mathematical function, which fits for defined empirical situations only approximately, with a certain probability. Demand for the application of these methods is also increasing in management of companies *(Scheer, 2007).* During the monitoring of many socio-economic phenomena it is aim to see if changing one or more variable affect another variable and how. In examining the relationships and dependencies between variables are used techniques of regression and correlation analysis. *(Sodomová, 2000, s. 129)*

Regression analysis is the summary of statistical methods and procedures used to study the interaction between two (or more) variables, when we observe the dependence between them. The task of regression analysis is to find a form of dependence, express it through mathematical function and to determine the parameters, with the basic aim - estimate values of mean values of the dependent variable. *(Pacáková, 2003).*

Correlation analysis allows assess the tightness of dependences, it means, the extent to which independent variables explain the variability of the values of the dependent variable and the appropriateness of choice of the regression function. *(Klein, Bahýl, Vacek, 2002).* Simple linear correlation (often called as a simple pairwise correlation) examines the interdependence of two random variables (economic indicators) that from the aspect of the position in the linear regression model distinguishing between dependent (explained) variable -Y and the independent (explanatory) variable - X.

In the simple linear correlation are solved two tasks - regression and correlation. The regression task is to determine the regression line y = a + bx, it means determine the line that the best describes a given linear relationship. Within correlation task we find the strength (the tightness) of dependence, which is determined by the correlation coefficient **r.**

$$r = cov\,(xy) / s(x)\, s(y) \qquad (2)$$

where:

$cov(xy)$ – *covariance of random variables X and Y*

$s(x), s(y)$ – *standard deviation*

Correlation coefficient takes the values from interval < -1, 1 >, while assume *(Sodomová, 2000)* : r = 0 – variables X and Y are not linearly dependent, r > 0 – between X and Y is a direct linear relationship, r < 0 – between X and Y is an indirect linear relationship. If is the absolute value of the correlation coefficient closer to 1, the dependence is stronger. If r = 1 and r = - 1, it is a functional dependency, not statistical. Through squared exponential of correlation coefficient (r) is obtained the coefficient of determination d.

$$d = r^2 \qquad (3)$$

The coefficient of determination takes the values from interval < 0, 1 > and its hundredfold determinates what percentage of the total variability in the dependent variable Y is explained by linear regression function of the explanatory variable X. *(Pacáková, 2003).*

Time series analysis. The time series is a chronological sequence of materially and spatially comparable values of some quantitative characteristics of the phenomenon. *(Pacáková, 2003).* Increasing importance has obtained the time series of economic indicators. The effort to understand their development in the past and possible estimation of the development in the future in recent years has led to the development of methods for the analysis and prognosis of economic time series. *(Pacáková, 2003).*

Classical approach in modelling of time series evolution is based on Decomposition method. By using this method is each value of y_t, t = 1,2,..., T decomposed to the value of the trend (Tr_t), cyclical, seasonal and random components, the combinations are different. Choice of decomposition depends on

the fact if it is the series of annual data or short time series, and also it depends on the length of T - time series. In the time series of annual data is most common (Tr_t) trend and random component (E_t) in the form:

- additive form = $y_t = Tr_t + E_t$
- multiplicative form $y_t = Tr_t \,.\, E_t$ pre $t = 1,2,...,T$

Time series are used for characterize of data in special shape. Input information for prognosis is necessary obtain from time series by suitable analysis. The aim of the statistical analysis of time series is to understand and describe the characteristics of the development and changes in the values of variables at a time. The aim is put together a quality mathematical and statistical model of time series and based on it to interpret the correct results, to estimate the values of variable in the future periods and to understand their importance for economic practice. *(Pacáková a kol., 2009).*

The determination of trend consists in replacing the empirical values by theoretical values that the best represent the regularity expressed by empirical values. The trend in the time series is identified by non-analytical or analytical methods.

The estimation the trend component of the time series by non-analytical method belongs primarily to the method of moving averages. In this chapter we are dealing with the models of trend, which are expressed as a function of time, it means analytically. The trend estimation by analytical method is based on finding the suitable type of trend function (linear, quadratic, exponential, logistic), in the estimation of the parameters and in the assessing of adequacy of the selected trend function by testing of individual parameters. Here it is necessary to use the knowledge from regression and correlation analysis. The dependent variable is *Y* with values y_t of the time series and the independent variable is variable *t* for *t = 1,2 ..., T.* Values of a random variable E_t are marked in the trend functions the same as in the regression analysis, by the symbol ε_t. *(Pacáková, 2003).*

4. RESULTS OF STATISTICAL ANALYSIS

Value-added data for statistical analysis come from the yearbook of industry in the Slovak Republic, by the years 2009, 2010 and 2011, issued by the Statistical Office of the Slovak Republic and the material presented in monograph DRÁBEK, J., MERKOVÁ, M. The effectiveness of direct foreign investments in the wood processing industry, Zvolen: Technical University in Zvolen, 2010, 103 p. ISBN 978-80-228-2196-4.

Summary overview of the input data for the purposes of statistical analysis and forecasts presents table 1, Figure 1 and Figure 2. For the using of statistical analysis (time series analysis, regression and correlation analysis) was used statistical software STATISTICA 7th.

Table 1. Value added (in thousand €) and average monthly wage per employee (in €) in wood processing industry in Slovakia.

Sector of	**2006 Value added/ Average wage**	**2007 Value added/ Average wage**	**2008 Value added/ Average wage**	**2009 Value added/ Average wage**	**2010 Value added/ Average wage**	**2011 Value added/ Average wage**
Manufacture of wood SK NACE 16	136 883,9 /487,42	115 816,7 /543,62	110 402,3 /589,29	75 303,1 /582,74	79 402,1 /635,0	84 377,2 /647,0
Manufacture of furniture SK NACE 31	197 764,7 /573,39	202 159,0 /628,36	265 988,5 /644,89	161 229,5 /635,98	168 859,2 /660,0	169 053,9 /680,0
Manufacture of paper . SK NACE 17	275 022,6 /791,58	295 394,9 /850,99	280 601,4 /899,46	262 339,3 /947,53	290 347,4 /974,00	272 271,9 /965,0

Source: http://portal.statistics.sk/showdoc.do?docid=4

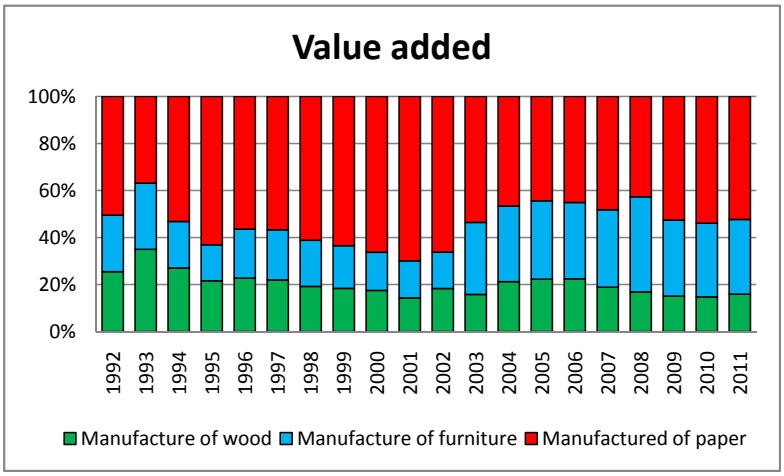


Figure 1. Levels of value added in different sectors of wood processing industry in Slovakia

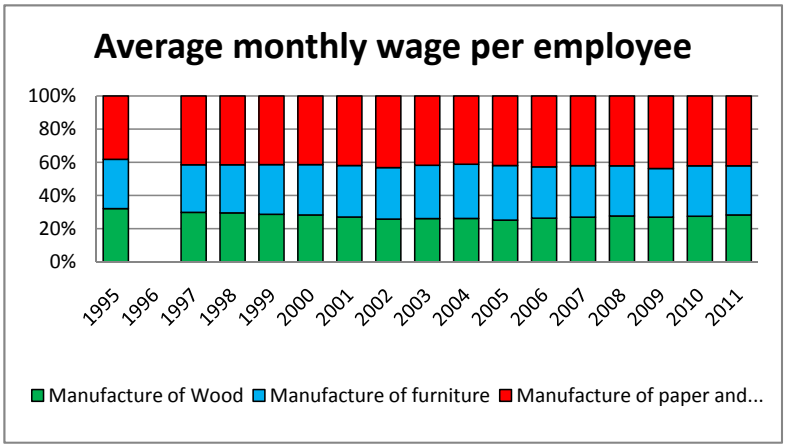


Figure 2. Levels of average monthly wage per employee in different sectors of wood processing industry in Slovakia

Correlation and regression analysis are focused on the detection of a simple linear dependence between economic indicators of performance for the whole wood sector of wood processing industry. From the selected economic indicators, is presented the dependence of the value added per average monthly wage per employee (Figure 3), by the same way it is possible to analyze the dependence of the value added to the other indicators (sales, profit, productivity), in which a causal dependency.

In the correlation functions are quantified indicators - correlation coefficient (r) and the coefficient of determination (d), the regression coefficients of the regression line task (a, b) and mean errors of regression lines (s_{yx}) (standard deviation of residue). The part of the analysis is also a statistical verification of significance linear dependence between economic indicators by testing the correlation coefficient at the chosen significance level $\alpha = 5\%$.

Simple linear correlation

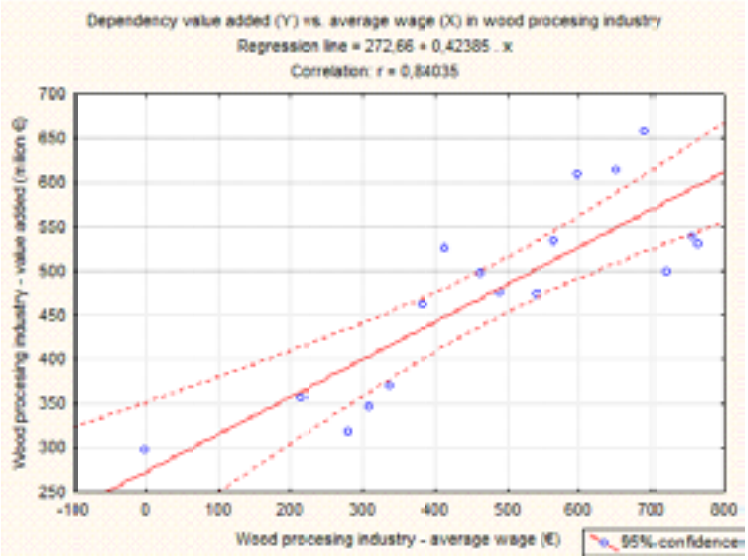


Figure 3. Correlation between average monthly wage and value added in wood processing industry in Slovakia

Between the average monthly wage per employee and value added (figure 3) was detected very close direct linear relationship, with a correlation coefficient of r = 0.84035. The coefficient of determination $d = r^2$ indicates that the oscillation of the average monthly wage explains 70,6% of value added variability. The remaining 29.4% is attributed to random effects, as well as other factors not included in the regression function. The equation of the regression line has the form y= 272,66 + 0,42385 * x and the value of the mean error of the regression line is s_{yx} = 59,825 mil. €.

The regression coefficient indicates that an increase in the average monthly wage of a unit (1€) may show an increase in the value added of 0,42385 million € annually. The equation of the regression line is also used for prediction, with some reliability allow to predict the unknown value of y, which corresponds to a particular value of x. For example, with increase of average wage at 820 €, is possible to predict with the reliability of 68% of the value added at the level of 620,17 mil. € ± 59,825 mil. € (± 1. s_{yx}), or is possible to predict with the reliability 68% of the value added at the level of 620,17 mil. ±119,650 mil. € (± 2.s_{yx}).

Time series analysis

Time series data are used to characterize a special shape. The input information is needed to obtain a suitable forecasting analysis. The aim of the statistical analysis of time series is to understand and describe the characteristics of the development and changes in the values of variables at a time, prepare a quality mathematical and statistical time series model and based on this the correct interpret results, to estimate the values of variables in future periods and to understand their importance for economic practice.

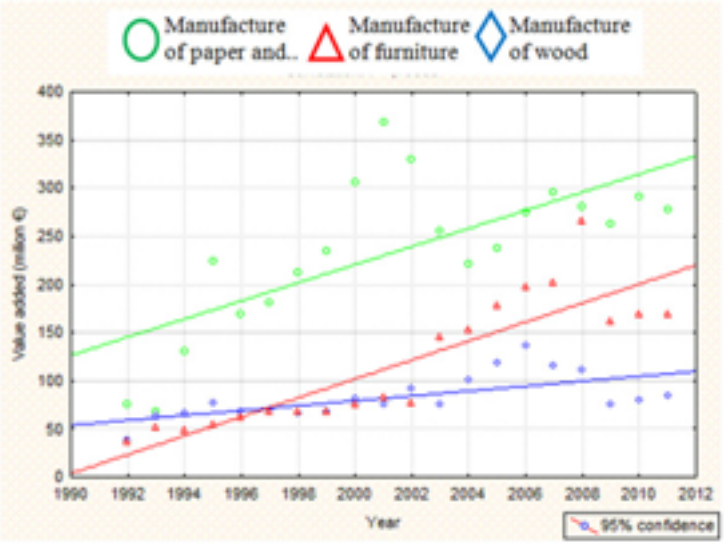


Figure 4. Development trend of value added in all sectors of wood processing industry in Slovakia (y. 1995 – 2011)

Linear trend

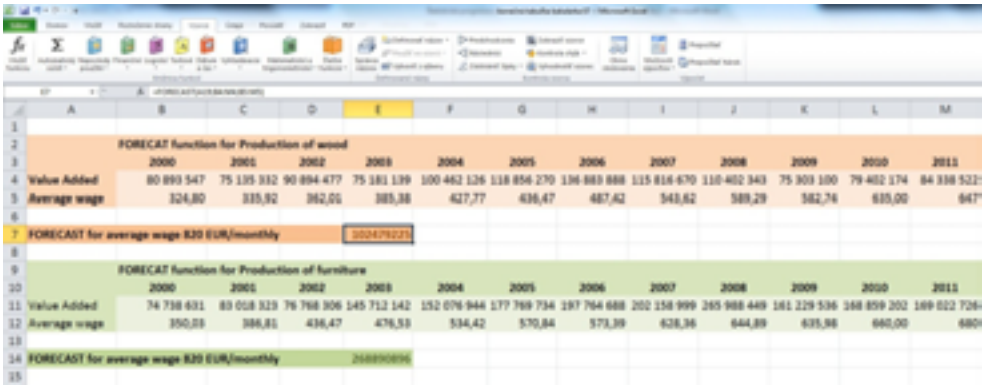
Manufacture of wood: y = - 5004 + 2,5415.x; s_{yx} = 18 128 463
Manufacture of furniture: y = - 196E2 + 9,8336.x; s_{yx} = 32 601 287
Manufacture of paper ..: y = - 186E2 + 9,3996.x; s_{yx} = 57 222 169

Based on figure 4, and defined the test parameters can be concluded that in all sectors of the wood processing industry can be observed an increasing linear trend in value added in the reporting period. The regression coefficient of the linear trend model to interpret that in the years 1992 to 2011 the value added has grown an average annual rate of 2.54 million. € in the manufacture of wood, about 9.83 million. € in the manufacture of furniture and about 9.39 million. € in the manufacture of paper. Slope of growth in manufacture of wood is significantly lower than in the manufacture of furniture and the manufacture of paper. Standard deviations s_{yx},, residues, serve to estimate the random component of a time series and the deviations are a measure of quality of the estimated model (in case of the existence of several models we choose the most suitable one standard deviation of the residue has the lowest value). Estimated value in predicting economic indicator in the future based on the model trend, we accurately predict the amount of value added in the manufacture of wood as the standard deviation of residues s_{yx} = € 18,128,463 is the smallest.

To predict the trend will use the available FORECAST function in Excel that is able to estimate the values of existing future value. The predicted value is the dependent variable (y) for a given value of the independent variable (x). Known values are pairs of numbers x and y, and the new value is estimated using linear regression. This function will be used to estimate the amount of future levels of value added, if we assume that the level of the average monthly wage would be at the level of 820 EUR/month in the sector of wood and furniture industry. For the analysis we use the input data since 2000.

The function "forecast" assumes that the level of value added in the Production of wood industry, at the level of the average monthly salary of 820 EUR could be able to achieve the level of 102 479 225

EUR. The function "forecast" also assumes that the level of added value in the furniture industry, at the level of the average monthly salary of 820 EUR could reach the level of 268 890 896 EUR.



	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2		FORECAT function for Production of wood											
3		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
4	Value Added	80 893 547	75 135 332	90 894 477	75 181 139	100 462 126	118 856 270	136 883 888	115 816 670	110 402 343	75 303 100	79 402 174	84 338 522
5	Average wage	324,80	335,92	362,01	385,38	427,77	436,47	487,62	543,62	589,29	582,74	635,00	647
6													
7	FORECAST for average wage 820 EUR/monthly				1024179221								
8													
9		FORECAT function for Production of furniture											
10		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
11	Value Added	74 738 631	83 018 319	76 768 306	145 712 142	152 076 944	177 769 734	197 764 688	202 158 999	265 988 449	161 229 536	168 859 202	189 022 726
12	Average wage	350,03	386,81	436,47	476,53	534,42	570,84	573,39	628,36	644,89	635,98	660,00	680
13													
14	FORECAST for average wage 820 EUR/monthly				268890896								
15													

Figure 5. Prediction of the development of value added through the function "Forecast"

5. CONSLUCION

This article offers a view as by the method of mating simple correlation is analyzed the interdependence of selected economic indicators. Time series analysis, due to insufficient data (absence of monthly data, which allow assess the seasonal component of the time series), is limited for the trend component modelling and estimation of random component of the time series. Based on the selected performed statistical analyzes, it can be stated that:

- average monthly wage has significantly positive effect on the value added in various sectors of wood processing industry (and revenues),
- time series of value added (as well as revenues and average monthly wages) have increasing linear trend in all sectors of wood processing industry in Slovakia,
- assuming the increasing of average monthly wage to the level 820 EUR, it would be possible, in sectors of the furniture and manufacture of wood industry, to achieve that level of value added per one employee or the level of sales which has interesting value compared with competitive sectors.

We realize that prognosis the level of value added based on single factor, namely the level of the average wage, even though the high value of the correlation coefficient is not absolute relevant. In our article we wanted to present the possibilities of using statistical tools for prediction the development of specific performance indicators in the sector of wood processing industry.

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MULTI-PROJECT RISK ASSESSMENT FOR WOOD PRODUCT DEVELOPMENT

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ABSTRACT

The paper aims at presenting risk assessment for multi-project environment in the context of wood product development. The proposed model of risk identification takes into account the risk factors connected with external environment, schedule, finance, design, and organisation's structure. The last risk factor includes communication and culture issues that are often omitted in project risk assessment. Moreover, risk assessment is usually conduced in the context of single project. This provides the motivation to develop a decision support tool for risk assessment in multi-project environment that is dedicated for wood product development. Risk assessment methodology is based on fuzzy set theory that is especially useful to express vague, linguistic terms such as high risk, very complex project, insufficient communication in project team.

Key words: risk identification, project risk factors, fuzzy risk assessment, decision support tool

1. INTRODUCTION

In recent years, the rate of change in industry has been extremely fast. Competition in quality, design, cost of new products, and time their launching into the market has increased with new competitors having established segments and, in some cases, with change in competitive tools. The need to manage new product development effectively becomes ever more urgent for companies. Thus, most companies have to deal with uncertain risks and uncertain expected performance in every aspect of both their internal and external environments [1].

The management of uncertainty is seen as a necessary condition for effective project management. Sources of uncertainty are wide ranging and have a fundamental effect on projects and project management [2]. Uncertainty is an important issue in the support of any decision-making in the process of new product development. In a wood company, this process involves objectives and information concerning ecological, economic, and social issues. Uncertainty in the wood industry often results from forest management programmes that are hard in assessment. These programmes concern large areas, long time horizons and multiple stakeholders, which further complicates forest management planning and increases uncertainty involved in it [3].

Uncertainty can be defined in several ways. Essentially, it is lack of information, which may or may not be obtainable [4]. Uncertainty is also linked with risk based on the distinction between aleatory and epistemic uncertainty in the following couplet: uncertainty is immeasurable risk; risk is measurable uncertainty [5-6]. The term risk has different meaning to different people according to their viewpoint, attitudes and experiences. Engineers, designers and contractors view risk from the technological perspective, whereas lenders and developers tend to view it from the economic and financial side [7].

Project risk is defined by Project Management Body of Knowledge (PMBOK) as an uncertain event or condition that, if it occurs, has a positive or a negative effect on a project objective [8]. PMBOK included risk management as one of the nine areas in project management and described it as the process concerned with conducting risk management planning, identification, analysis, monitoring, and control on a project. Risk management is often considered in the aspect of risk identification and assessment.

Risk identification refers to the evidences from previous experience or similar cases which would apply to the current project, in order to increase the probability of the project's success. After the identification a list of risk events that can probably occurred in the process of project performance, these risks are assessed. Risk assessment involves measures, either conducted quantitatively or qualitatively, to produce the estimation of the significance level of the individual risk factors to the project. With a better quantification measuring result, the managers can recognize which risks are more important and then deploy more resources to eliminate or mitigate the expected consequences [9].

The identification and assessment of project risk are the critical procedures for project success, and they usually become the essential factors in the decision-making process [10]. Several methods have been proposed to evaluate and select the best projects in order to decide which projects are more risky. Risk assessment methods have ranged from the classical quantitative methods (e.g. Monte Carlo methods, sensitivity analysis, critical path method, fault and event tree analysis) to fuzzy approach mathematical models [11].

Using fuzzy logic, sets may be defined on vague, linguistic terms such as high risk, very complex project, poor performance of subcontractor, etc. These terms cannot be defined meaningfully with a precise single value, but fuzzy set theory provides a means by which these terms may be formally defined in mathematical logic [12]. Project managers make decisions on the basis of their knowledge of the facts and personal experience. Their judgments and preferences are often vague, inexact, imprecise and uncertain by nature which makes it difficult to estimate their preference with an exact numerical value since crisp data are inadequate to model real life situations [9].

The structure of this paper is organised as follows: Section 2 presents a project risk identification model for wood product development. A proposed methodology for fuzzy risk rating is shown in Section 3. An illustrative example of the approach is presented in Section 4. Finally, some concluding remarks are contained in Section 5.

2. PROJECT RISK MODEL FOR WOOD PRODUCT DEVELOPMENT

Risks concerning new product development can be categorized in a number of ways based on the source of risk, impact of risk or by project phase. For instance, project risks are divided into two groups, according to their source, into internal and external. External risk concerns the attitudes of clients, availability and performance of subcontractors, partners, and suppliers, as well as law, politics, technology, economy, culture, and environment. Increasing buyer's awareness concerning ecology forces the wood companies to design new products and manufacturing processes according to green technology and appropriate quality of wood and wood-plastic composites (WPCs). WPCs are often considered a sustainable material because they can be made using recycled plastics and the waste products of the wood industry [13]. However, WPCs also include the polymers and adhesives added make wood-plastic composite difficult to recycle again after use. Hence, risk identification in new product development should contain sustainability standards and certification.

Internal risk of new product development includes the issues connected with the project triangle, i.e. schedule, cost, and scope that can be considered in the aspect of a company's organisational structure, project management culture, and communication in the project team [14-15]. The project risks can be categorized in a number of ways, for instance, as the fields concern organization, requirements, communication, and product development methodology [16]; county,

construction, design, payment, client, and subcontractor risk [17]; technical, organizational, design, procurement, implementation, and operations risk [18]; project management, engineering, execution, and suppliers risks [19]. After the above literature review and assuming that project risk identification model should be tailored to the nature of a company that develops new wood products, the following risk factors are identified: external, schedule, financial, design, organisational. An illustration of a risk identification model is presented in Fig. 1.

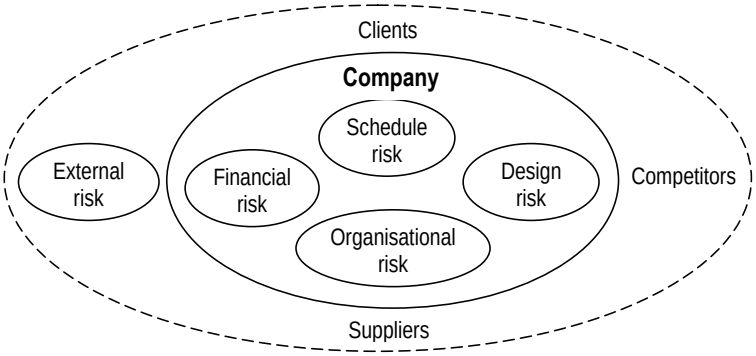

Figure 1. Project risk identification model.

Table 1 presents the sample of major risk factors and subfactors in the context of multi-project management in wood product development.

Table 1. Major project risk factors and subfactors

Risk factor	Risk subfactor
External	1. Insufficient demand - Attitude of client - Incomplete understanding of customer requirements - Poor macroeconomic conditions 2. Environmental requirements - Inappropriate materials, synthetic chemicals (including hazardous substances) to manufactured products; amount of waste - Inconsistency with sustainability standards and certification - Unclear legal requirements 3. Unavailability of suppliers - Poor performance of suppliers and subcontractors - Inappropriate forest governance - Natural disaster such as earthquake, fire, flood, storm, and their impact on the forest and timber industry

Table 1. Major project risk factors and subfactors

Schedule	1. Project complexity - Schedule inaccuracy - Project density - Task dependencies 2. Project duration - Reserve time inaccuracy - Incomplete task assignments 3. Unavailability of resources - Inaccurate estimation of personnel availability - Inaccurate estimation of material ordered - Ill-assigned schedule responsibility
Financial	1. Unavailability of funds - Delay in payments - Contractor's financial instability - Inaccurate price conformance of material supplier - Inaccurate project budget estimation 2. Inappropriate financial reserves - Economic power of company - Working capital requirements
Design	1. Lack of experience in similar projects - Product complexity - Incomplete product performance (functionality) evaluation 2. Incomplete product specification - Unfamiliarity with the technology - Inaccurate estimation of material specification - Incomplete conceptual manufacturing process design
Organisational	1. Complexity of organisational structure - Instabilities in management structure (including changes of project team members) - Unstable working relations - Inappropriate delegation of responsibilities - Incompatible hardware/software (also information infrastructure breakdown, IT hacking) - Inappropriate methods/techniques/tools for planning - Inappropriate metrics (or lack of metrics) 2. Ineffective communication - Ill-determined team size - Incompatible team - Inaccurate estimation of team skill and training requirements - Inappropriate leadership style (including lack of clear goals, motivation, trust, commitment, etc.) 3. Inappropriate project management culture - Inappropriate organisation's culture - Lack of team member commitment (inappropriate skills, motivation, trust, etc.) - Personality conflicts (including competition between project managers over resource allocation to "own" project)

The presented model of risk identification includes a set of decision variables (risk factors) and the constraints, e.g. rules that are formulated by the experts. The decision problem can be reduced to a following question: what is the total project portfolio risk for the considered values of risk factors. The methodology concerning the solution of the considered problem is presented in the next section.

3. PROPOSED METHODOLOGY FOR PROJECT RISK ASSESSMENT

The methodology for project risk assessment is based on fuzzy set theory and consist of following stages:

- Definition of variables and selection of a membership function for each variable.
- Obtaining the rule base from the experts.
- Determination of subjective level for risk subfactors.
- Obtaining the ratings for each risk factor, project, and project portfolio.

In fuzzy logic, the membership defines how the value of a fuzzy variable is mapped to a degree of membership between 0 and 1. Membership functions are used to calculate the degree of membership of a fuzzy risk score to different sets expressed by linguistic terms such as e.g. low risk, medium risk, and high risk (see Fig. 2). The shape of a fuzzy number and scale of a linguistic variable depends on user needs. In this paper, a subjective risk level is assigned to a risk factor using 1-10 scale.

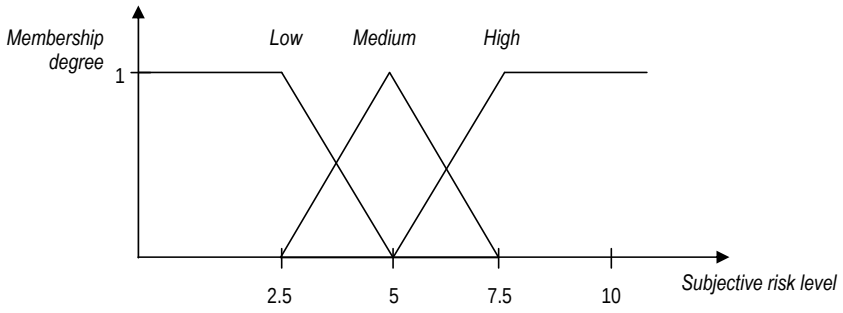

Figure 2. Membership function

In the next stage, the rule base is obtained from the experts. In this study, aggregation rules demonstrate how the risk levels change under different scenarios. Aggregation rules are the IF … THEN rules that reveal the value of an output variable (risk rating) if values of input variables (risk subfactors) are expressed by different linguistic terms. An example of decision matrix is depicted in Fig. 3.

		Project complexity		
		Low (L)	Medium (M)	High (H)
Project duration	Low (L)	L	M	M
	Medium (M)	L	M	M
	High (H)	M	H	H

Figure 3. Decision matrix of aggregation rules

The above example concerns an influence of “Project complexity” and “Project duration” on “Schedule risk” that can be considered as a meet of target time. For instance, *low* schedule risk means the project should be completed without delay, medium – the project should be completed within 20%

delay, and *high* – the project should be completed above 20% delay. As an example, three of nine fuzzy rules for "schedule risk" are given below:
IF "Project complexity" is *low* AND "Project duration" is *low* THEN "Schedule risk" is *low.*
IF "Project complexity" is *low* AND "Project duration" is *high* THEN "Schedule risk" is *medium.*
IF "Project complexity" is *medium* AND "Project duration" is *high* THEN "Schedule risk" is *high.*

In the next step, the user determines subjective level for risk subfactors that after defuzzification enable obtaining the ratings for each risk factor, i.e. external, schedule, financial, design, organizational risk. Finally, project risk is calculated as the average of all risk factors, in turn project portfolio risk is determined as the average of all project risks.

4. EXAMPLE

The proposed methodology has been applied to the projects concerning three new product lines. A company considers the development of indoor furniture with the use of different wood-plastic composites. Materials are ordered from different suppliers, as well as they vary considerably in sustainability standards. This leads to the determination of different risk level for subfactors, such as "Insufficient demand", "Environment requirements", and "Unavailability of suppliers" for the field of external risk. Subjective risk level is from 1 to 10, where 1 depicts the lowest level of risk and 10 the highest level of risk.

The calculations concerning risk assessment have been generated with the use of Fuzzy Logic Toolbox Matlab® software. After converting the linguistic variables (subjective risk level) into triangular fuzzy numbers, the centroid of area method was performed for defuzzifying the triangular fuzzy numbers into corresponding non-fuzzy performance values.

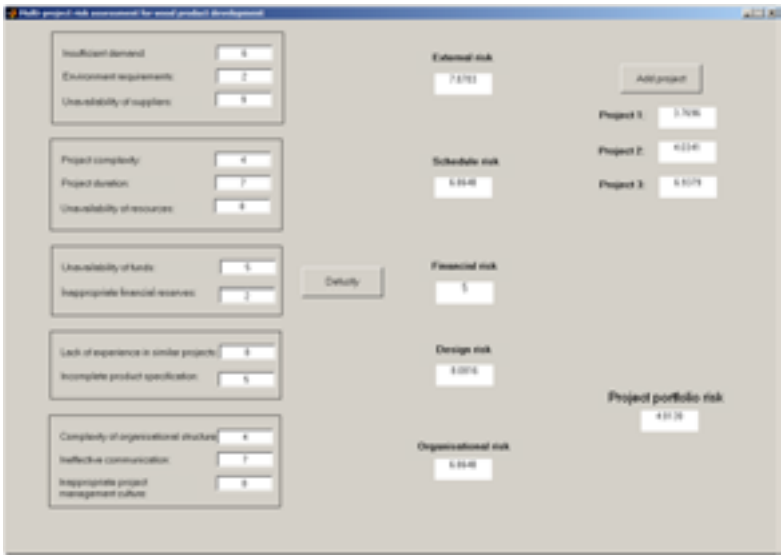

Figure 4. Project portfolio risk rating

The goal of quantitative risk analysis is the numerical analysis of probability of occurrence of each risk subfactor and their outcomes on risk factors, project, and finally on project portfolio. Project risk is calculated as average of risk factor, i.e. external, schedule, financial, design, and organisational. For example, presented in Fig. 4 the average of risk factors equals 6.9379 for third project. In turn,

project portfolio risk is calculated as the average of all project risks as follows: (3.7696+4.0341+6.9379)/3=4.9139. If a company considers minimization of project portfolio risk, then it can test for which projects the entire risk is the lowest (e.g. for project 1 and 2 the project portfolio equals 3.9018).

5. CONCLUSIONS

The activity of a present enterprise comprises turbulent changes concerning technology, economics, and society [20]. As a result, most projects are executed in the presence of uncertainty. Fuzzy risk assessment provides a promising tool to quantify risk ratings where the risk impacts are vague and defined by subjective judgments rather than objective data. In this research, a risk identification model is proposed for multi-project environment in the context of wood product development. In the proposed methodology, fuzzy set theory is utilized for project portfolio risk assessment. The major contribution of this work to the risk management literature is modelling external and internal risk factors, including communication and culture issues in project team, in simultaneous development of many wood products. The proposed approach of risk assessment has been implemented in the form of a decision support tool that can be used by the professionals to quantify risk ratings.

The advantage of the tool is that it can provide guidance for a wood company about the amount of risk premium that should be included in the mark-up. If new products are similar to developed products in the past, then the rule base can be verified according to past experiences with risk assessment. Another potential advantage is the tool's utilisation as an organisational learning tool. As the experience of the managers is captured in the form of IF … THEN rules and uploaded to the tool, it can help development of a corporate risk memory. Less experienced staff can refer to this risk information while calculating risk premiums in a similar project.

The disadvantage of the approach is connected with the difficulties with capturing knowledge from expert. This obstacle leads to the increase of interest in an automatic knowledge discovery, for instance, with the use of statistical analysis or artificial intelligence techniques, such as case-based reasoning, neural networks, hybrid fuzzy neural system. This system can estimate a function without any mathematical model and learn from experience with sample data [21].

Further research focuses on the extension of the proposed risk identification model towards an enhancement of organizational risk in a project. Moreover, further research can be aimed at developing a fuzzy neural system and its real life verification. The subject of future research can also include formulation of the risk identification model in terms of a constraint satisfaction problem that facilities seeking a feasible set of alternatives for project portfolio completion e.g. according to a required risk level.

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FOREST-BASED BIOENERGY-PRODUCTION: IMPLICATIONS FOR RURAL ECONOMIC DEVELOPMENT IN LOUISIANA, USA

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ABSTRACT

Bio-based products are gaining attention in order to supplement the growing demand for energy and recently, several innovations and technology advancements have come from the biomass industry. With advancements in biomass technologies in place, energy producers will look for a much needed sustainable supply of biomass to ensure long-term success. Much of this feedstock will come from the forestry community. The continued development of bio-based products and facilities will help to establish several market opportunities for forest landowners through several means such as providing post-harvest residues, dedicated energy crops, or small diameter material from thinning. We conducted a study of small and medium forest landowners in the U.S. South to discern potential involvement in bio-based business activities. Rural economies, especially in the South, are historically some of the poorest in the nation. The development of bio-based facilities in rural communities will strengthen the economy through increased revenue and taxes. In order to maintain a sustainable supply, forestry professionals could develop new generation cooperatives that offer producers leverage and strength in the form of community involvement; especially when faced with the uncertainty of domestic and international markets.

Key words: Forest, Bioenergy, Rural, Development, South, USA

1. INTRODUCTION

Interest in renewable energy resources has grown significantly among energy producers, developers, legislators, and policy makers over the past decade as the cost of fossil fuel continues to increase with a shrinking resource base. This interest has also been driven by concerns about climate change believed by many to be caused in part by the use of fossil fuel (IPCC 2007). Hydro-electric, geo thermal, wind, solar and biomass energy are the most common forms of renewable energy sources that are being used to replace dependency on fossil fuels.

Wood has several economic and environmental advantages over fossil fuel. It is significantly less expensive, renewable, carbon-neutral, and locally available when compared to most fossil fuels. In combustion, wood produces 90% less carbon dioxide (CO^2) than fossil fuels with minimal emissions of sulfur, heavy metals and particulates (USDA 2004). About 84% of the wood and wood waste fuel used in the U.S. is consumed by the industry, electric power producers, and commercial businesses while

the rest is used domestically. In addition the cellulosic content of wood makes wood a viable candidate biomass input for transportation fuel production (USDA 2004).

In utilization of wood biomass for energy, whether it be for co-generation, gasification, manufacturing into pellets, or other applications, it is critical to evaluate the available supply of wood. Transportation costs often become a limiting factor, and hauling wood biomass beyond a 50-mile radius of the plant may not be economically feasible (USDA 2004). Therefore, generating energy, electricity, or other related products from wood biomass is more applicable in regions where forestland and wood wastes are readily available and supply is sustainable.

2. WOOD BIOMASS RESOURCES IN THE U.S. AND THE U.S. SOUTH

U.S. forests are expanding with an annual net forest biomass increase of 3% (Kizhakkepurakkal 2008). This creates new opportunities for the forest products industry, especially in bio-energy sectors. Recent estimates show that American forests are able to sustainably produce 368 million dry tons of wood for energy generation per year; this figure is an underestimation as it excludes the wood used for pulp/paper, low-value solid products, or wood from fast-growing trees on non-agricultural lands (Richter et al. 2009). Wood residue is an important low-cost source of renewable biomass energy in regions where forest cover forms a major portion of land area. Nearly all of biomass fuel used for energy production today comes from wood wastes and residues (Parikka 2004).

The U.S. South[1] is an area rich in natural resources, accounting for approximately 40% of the total forest lands in U.S. and producing about 55% of the total annual round wood harvest (Prestemon and Abt 2002). Of the 200 million acres of timberlands in the South, approximately 90% (181 million acres) are privately owned either by forest industry or non-industrial private forest landowners (NIPF) (Conner and Hartsell 2002). Understanding the characteristics of these producers should have positive economic impacts for individuals, families, and communities within their regions. A large portion of research within the forest industry sector over the past few decades has revolved around NIPF, which is synonymous with the current term family forest owners. Justification of such inquiries is partially attributed to the relative size of forestland owned by this group. From 1993-2003, this group increased by 11%, and studies indicate this trend persists (Butler and Leatherberry 2004; Hodgden et al. 2003). Despite NIPF land ownership increases, the average area of individual land ownership has decreased due to fragmentation. According to the U.S.D.A (2009), the majority of private forestlands are less than a thousand acres.

3. THE STUDY

3.1. Objectives

One objective of this research was to survey small and medium private forest landowners in the U.S. Gulf South using Louisiana as a pilot state in order to identify current and potential business positions as well as identify willingness to participate in new cellulosic bio-based management activities. Using results from the first part of the study, another objective, which is the focus of this paper, was to discern economic impacts on rural communities resulting from forest bio-based energy sectoral development.

[1] Southern states refers to Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas and Virginia.

3.2. The Study Region

Louisiana, the study region, is typical of southern states, with NIPF landowners accounting for about 62% ownership of the 13.8 million acres of forestland (LSU AgCenter 2009) (**Figure 1**). Louisiana is rich in renewable natural resources readily available for bioenergy production from the forestry industry. Approximately 4,289 million kwh 1(5.43 gigajoules) of energy can potentially be produced from woody biomass residue in Louisiana (de Hoop 2006). **Figure 2** shows the concentration of woody biomass in the Southern U.S. with the highest concentration being in Louisiana. In addition to the abundant forest resources in the South, there is a trend towards conversion of farmland to forests in the region.

Another rationale for selecting the study region in Louisiana is that (NIPF), defined as private forest owners who do not own or operate wood processing facilities, including farmers, miscellaneous individuals and non-forest industry operations are the primary forest landowner group in the South (Bliss et al. 1997). Of the 203 million acres of timberlands in the South, approximately 90% (181 million acres) are privately owned either by forest industry or NIPF landowners. The remaining 10% is collectively owned by federal, state, and local public entities. NIPF landowners account for the greatest share of timberlands with 4.9 million landowners owning 71% of the forestland in the South (Conner and Hartsell 2003) while NIPF landowners account for about 62% of the forest land ownership in Louisiana (LSU AgCenter 2009).

Finally, the study region within Louisiana chosen has characteristics similar to the land base in the Gulf South. Rural economies, especially in the South, are historically some of the poorest in the nation. **Table 1** shows the high degree of poverty, percent forestland, and other geographical data for the parishes in the region. Forest Bio-based energy production has been identified as a potential means to ameliorate rural poverty. We estimated jobs creation and economic contribution of two wood bio-based energy facilities in Southwest Louisiana. (**Figure 3**).

Figure 1. Louisiana Location in the United States

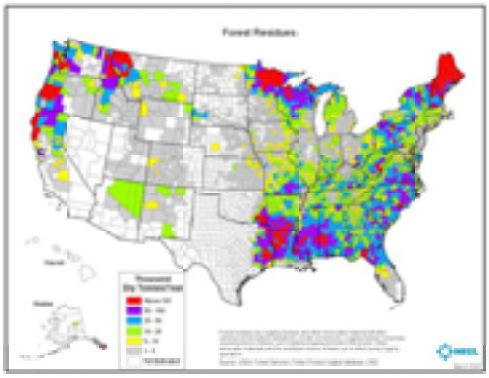

Figure 2. Estimated Forest Residues by County (Source: Milbrandt, 2005)

Relative to Northwest Louisiana and the Florida Parishes in the Southeast, the Southwest region of the state has significant forest resources but has a relatively low current level of forest utilization (**Figure 3**). According to Mr. George Swift, President/CEO, Southwest Louisiana Partnership for Economic Development "We have strong timber resources in our area especially Beauregard and Allen parishes. We want to discover new economic development opportunities for our area utilizing those resources" (Swift 2008). The parishes in this region (with area of forest land (thousand acres) for each in parentheses) are Allen (343), Beauregard (543), Calcasieu (221), Rapides (575), and Vernon (750) (Dubea 2009).

Figure 3. Study Sub-Region I-Southwest Louisiana

Table 1. Study Regions-Demographic, Socio-economic and Resources Summary[2]

	Population (1,000)	Median Income	Unem-ployment Rate (%)	% Below Poverty Line	% of Area Forested	Forest Area (1,000 Acres)	Ag. Land, Cropland and Pasture (1,000 Acres)	% of Area Agricul-tural	Total Land Area (1,000 Acres)
Allen	25,635	$34,958	7.1	21.6%	70	342.9	83.2	17.0	489.9
Beauregard	34,978	$40,592	5.8	15.9%	73	543.3	179.0	24.0	744.2
Calcasieu	185,618	$42,018	5	17.5%	32	221.5	387.8	53.1	692.2
Rapides	133,131	$36,938	5.4	19.8%	67	575.1	177.3	20.7	858.4
Vernon	45,639	$41,605	5.3	16.6%	88	749.9	50.6	5.9	852.2

3.3. Study Design and Procedures

3.3.1. Mail Survey

The survey portion of this research, Phase I, was focused on developing qualitative and quantitative information on the forestry sector. Following procedures suggested by Dillman (2000), a survey was conducted of of 3,500 small to medium forest landowners with forest ownership within the focal region chosen by random sample from tax roll data. Information gained from the survey was analyzed to characterize the populations and regions as well as providing information that could aid in respondents in managerial decision making regarding the bio-sector. Results were also used as inputs into econometric modeling of economic impacts of bio-sector growth in the study region.

3.3.2. Input/Output Analysis of Alternative Products & Processes[3]

This phase of the study, the focus of this paper, was constructed based on the survey output from Phase I and secondary government data. These surveys were combined with interviews of producers, industry, and experts to assess the extent to which new forest bio-based products would alter the existing production process. One important issue in this project is that the new technology may differ from that currently implemented in a particular region. It was important to verify stability of the production function, regional purchase coefficients, margins, and other inputs used to create multipliers.

Given this need for flexibility, the IMPLAN Pro Social Accounting and Impact Analysis Software (Minnesota IMPLAN Group 2000) was used to identify the overall structure and linkages within state economies as well as to measure the indirect and induced impacts from transitioning from traditional agricultural and forest-based products to alternative bio-based products. Survey results from Phase I were used to identify high potential alternative product industry sectors that are directly impacted by SMFF producing bio-based products. These new sectors can be modified in an existing IMPLAN model using updated raw material and labor input data. Overall demand changes measured by production will be used as an input into the modified IMPLAN model to generate indirect and induced spending impacts as well as value added and income impacts in Louisiana and Mississippi state economies.

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[2] Sources: Population, income and poverty statistics : http://quickfacts.census.gov/qfd/states/22/22035.html; Unemployment LA: http://www.laworks.net/Downloads/LMI/Data_for_January_2009.pdf; Unemployment MS : Source: Labor Market Data Publication, March 2009, http://mdes.ms.gov/wps/PA_1_0_CH/docs/ LMI/MAPS/uratesmap.pdf; Forest Statistics for Mississippi Counties: 1994, USDA Forest Service, http://www.mfc.state.ms.us/pdf/Info/FF/Other/land%20area.pdf; Forest Statistics for Louisiana Parishes 1991, USDA Forest Service, http://www.laplt.org/index_files/Publications/ LouisianaForestTypeMap(color).pdf, Agriculture data (land area under farming and ranching) : 2007 Census of Agriculture, http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/index.asp

[3] Phase I Survey Data, U.S. Economic Census Industry Data, Bureau of Economic Analysis (BEA) Industrial Value Added and Employment Data, IMPLAN Pro Social Accounting and Impact Analysis Software

Total impacts on the demand for raw materials required to manufacture two alternative products were measured. The methodology for this study is to first estimate the direct expenditures on constructing the plants and plant operations. However, the total impact on the economy is not only limited to the direct expenditures. When workers at the plant or construction site receive wages, they spend a portion of those wages in the local economy. Likewise, local business will directly receive additional sales from the plant's construction and later operations. In turn, additional rounds of businesses and workers will benefit from this injection in the economy. Like a rock dropped in a pond, an economic injection ripples throughout the economy to create additional rounds of spending. Input-output analysis provides a method of quantifying the total economic impact of an economic injection on the local economy.

4. RESULTS-ESTIMATED ECONOMIC IMPACT OF HYPOTHETICAL WOODY BIOMASS PLANTS

4.1. Electric power plant in Southwest Louisiana Using Chips/Post-Harvest Residuals as Feedstock

The first hypothetical facility is an electric power plant in Southwest Louisiana using woody biomass as a feedstock. Consider first the electric power plant in Southwest Louisiana. The base production, feedstock consumption, feedstock costs, and construction assumptions for each facility are:

- 55 megawatt
- Construction cost: $250 million
- 25% construction expenditures from within the region
- Feedstock cost: $30/green ton
- Feedstock annual consumption: 600,000 green tons

Table 2. The Economic Impact of Construction of a Woody Biomass Electric Plant in Southwest Louisiana

	Jobs	Earnings ($ Million)	Output ($ Million)
Direct Effect	410	$22.7	$62.5
Indirect Effect	121	$6.0	$20.1
Induced Effect	133	$4.6	$14.7
Total Effect	**664**	**$33.2**	**$97.3**

Notes: Earnings and Output are measured in 2011 $.

The results in **Table 2** imply that construction of the plant would directly employ 410 workers in the region. Accounting for the ripples in the economy (indirect and induced impact) leads to a total of 664 jobs. In terms of earnings, we estimate that this would translate into just over $33 million in new earnings for the region. Just over $97 million of new output would be created in Southwest Louisiana during the construction phase.

Annual Operations computations are based on an assumption that the plant would employ 25 full time workers. The plant would require 600,000 raw tons of woody biomass as feedstock. We focus on three scenarios based on varying the feedstock cost starting with a baseline of $30 per ton. Table 2 contains the estimated annual impact of operations for this baseline model in 2011 dollars.

Table 3. The Economic Impact of Operations of a Woody Biomass Electric Plant in Southwest Louisiana (Baseline model assuming $30 per Raw Ton for Feedstock)

	Jobs	Earnings ($ Million)	Output ($ Million)
Direct Effect	92	$6.6	$31.1
Indirect Effect	62	$3.0	$13.4
Induced Effect	45	$1.5	$5.0
Total Effect	**199**	**$11.1**	**$49.5**

Notes: Earnings and Output are measured in 2011 $.

The results in **Table 3** imply that plant operations would create 92 direct jobs in the Southwest Louisiana region, including both workers at the plant and employees acquiring feedstock. Accounting for the indirect and induced impacts leads to 199 total jobs from operations and $11.1 million in total earnings. The impact of operations on the region's output is almost $50 million. Note that both earnings and output are expressed in 2011 dollars. For simplicity, we currently assume that all input and output costs rise at the overall inflation rate. Under this assumption, both earnings and output would grow proportionately with inflation. Table 4 focuses on the impact of varying the price of feedstock. We consider a low of $20 per ton and a high of $40 per ton. For simplicity, we focus only on the total impact of operations at each price.

Table 4. The Economic Impact of Operations of a Woody Biomass Electric Plant in Southwest Louisiana (Scenario Analysis)

	$20 per Ton	$30 per Ton	$40 per Ton
Total Jobs	148	199	251
Total Earnings ($ Million)	$8.6	$11.1	$13.6
Total Output ($ Million)	$38.2	$$49.5	$60.1

Notes: Earnings and Output are measured in 2011 $.

The total number of jobs created by operations drops to just under 150 if the feedstock cost drops to $20 per ton. If the feedstock rises to $40 per ton, the region could expect 251 jobs annually attributable to the plant. Our second facility of interest uses wood shavings and forestry byproducts to form wood pellets, which will then be used as a fuel source for power plants in Europe. The base production, feedstock consumption, feedstock costs, and construction assumptions for each facility are:

- Annual production output: 187,500 tons of pellets
- Construction cost: $200 million
- 25% construction expenditures from within the region in Louisiana; 20% from within Mississippi region
- Feedstock cost: $35/green ton
- Feedstock annual consumption: 375,000 green tons

Table 5 contains the estimated impact of constructing a wood pellet plant in Southwest Louisiana. The construction project would directly employ just over 100 workers in Southwest Louisiana and 168 total new jobs could be expected in this area. Southwest Louisiana could expect $8.4 million in new earnings and $24.6 in new output once all the economic ripples are included.

Table 5. The Economic Impact of Construction of a Wood Pellet Plant using Wood in Southwest Louisiana

	Jobs	Earnings ($ Million)	Output ($ Million)
Direct Effect	104	$5.7	$15.8
Indirect Effect	31	$1.5	$5.1
Induced Effect	34	$1.2	$3.7
Total Effect	**168**	**$8.4**	**$24.6**

Notes: Earnings and Output are measured in 2011 $.

Table 6 focuses on operations of the wood pellet plant. We focus on a hypothetical plant that would employ between 80 and 90 workers and process 375,000 raw tons of wood into pellets. Our analysis suggests that plant operations would generate 313 total jobs each year for Southwest Louisiana. This translates into over $15 million in total new earnings and over $68 million in total new output

Table 6. The Economic Impact of Operations of a Wood Pellet Plant using Wood in Southwest Louisiana

	Jobs	Earnings ($ Million)	Output ($ Million)
Direct Effect	136	$7.6	$36.4
Indirect Effect	116	$5.4	$25.1
Induced Effect	62	$2.1	$6.8
Total Effect	**313**	**$15.1**	**$68.3**

Notes: Earnings and Output are measured in 2011 $.

5. CONCLUSIONS

This paper focuses on quantifying the total economic impact of two alternative bio-fuel facilities on a region in Louisiana. More specifically we estimate the new jobs, earnings, and output that would be created by construction and operations of these facilities. The results generally indicate that these plants would have a substantial economic impact, particularly when considered in the context of the rural communities where they would likely be built. The development of bio-based facilities in rural communities can strengthen local economies through increased revenue and taxes.

In order to maintain a sustainable supply, forestry professionals could develop new generation cooperatives that offer producers leverage and strength in the form of community involvement. Of course, a number of issues and questions need to be addressed including:

- What is the commercialization potential and time horizon
- Supply chain risks
- Uncertainty across supply chain is a deterrent
- Resource owners are uncertain about market potential
- Resource processors are uncertain about supply potential
- Uncertainty manifests into risks for resource owners and processors
- Innovative strategies and business models can help alleviate perceived risks and drive higher acceptance
- New generation cooperatives

- Public-private partnerships
- Sustainability Issues and Concerns
- Biomass industry drivers: sustainable harvest levels, wood fiber prices, and transportation costs.
- Harvesting, collecting and transporting cellulosic biomass residues can be difficult and expensive.
- High transportation costs means cellulosic biomass plants must source feedstocks near plant.
- Biomass demand currently driven by wood-burning power companies---Pellets.
- Cellulosic ethanol could impact the structure of the forest sector.
- Demand for wood electricity could also change the landscape

Overall, findings from research provide a base for entrepreneurs, developers, energy producers, and politicians to create alternative management practices and strategies for landowners in a rural environment to incorporate into current management plans or entirely new plans.

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DEVELOPMENT OF ROUNDWOOD DELIVERIES IN SLOVAKIA

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ABSTRACT

This paper deals with the analysis of roundwood deliveries in Slovakia over the past two decades. Changing supply and demand conditions can cause changes in the structure of production and deliveries of different roundwood assortments. This paper aims to analyse the past development of structure of roundwood supplies, identify main changes and trends in the production and sale of roundwood assortments. A high share of accidental felling and different demand conditions for particular assortments are the main reason for the changes in supplied volumes of individual assortments, exported volumes of roundwood and for the changes in the assortment structure of deliveries.

Key words: roundwood, deliveries, industrial roundwood, energy wood

1. INTRODUCTION

Forest production potential can be understood as the ability of forest to primary produce timber as the basic raw material for wood as well as pulp and paper industry. Forests cover approximately 2.0 million ha in Slovakia, i.e. 41% of its territory. There is a relatively good composition of tree species consisting roughly of 50% coniferous and 50% broadleaved tree species. According to the Green report (2009) the total growing stock is approximately 452 million m^3. Its composition has shifted to the older age classes, thus strengthening the basis for greater allowable cut originating mainly from regeneration felling. A higher share of broadleaved trees species, its natural composition and especially its age structure are a priori good preconditions for higher production of high quality timber assortments.

The category of commercial forests, creating 81% of the planned timber felling, is crucial for timber production. The category of special purpose forests counts for about 17% and protective forests for only 2%. Based on the area comparison, broadleaved species in the category of commercial forests are prevailing, covering nearly double area compared to coniferous species. The differences in distribution of the growing stock according to age classes are not so significant as it is almost symmetrically distributed around the 9^{th} age class. The average growing stock per hectare increases with age classes according to the typical growth "S" curve, while coniferous species reach the volume up to 500 m^3 per ha in the oldest age classes. The growing stock per hectare of broadleaved species is lower by about 20-25%. The growing stock per hectare in the protective forests reaches only 50-70% of the commercial forests. During the last 20 years the forest area and standing volume has moved by 1-2 class to the older age classes. As a result, the greatest portion of growing stock of coniferous as well as broadleaved species moved from the 7^{th} to the 9^{th} age class and thus closer toward the rotation period.

At the same time, the intensity of planned tending and regeneration felling moderately decreased (Petráš, Mecko, Paluš, 2010).

2. ROUNDWOOD PRODUCTION AND CLASSIFICATION

The forest industry has experienced many important changes during last twenty years. After the year 2000 wood processing capacity in Slovakia increased significantly and improved domestic wood consumption (Kaputa, 2012). In 2010, total felling was 9.9 mil. m^3; the second highest volume of timber felling in the history of forestry in Slovakia (in 2005, it was 10.2 mil. m^3 due to processing of windthrown wood after windstorm in November 2004). In the 1993 roundwood removals was only 5.2 mil. m^3 (2.99 mil. m^3 coniferous roundwood). The current volume and assortment structure of felling is the result of large-scale incidental felling due to the action of harmful agents. The proportion of incidental felling in coniferous forest stands is in the long term around 80% of the total coniferous wood felling. Income and economic potential of forestry has an increasing trend, but exceeding the planned volume of production diminishes the future felling opportunities. The most important source of income in forestry is sale of timber, which comprises more than 78 % of total sales in forestry. Therefore, timber production is considered as the crucial management and economic activity in forestry and related industries. One of the aims of the economic policy of the EU countries is the continuous growth of wood competitiveness. (Loučanová, 2006). The traditional markets for wood products are saturated and new opportunities are going to be uncovered (Maťová, 2009).

In the wood supply chain, assortment process is one of the most important operations. This process decides how and where timber will be use. From technical point of view, only certain qualities of wood can be used for specific purposes. According to the valid Slovak Technical Standards the roundwood is categorised into timber assortments. The criteria for classification are based on the tree species, timber dimensions (length and diameter) and the presence of wood defects (quality). Each quality class includes timber for particular use within industrial processing or for the final use. For coniferous and non-coniferous wood, these standards distinguish the following quality classes of assortments: I. quality class - veneer logs (used for production of sliced veneer), II. quality class - veneer logs (used for production of rotary cut veneer), III. quality class – sawlogs. The first three classes are defined as sawlogs and veneer log according to international classification. IV. quality class - posts, pit props, poles are classified as other industrial roundwood and V. quality class is pulpwood for chemical and mechanical processing. Whole those classes are classified as industrial roundwood. The last - VI. quality class is fuel wood. There are differences between international classification and the Slovak national standards. In domestic terms, the fuel wood is a specific assortment of roundwood that is utilised for energy purpose. On the other hand according to international classifications fuel wood includes also charcoal, wood residues chips and particles etc.) In foreign trade relations, timber classification standards of foreign timber markets are also used. Apart from the dominant wood assortments (sawlogs and pulpwood), whole lengths, wood chips and standing timber are also offered to the market (Parobek et. al., 2009).

Any changes in the structure of roundwood deliveries result from the possibility of their mutual substitution. However, it is necessary to notice, that a perfect substitution in production of roundwood assortments does not exist as during the production of one assortment there are, at the same time, other assortments produced as well. In certain cases the demand conditions reflected through the market price can stimulate production of a certain assortment instead of the other one. This process is, however, limited by the qualitative attributes and appropriateness of individual assortments for certain uses.

Removals of fuel wood in 2010, including wood for production of charcoal were 510 thous. m^3 and removals of industrial roundwood reached 9.1 mil. m^3, thus increased annually by 6.92%. Removals of coniferous industrial roundwood were 6.1 mil. m^3 and non-coniferous industrial roundwood 3.0 mil. m^3

which was 16.4% more than year before. Removals of sawlogs and veneer logs reached 5.6 mil. m^3 and increased annually by 17.8%. A significant part of logs is represented by coniferous sawlogs and veneer logs which production increased by 13.2% to 4.3 mil. m^3. Non-coniferous sawlogs and veneer logs production was not so high but increased by 36.7% to 1.3 mil. m^3. Removals of pulpwood were 3.5 mil. m^3 (drop by of 6.8%); about half of this volume was coniferous pulpwood. Removals of other industrial roundwood decreased and reached only 31 thous. m^3.

Foreign trade during last 20 years passed significant changes. In 2010, import of roundwood increased and was 650 thous. m^3 (mostly industrial roundwood 582 thous. m^3). On the other hand fuel wood import was only 68 thous. m^3 and wood chips and particles was 108 thous. m^3, but in this assortments import increased 54 times compared to the previous year. Roundwood exports reached 2.6 mil. m^3 (export of industrial roundwood decreased to 2.4 mil. m^3, wood fuel to 130 thous. m^3 and wood residues to 60 thous. m^3). Only export of wood chips and particles increased and reached 198 thous. m^3, which was two times more than in the previous year.

3. METHODOLOGY

In order to analyse the past development of roundwood deliveries during the years 2003-2011 the official statistical data published for forestry and the national classification of roundwood assortments were used. In particular, the following categories of roundwood assortments were analysed: coniferous veneer and sawlogs, coniferous pulpwood, coniferous other industrial wood, non-coniferous veneer and sawlogs, non-coniferous pulpwood, non-coniferous other industrial wood, and aggregated category of coniferous and non-coniferous energy wood.

First of all, the development of total deliveries and deliveries according to the geographical destination were analysed using the share of export deliveries on the total deliveries. Secondly, the development of a share of energy wood on the total deliveries of roundwood was analysed to examine changing patterns in sale of wood due to changing demand requirements. Finally, we have analysed the development of the three main groups of assortments (logs, pulpwood and other industrial roundwood) on the total deliveries of coniferous and non-coniferous industrial roundwood.

4. RESULTS

The development of total roundwood deliveries is shown in Fig 1. Both, coniferous and non-coniferous deliveries as well as the deliveries of energy wood have been increasing during the observed period. An increasing trend in coniferous roundwood deliveries is the result of accidental felling due to severe windthrown in 2004 and the consequent bark beetle damages in coniferous stands.

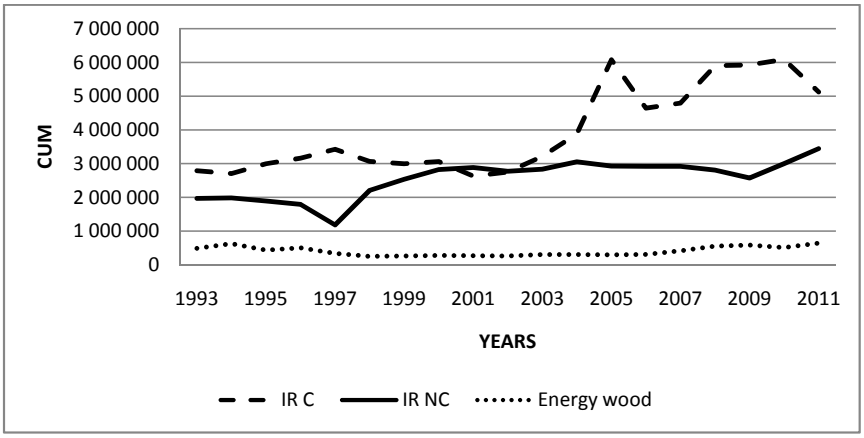

Fig. 1. Roundwood deliveries

As it is shown in Fig. 2, in spite of fairly well developed wood processing sector and strong domestic demand for certain assortments such as coniferous sawlogs, a share of export on the total roundwood production is relatively high. Exported volume of wood should reflect domestic conditions and available capacities for wood processing. This is particularly valid for non-coniferous roundwood, where export accounted only for 16% of the total deliveries, mainly due to high domestic demand for hardwood pulpwood used for pulp and paper production. On the other hand, up to 39% of deliveries of coniferous roundwood were exported from the country in 2011. In spite of the increasing domestic demand from domestic sawmills there has been an increasing trend in export of coniferous sawlogs during the last years. Reasons for this paradox can be found in price differences between the domestic and export markets.

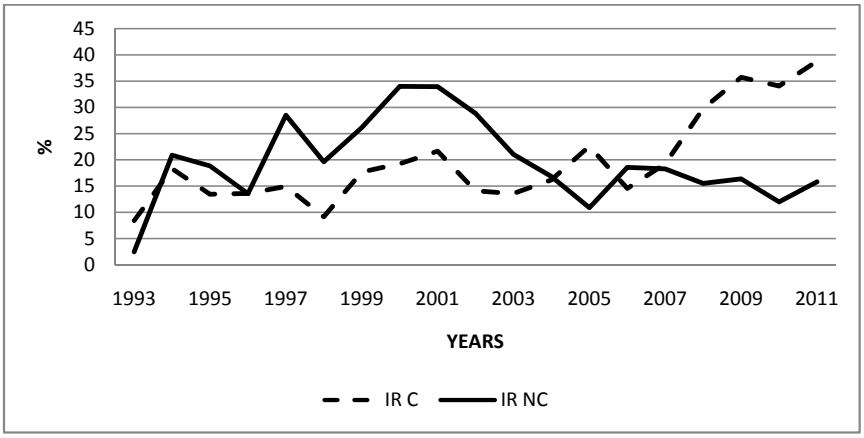

Fig. 2. Share of export on total deliveries of industrial coniferous and non-coniferous roundwood

Fig. 3 illustrates the development of the share of energy wood on the total roundwood deliveries. Traditional use of wood as a fuel for households in the beginning of 90's was reflected in a relatively high proportion of wood fuel deliveries. It should be pointed out that these deliveries consisted completely of wood fuel; an assortment of wood in round or split form. With the increasing possibilities to apply for financial support from the EU funds after Slovakia entered the EU in 2004, forest energy chips, harvesting waste and wood fuel started to be more intensively used in energy sector. This growth has

been also supported by the increasing prices of conventional fuels resulting in higher demand for wood as fuel by households. It is also important to mention that with the increasing felling and deliveries of roundwood, the volume of energy wood has been also increasing in absolute term.

Fig. 4 and Fig. 5 illustrate the development of shares of the main groups of roundwood assortments of the total deliveries of coniferous and non-coniferous industrial roundwood. There are significant differences in composition of coniferous and non-coniferous deliveries. Coniferous logs represent the main category of assortments with the share reaching up to 70%, while a share of non-coniferous logs on the total deliveries of industrial roundwood is up to 40%. The volume of deliveries of other industrial roundwood decreases with the increasing volumes of delivered logs.

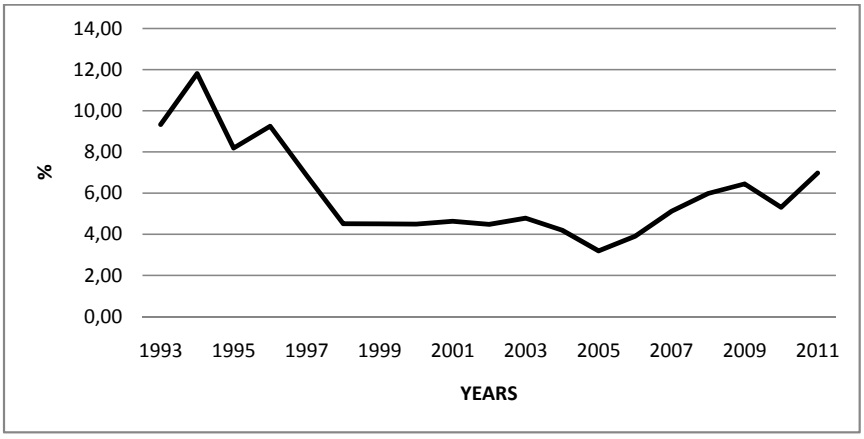

Fig. 3. Share of energy wood on total deliveries of roundwood

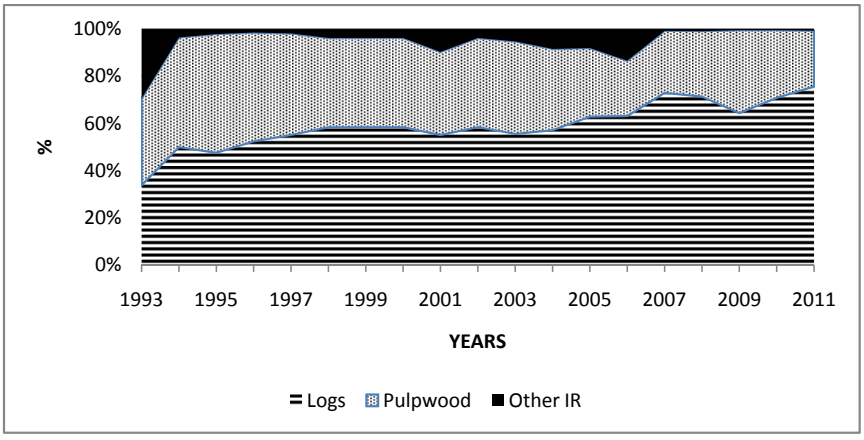

Fig. 4. Share of assortments on total deliveries of coniferous industrial roundwood

Puplwood is the main non-coniferous assortment produced and supplied to the market. Its share on the total non-coniferous roundwood accounts for about 60%. Due to the strong demand from domestic pulp and paper industry as well as very low demand for beech logs, it can be assumed that a certain part of industrial roundwood is used for the production of pulpwood even if it meets the qualitative and dimensional requirements for logs.

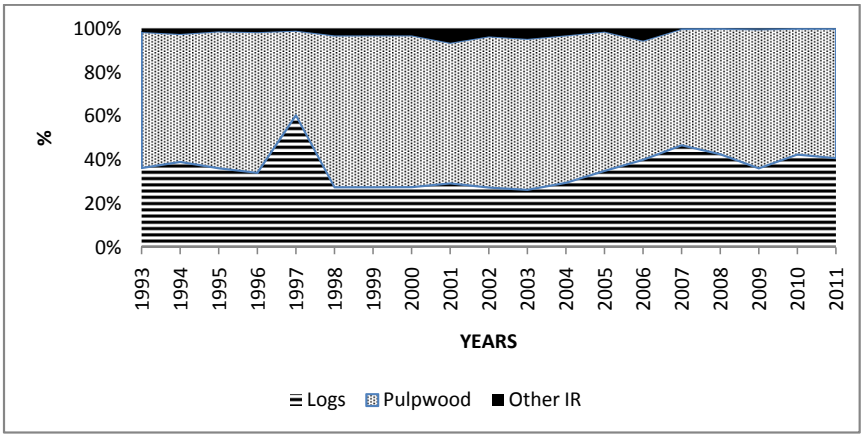

Fig. 5. Share of assortments on total deliveries of non-coniferous industrial roundwood

4. CONCLUSION

This paper dealt with the analysis of roundwood supplies in Slovakia. Based on simple indexes calculated from available data of roundwood deliveries it can be concluded that:

- there is an increasing trend in deliveries of coniferous and non-coniferous roundwood as a result of increasing felling and, in particular, accidental felling,
- since 2006, there has been a significant increase in the share of export of coniferous industrial roundwood on total deliveries; reaching approximately 40% in 2011,
- a share of energy wood on total deliveries of roundwood has increased during the last years (up to 7%),
- there are significant differences in the structure of coniferous and non-coniferous deliveries of industrial roundwood caused by the tree species characteristics themselves as well as by the changing demand conditions.

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DETERMINANTS OF SUSTAINABLE DEVELOPMENT IN CORPORATE SOCIAL RESPONSIBILITY

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ABSTRACT

The paper discusses a general idea of sustainable development as an economic doctrine which is aimed at meeting the basic needs of the society and maintaining integrity of the Earth's ecosystem. The study also presents general principles of the system of management of sustainable development in companies, problems of corporate social responsibility (CSR) and the related activities aimed at improvement in social cohesion, development of human capital, increase in innovativeness and sustainable utilization of environmental resources.

Key words: sustainable development, corporate social responsibility, business management.

1. INTRODUCTION

The idea of *sustainable development* as a modern doctrine of political economy is rightly reflected by the first sentence of the of the report of the World Commission on Environment and Development (WCED): Our Common Future, which defined that: *"Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs"* [1].

This report emphasized that the sustainable development is aimed at social justice through e.g. economic and environmental effectiveness of the enterprises. According to this opinion, in order to ensure further existence of life in the Earth and meeting all basic needs of humans and future generations, one should take care of the sustainable development of all the domains of life and human activities.

In order to define sustainable development more precisely, many studies have used the standards and documents of the United Nations (STOCKHOLM CONFERENCE, 1972), which emphasized that:

"Sustainable development of the Earth is a development that meets the basic needs of all human beings and which conserve, protect and restore the health and integrity of the Earth's ecosystem, without compromising the ability of future generations to meet their own needs and without going over the limits of long term capacity of the earth`s ecosystem"

Therefore, sustainable development means that economic growth leads to increased social cohesion (including providing equal opportunities, prevention of marginalization) and improved quality of the

[1] Contemporarily, the term 'sustainable development' has been widely accepted, especially at the end of the eighties of the 20th century, when it was used in a publication *Our Common Future, also known as the Brundtland Report.* The report has been developed by the UN's commission established in order to propose a 'global programme of changes' in the concept and practice of development.

The concept of *sustainable development* was first used in forestry by Hans Carl von Carlowitz in the beginning of the 19th century. Initially, it meant a method of managing forests that consisted in felling as many trees as can be grown in the same place so that the forest is never destroyed and can be constantly renewed.

natural environment through e.g. limitation of the harmful effect of production and consumption on the environment and protection of natural resources.

Sustainable development is an essential element of the system of international law [2]. In Poland, the principle of sustainable development gained a constitutional dimension: it is contained in the Art. 74 of the Constitution of the Republic of Poland. The provisions concerning the sustainable development were also stipulated by *the Act on Planning and Spatial Development* and also in *the Environmental Law Act,* which says that: *".... a socioeconomic development with the process of integration of political, economic and social activities while maintaining the balance in the nature and persistence of fundamental processes in the nature in order to guarantee the opportunities of meeting the basic needs of individual societies or citizens in both present generations and the generations to come" and in the act of 6th December 2006 on the principles of implementation of developmental policies,* with its Article 2 which says that: *"The policy of development means a group of interrelated actions taken and implemented in order to ensure a constant and sustainable development of the country, socio-economic, regional and spatial cohesion, improved competitiveness of the economy and creation of new job opportunities on the national, regional or local scale.*

The concept of sustainable development represents an essential element of the EU's policies and economy. This is also confirmed by e.g. the EU's *Lisbon Strategy* (2000), *Goeteborg Strategy* (2001), Campaign for corporate social responsibility (2005), and, realized since 2010, new EU strategy *Europe 2020: A strategy for smart, sustainable and inclusive growth* adopted by the EU member states, which is aimed at creation of stable foundations for economic growth that allow for realization of developmental aspirations of society and secure the competitiveness of the EU under conditions of globalization. This strategy focuses on the three interrelated areas of growth: smart growth, sustainable growth, and the inclusive growth) [3].

With this approach, corporate responsibility is a strategy of management which, through social dialogue at the local level, contributes to the improved competitiveness of enterprises at the global level and forms the conditions for sustainable social and economic development.

2. THE AIMS AND TASKS OF SUSTAINABLE DEVELOPMENT

Creation of sustainable model of life, thus improvement in the quality of life of humans without overexploitation of the Earth's natural resources, necessitates varied activities in individual regions of the world. However, the most essential problem is integration of the activities in three key areas [4]:

- *Economic growth and equal division of benefits***.** The goal is to ensure a responsible, long-term development which will be attributable to all societies,
- *Protection of natural resources and the environment.* In order to conserve our environmental heritage and natural resources for the generations to come, it is necessary to implement rational and economic solutions that limit consumption of resources and environmental pollution.
- *Social development.* While meeting the general social needs (work, food, education, energy, health care, water), international society should take action in order not to destroy

[2] the most important documents which emphasized the problems of sustainable development include *Agenda 21, the Rio Declaration on Environment and Development from 1992 or Johannesburg Declaration on Sustainable Development from 2002.*

[3] Following the *Europe 2020* strategy, the Council of the Ministers in Poland adopted, on 25th September 2012, the National Development Strategy 2020. The main aim of the Strategy is *to reinforce and utilize economic, social and institutional potentials that ensure more dynamic and sustainable development of the country and improved quality of life of the citizens.* The strategy defines three strategic areas: - *Efficient and Effective State, Competitive Economy and Social and Territorial Cohesion***,** on which basic initiatives will be focused.

[4] Polish National Commission for UNESCO: *UNESCO and Sustainable Development,* a multimedia presentation during 2nd Ecological Conference in Warsaw on 20th March 2006, www.unesco.pl

the cultural wealth and social variety and to ensure that societies have instruments that stimulate their own future.

Therefore, the concept of sustainable development is focused on the need of taking into consideration the three "pillars" of society, economy and environment: which are interrelated and the economic growth is in general correlated with overall improvement in the quality of life through inclusion of correlated factors which contribute to the welfare while maintaining the natural equilibrium in the environment (Fig. 1).

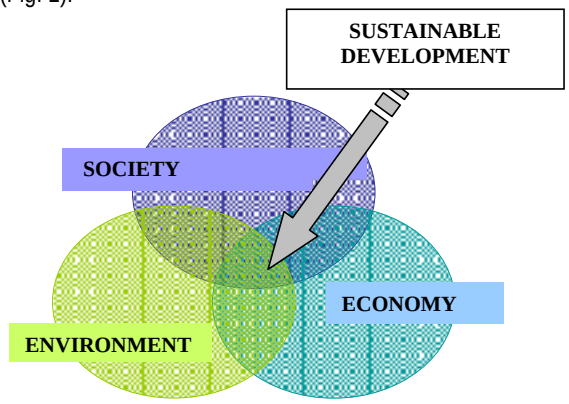

Figure 1. Sustainable development as a result of three components

Source: Authors own elaboration based on www.eko.org

The economy of sustainable development, adopts intragenerational equity and intergenerational responsibility as its basic value. Business and society are inseparably connected with each other, while the business goals might interact with social goals.

The financial success requires, on the one hand, ensuring the capital for development (not only financial but also human and social) and, on the other hand, improved effectiveness of utilization of the available resources, both tangible and intangible.

Hence the two basic objectives of sustainable development (KIEŁCZOWSKI D., 2009):

- ***intragenerational equity,*** which consists in striving for meeting the basic needs (food, accommodation, education, health care, social assistance, quality of the environment), reduction of poverty, meeting intellectual needs, preventing conflicts and protecting cultural variety of societies and support for their entrepreneurship;
- ***intergenerational equity***, which means the necessity of maintaining present natural capital for future generations through economical management of natural resources, maintaining equilibrium in the environment, recycling of the resources and respecting the prerequisites for economic growth through maintaining adequate proportions between consumption and investments.

Therefore, the principal problems of the sustainable development include: the problem of distribution of the resources among the contemporary generations in order for the development to be not only efficient but also equal and the problem of which principle of permanence to adopt for managing present natural capital. Therefore, it is important for the economy of sustainable development to consider the theory of public goods, characterized by the lack of opportunities for excluding them from consumption while they are not competitive in consumption (RANDALL G., HOLCOMBE R.G., 1997). With this approach, the public goods constitute the collective consumption of society, financed from public funds.

Business activity is, by its definition, aimed at earning profits while voluntarily adopting the principles of social responsibility and taking the action for their stakeholders and societies, approaching them as investments (rather than costs) that meet the expectations of all the parties interested in the achievements of the enterprise.

Investments in sustainable development contributes to reduction of progressing degradation of the environment, rationalization of consumption of natural resources, improvement in the effectiveness of production, improvement in the comfort of life, ensuring the needs for present and future generations and economic growth.

The need for changes in paradigms in management and reinforcement of the relations between the profit in the enterprise and social benefits is being noted by more and more business leaders who understand that an essential element in business strategies should be a dialogue with key stakeholders that allows for searching and implementation of solutions conducive to building permanent competitive advantage.

3. MANAGEMENT OF SUSTAINABLE DEVELOPMENT

Sustainable development has become a contemporary ideology, which is often used by politicians and ecological organizations, understood as a method for finding a solution and norms of human activity which allow for harmonious co-existence.

The corporate business responsibility (CSR) which, with respect to the enterprises is often associated with sustainable development, is understood and realized mainly as care for employees, minimization of the effect on the environment, responsible and ethical business behaviour with respect to business partners and responsibility for the effect on local society through support of its welfare and development [5]. Social responsibility is more and more often considered as the prerequisite for maintaining and creation of good reputation of the enterprise as one of its intangible resources that is becoming a particular resource in development and achievement of competitive position of the enterprise in the market [6].

Management of sustainable development, which in Polish enterprises is identified with social responsibility, largely depends on historical and economic development of Polish entrepreneurship and also on the presence of international corporations in the market, which use the concept of CSR and promote the idea of social responsibility and become an example of improvement in competitiveness through initiatives for the good of consumers and natural environment.

The modern and responsible business seeks synergy between economic, environmental and social aspects of functioning through building of a complex strategy of development based on CSR assumptions. The activities towards CSR also lead to achievement of political goals, such as more integrated labour markets, enhanced social cohesion, improved innovativeness and sustainable utilization of environmental resources.

One of the concepts of managing sustainable development is the sustainability management system (SMS), which might be either included in general system of management or perform an overriding function, including other systems of management. The SMS system supports and allows for active realization of the vision and strategy of the enterprise at the level of the elements of planning,

[5] Social business responsibility has been already discussed in ancient Vedic and Hindu texts which condemned usury; the Islam has Zakāt, which is the obligatory donation for the poor or needy. The problems of CSR were presented in the second half of the 20th century by R. Bowen in his book *„Social Responsibilities of the Businessman"*. The first commonly accepted definition of CSR was also developed by A. Carroll, pointing to economic, legal, ethic and philanthropic responsibility, later known as a CSR pyramid. Institutionalization of CSR occurred in the 90-ties of the 20th century with the emergence of such standards as ISO 14001 and SA 8000 and corporate governance codes.

[6] The World Bank, in its report for the Polish government, pointed to four key areas for effective implementation of corporate social responsibility i.e: integrated structure of management, plan of implementation with the indices and system of monitoring, involvement and education of employees, communication with key stakeholders.

implementation, verification of the effects and taking actions that ensure the consistency with primary plans, based on the concept of continuous improvement [7], (KRONENBERG J., BERGIER T., 2010).

The basic components of the SMS system, which occur consecutively and are in constant interaction, include the following phases:

- *vision,* which defines orientation of the enterprise and directions of its development,
- *program of sustainable development*, which is comprised of the policy and goals, means (for achievement of the goals), indices, responsible people,
- *implementation of SMS system,* which necessitates that all the stakeholders understand its usefulness and idea behind the implementation,
- *evaluation of sustainable development*, which verifies the achievement of goals,
- *innovation*, which relates to social and environmental aspects,
- *dialogue with stakeholders*, which represents a source of inspiration for innovation and analysis of risk in enterprise's operation,
- *reporting on sustainable development*, which presents the economic, social and environmental surroundings of the enterprise and reveals progress in the implemented projects and the goals achieved for the program of sustainable development.

The process of implementation of the principles of sustainable development in the enterprise should be initiated by the board of directors or owners in order to ensure an adequate allocation of human and financial resources while building the awareness of sustainable development in all the employees. It can be started with preparation of a report concerning a sustainable development, which encompasses, collectively, individual and often unrelated projects of the strategy, or with concentration on the activities on the environmental areas and management of human resources.

Implementation of the CSR concept by the enterprises that function within SME sector concerns the initiatives in the areas of social responsibility, oriented at those groups of stakeholders that the enterprise is constantly in contact with, i.e. customers, business partners or employees. Furthermore, the initiatives towards local society and natural environment are typically the domain of the bigger enterprises, which are usually much more efficient, especially in terms of external communication (BIEŃKIEWICZ M., 2008). The essential activities include those in the areas of development of human capital and any activity oriented at creation of an innovative organizational culture, which is supported by e.g. codes of business ethics or initiatives aimed at enhanced satisfaction and quality of life of the employees. Popular CSR activities of social character include: sponsoring of culture, education, sport, health promotion, combating pathologies and charity campaigns through donations of the products or services for the organizations or people in need.

Apart from the social aspects, a key importance in CSR is from protection of the natural environment. The most popular tools used in Poland are environmental management systems which are consistent with the requirements of ISO 14001 and ISO 22000 standards or registered in the EU's system of eco-management and audit named EMAS, which is a voluntary instrument which confirms continuous improvement in the ecological (environmental) efficiency in the enterprise [8].

The survey carried out at the request of Harvard Business Review Poland and CSR Consulting in 2008 demonstrated that, among 212 enterprises, the plan of actions in the area of CSR was declared by 32% of the respondents and only 7.6% of the respondents reported that their strategy of social

[7] PDCA (Plan-Do-Check-Act) Deming's cycle

[8] Other systems and standards for management of corporate social responsibility are also used, e.g.:
SA8000 **(** *Social Accountability 8000)* – the standard used for verification of the enterprises that consider social aspects in management and other factors that directly affect the stakeholders in a particular organization.
GRI (*Global Reporting Initiative*) – an initiative used for reporting in the area of sustainable development.
AA1000 – series of standards concerning the area of management of the process of cooperation with stakeholders, including three standards: AccountAbility Principles Standard, AccountAbility Assurance Standard, AccountAbility Stakeholder Engagement Standard).

responsibility is of comprehensive, holistic characters and relates to all the areas of business (GRESZTA M., 2008).

4. CORPORATE SOCIAL RESPONSIBILITY

Sustainable development means development which meets the needs of present generations without compromising the ability of future generations to meet their own needs [9].

Principles of the CSR concepts is best reflected by the standard (draft) ISO 26000 in terms of social responsibility, published in November 2010 by ISO (*International Standardization Organization*) [10], which is neither a form of certification nor obligatory regulations. The standard constitutes a practical guide of the concept of responsible business, which defines corporate social responsibility as: "*Responsibility of organization for the effect of its decision and activities (products, services, processes) on society and the environment".*

ISO 26000 standard distinguishes between the areas of social responsibility, presented schematically in Fig. 2.

Figure 2. Areas of corporate social responsibility (CSR) (according to ISO 26000).
Source: author's own elaboration based on www.odpowiedzialnafirma.pl

[9] Strategic documents concerning economic development of Poland, such as the assumptions for the National Development Strategy, National Strategic Reference Framework (which is a reflection of the goals of the Lisbon Strategy) and the strategy *Europe 2020*, encompass implementation of the standards of social responsibility.

[10] ISO 26000 standard defines that social responsibility means engagement of organizations in inclusion of social and environmental aspects in the process of decision-making and taking responsibility for the effect of the decisions and activities on society and environment**.** Furthermore, it clearly differentiates between the concepts, often used interchangeably, of 'sustainable development' and 'social responsibility'.

Sustainable development means a doctrine of political economy which assumes striving for the quality of life at the level which is possible with present development of civilization. The doctrine assumes that humans, with particular focus on the entrepreneurs, should, within their own businesses, take into consideration all the social, environmental and economic challenges. Awareness and balancing of these three areas is what determines sustainable development.

Social responsibility, on the other hand, focuses on organization rather than on the world. However, it is closely related with sustainable development since the objective of corporate social responsibility should be its contribution to this idea. Corporate social responsibility does not necessarily have to mean an additional cost factor in the enterprise. While becoming a strategy of business, it should constitute an efficient mechanism which generates the value added through stimulation of the innovativeness and building competitive advantages.

Among the characteristics typical of socially responsible activities in business are: consideration for ethics through honestly fulfilled commitments, using transparent business practices based on the respect for employees and society and achievement of a long-term profits while building and reinforcing the relations, continuing the dialogue with stakeholders, facilitating of the strategy of enterprise development, building strategies of competitive advantages in the market, based on ensuring a constant value, both for the stakeholders and other parties (KURASZKO I., 2010).

Current economic crisis should make enterprises re-evaluate their economic models in order to provide solid bases for re-building and future stable development. It opens up the opportunities for businesses: through implementation of CSR systems, they are able to gain new competitive advantages [11] that result from building strong relationships with stakeholders in order to strengthen their position in the market.

The benefits derived by the enterprises from socially responsible activities connected with implementation of the principles of sustainable development include (LULEWICZ-SAS A., 2011):

- *general business*, i.e. increase in the company value, improved reputation and relations with stakeholders, new business opportunities, fair competition, reduced intervention of regulators,
- *operational*, which encompasses enhanced quality, higher loyalty of employees and customers, higher innovativeness, safe cooperation with contractors, better risk control,
- *financial,* which concern cost reduction, higher incomes (prices), fast development (more stable results), lower costs of capital, better ability of acquisition of capital (higher attractiveness of the investors).

Furthermore, the business commitments that results from social responsibility include the following zones (GASIŃSKI T., PIEKALSKI G. 2009,):

economic: generation of the profits through offering goods and services with high demand in the market at the fair price,

legal: activities consistent with current legal regulations,

ethical: activities consistent with the codes of ethics in enterprises,

voluntary: they result from the good will of the managers and owners (e.g. sponsoring)

Development of the knowledge of CSR concept and consistent implementation of CRS systems in the enterprises justifies the notion of a considerable increase in awareness of Polish entrepreneurs regarding the ecological and social problems that are present in the contemporary economy.

5. CONCLUSION

The main idea behind sustainable development is harmonization of the environment, economy and society. Harmonization concerns the resources which are connected with these areas and represents a challenge that considerably relates to the entrepreneurs. A challenge for the international community is the necessity of protecting the environment both for present generations and for those to come (the principle of intergenerational equity). Therefore, the strategy *Europe 2020: A strategy for smart, sustainable and inclusive growth* adopted by the EU member states is aimed at creation of stable basis of economic growth that should make it possible to realize developmental aspirations of the society and ensure the competitiveness of the EU under conditions of globalization. This EU policy, which clearly points to the need for a transition towards the economy that efficiently utilizes the resources of the environment, substantially contributes to increased awareness of Polish society and

[11] In 2009, Warsaw Stock Exchange has launched first in Poland and one of the few indexes of responsible businesses in Europe, the RESPECT INDEX (which is an acronym from the pillars of CSR: *Responsibility, Ecology, Sustainability, Participation, Environment, Community, Transparency*). This initiative was aimed in particular at attracting interest of investors to the companies listed in the stock exchange, which, compared to other companies, are distinguished by their engagement in CSR activities.

Polish managers, institutions in business environment, trade unions, non-governmental organizations and public administration when taking measures to solve problems of ecological and social nature under conditions of developed market economy.

The enterprises which implement the principles of sustainable development and corporate social responsibility (CSR), emphasize voluntary actions that generate social, ecological and economic effects which often go far beyond mere legal requirements, aimed at seeking the most beneficial solutions not only to the enterprise but also to its closer and further environment. These activities contribute to: promotion and demonstration of a positive reputation of the enterprise, higher effectiveness of employees and active cooperation with local society.

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CORPORATE SOCIAL RESPONSIBILITY (CSR) STRATEGIES IN THE POLISH WOOD INDUSTRY

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ABSTRACT

At present there is enormous growth of public concern about the natural resources with the special interest in world's forest[1]. The wood sector similarly to other natural sectors such as mining or petrol, is under serious public scrutiny. This is why, the main purpose of a paper is to approach theoretically to the corporate social responsibility (CSR) strategy in the wood industry taking into consideration environmental, legal and ethical, as well as social points of view. Referring to the latest researches and literature in the CSR field the paper formulates a recent understanding of the importance of the CSR for the wood industry. The second purpose of the paper is to analyse chosen case studies how CSR strategy is implemented and practiced by the Polish companies in the wood sector.

The research suggests that CSR strategies should be implemented in the wood sector. The study also discusses what is required for such CSR strategy to be effectively implemented in order to improve corporate responsibility performance of organizations.

Key words: corporate social responsibility (CSR), timber, wood industry

1. INTRODUCTION

The idea of social responsibility is gaining a constantly increasing of both researchers and practitioners attention. Corporate social responsibility (CSR) is defined in a variety ways and many subjects such as ethics, economy, management, sociology, make crucial impact on the development of this field. The literature review shows there is no one broadly accepted definition, despite the wide global debate on corporate responsibility and importance of the wood industry. Bożena Klimczak(2006) stresses that social responsibility understand as accountability for all consequences of activities touched so- called third persons, comes from the social will for companies to practice business in a particular manner. Moral evaluation of business activities is done by the stakeholders[2] Although one may notice that many approaches, researches and concepts are evidence of a new theoretical and practical discipline emergence.

Elisabet Garriga and Domenec Mele classified four groups of CSR theories (Garriga, Mele, 2004). The first group of theories is called instrumental theories, because they understand CSR as a means to achieve economic objectives. Such an approach is rooted in the Milton Friedman view that the only responsibility of a company is maximization of profits. The second group of CSR concepts is connected with society and they stress tied connections between business and society. The authors called them as political theories because they emphasize certain social cooperation. The third group was named as integrative theories. They try to analyze how business integrates social demands, how

[1] See: CSR Case Study: Weyerhaeuser. A legacy of acting responsibly. Government of Canada.
[2] B. Klimczak: *Etyka gospodarcza*, op. cit. s. 68 - 72

corporate management integrates social values into business. The fourth group of theories is in fact the oldest ones. They understand the CSR idea as the ethical approach to business. They focus on the ethical requirements between business and society. Concluding the authors of the CSR typology suggest that all those approaches reflect four aspects of of corporate social responsibility: economic, political, social and ethical.

Considering this methodology and the concept of Archie B. Caroll[3] it can be concluded that to understand how the CSR idea is practiced an analysis of the four level should be accomplished.

Table 1. Four levels of CSR analysis (12 pt, normal, align left)

LP.	Levels	Indicators
1.	Economic	Profits, shareholder value,
2.	Political	CSR strategy, contracts with stakeholders, corporate citizenship
3.	Social	Public responsibility, corporate social performance
4.	Ethical	Values, norms, code of conducts

Considering those four levels of CSR the wood industry in Poland may be examined.

2. TIMBER INDUSTRY IN POLAND – AN OVERVIEW

Sold production and employment in the global timber sector in Poland is within the limits of Euro 18.8 billion which represents 8.8% of total production (compared to 6.4% in the EU). The timber sector employed 335.6 thousand of which represents 13.7% of all employees (compared to 9.9% in EU). It is worth noting the fact that the timber sector is divided into a number of key industries such as furniture, manufacture of wood products, manufacture of lumber or other wood materials. In each of the branches there are reported large variations in size of the enterprises, which has a significant impact on the introduction of sustainable development policy.

Poland is among the largest exporters of furniture in the world keeping the 4th place after China, Germany and Italy. In 2010, wood products exports stood at EUR 5.6 billion. There have been sent abroad 2.5 million tons of cabinets and TAPI darned. Balance of 2010 year's trade balance for this category is 19.5 billion PLN. Prospects for the furniture industry, both in the production of the country, and exports continue to be promising. However, Poland is followed by Canada, the USA and Mexico. The situation is even more dangerous, because in the furniture industry on a global scale Poland is at the 10th place.

Such a good Polish position in the timber industry may be maintained only by continuous industrial upgrading through the introduction of innovative technology solutions and through new strategies which will meet social requirements such as social responsibility. In 2007, Poland produced 8.5 million m3 of wood-based panels, which accounts for 12% market share of all EU member states and puts our country in second place (the Germans) in Europe. Plant timber industry are rapidly down to the wood industry sector in Poland. What is more there are several rapidly growing companies, plywood and other wood based products. The research conducted on innovation development of

[3] A. B. Carroll, *The Pyramid of Corporate Social Responsibility: Toward the Moral Management of Organizational Stakeholders*, "Business Horizons", July-August 1991

enterprises indicate the potential for the deployment of new solutions tailored to the needs of both customers and the competitive situation on the market.

The competitiveness of Polish industry, wood materials is also important in the global dimension, as evidenced by the global ranking classifier Poland in the third place among manufacturers of fibre porous and in the sixth place among manufacturers of chipboard and hardboard. Not without significance is trade Polish wood sector with foreign countries. Positive aspect for many years the balance of trade in timber from other countries is extremely beneficial for the Polish economy (in 2008 the surplus of exports over imports amounted to about 18 billion PLN). Export of materials and products of wood comprises 10 % of its total value. Of the total production of wood based panels 28 % goes to foreign markets - of which 79 % to EU countries. Maintaining such a situation will depend also on the action of ecological competition by entering the process of implementing sustainable development. H. G. Adamkiewicz - Drwiłło and H. Kruk define the ecological concept of competition as companies adapt to market conditions related to the ecological behaviour actors such as producers or consumers and benefit from actions taken for the natural environment (Adamkiewicz-Drwiłło, Kruk, 2010, 18). Enterprise sector of the described activities are increasingly using environmental competitiveness through the introduction of modern technology. An example would be converting paint fumes from the factories of furniture to heat, thus reducing not only cost the company, but also affects the growth of ecological awareness. The implementation of this process certainly support two major initiatives:

1.The use of environmental management system - ISO 14001 or Eco - Management and Audit Scheme - companies trying to improve the business environment and publish the so-called. Environmental statements;

2. Implementation of action programs for environmental pro - Clean Production Program (Cleaner Production - CP) Responsible Care Program (Responsible Care - RC).

In both initiatives the companies declare their adherence to the implementation and declare their acceptance of responsibility for its products, analysing them in the entire production cycle. Economic policy environment will likely be implemented by the company if they specify the sequence of actions conducive to the process. There are at least three fundamental tasks of eco-economy:

1. Determine the size of damage which is a result of deterioration of the environment caused by the company activities;
2. Establish the economic consequences of the damage incurred;
3. Developing methods for charging external costs of producers and consumers of the good.

Another way how companies reveal their engagement in sustainability issues is a CSR strategy. Although the brief recognition of evidence for social responsibility activities revealed that despite the fact that the timber industry is under sustainability pressure and many non-government organizations try to control this sensitive industry, Polish companies do not pay intense attention to the responsibility and sustainability. Review of the CSR activities of the companies submitted on the Warsaw Stock Exchange shows that the Polish timber industry does not perceive the sustainability as its major objective. According to the findings done by Toppinen (2010) and L'Etang (1994) who argue that the companies rather respond to external pressures than undertake proactive strategies, it should be highlighted that in the Polish case the situation is even worse. The companies accept only legal requirements and standards. None of the companies submitted on the WSE has any CSR report. It may mean that they do not know the idea of CSR reporting which allows to recognize the key areas of economic, environmental, social and governance performance.

3. CSR AS A COMPANY STRATEGY – CASE STUDIES

Technologies for environmental protection will not be effective if the company does not engage their employees. Employees in the company SWEDSPAN Poland, in Orla, participate in individual training programs, such as engineering and technical training, as well as health and safety and

management. Proper training of employees allows for efficient handling of machinery and equipment, as well as conducting regular maintenance or repair of equipment, so that, inter alia, it is possible to reduce the amount of waste generated in the production process. Pro-environmental solutions used in the company have also helped to reduce the noise level, and beyond that allowed to reduce the formaldehyde content in the final product, which will improve public health, causing widespread acceptance among employees and demonstrating care of the people employed in it.

An important role for the company SWEDSPAN Poland plays a co-operation with the local community. The company is actively working with the authorities and organizes meetings with residents of neighboring towns. The local population appreciates the friendly attitude of the plant into the environment, as well as unobtrusive neighborhood, and stresses its positive impact on the economic development of the region of Podlasie. The company SWEDSPAN Poland employs 250 people, and the vast majority, as many as 90% of these are the region's inhabitants. The production plant also supports the development of small and medium-sized enterprises that provide a variety of services on its behalf.

Indirect benefits are mainly sales, purchase and primary production costs reduction and also increase of production and productivity. The plant uses intelligent production supervising system. It allowed it to maintain transparency of costs and to optimize the use of raw materials, production processes and working hours. This enabled the introduction of the production plan dependent on customer orders. Relevant element of this system is automated logistics, including automated high-bay warehouse.

In 2010, Polish Agency Of Information And Foreign Investment considered the venture of SWEDSPAN company, in Orla, with a value of 140 million Euro , Poland's largest foreign direct investment in Poland. Respect for the environment is one of the core values of this company.

Table 2. Four levels of CSR strategy in SWEDSPAN Polska

LP.	Levels	Indicators
1.	Economic	Reducing costs of production, transparency of costs
2.	Political	Environment strategy,
3.	Social	Corporate social performance, active role in the social environment in Orla
4.	Ethical	Values, norms, code of conducts

"Fabryki Mebli FORTE" (Furniture Enterprise FORTE) is another example of the timber industry company operating in Poland. This organization is listed on the WSE and due to its obligation needs to introduce "The Best Practices of WSE Listed Companies" and current corporate governance initiatives. Corporate governance is a set of rules of behaviour addressed to companies' bodies and members of such bodies as well as majority and minority shareholders. Corporate governance rules concern broadly understood corporate governance practices. CSR activities are voluntary this is why organizations do not feel obligated to undertake more than those demanded by the WSE requirements.

FORTE started its operation in 1992 and now is one of the leading Polish producer and exporter of furniture. The main strategy objectives are focused on customers' needs and expectation as well as on contemporary vogue in the sector. As stated on the company website customer is in the center of attention, this is why the firm introduced a quality management system from the designing phase to client service. Much of the company's resources are put into knowledge development and the newest technology. One of the most important strategy elements is the corporate governance regulations what

allows the firm to be listed on the stock exchange. The company declares its permanent improvement and focusing on progress and enhancement.

The company was awarded by some of business honor prizes, some of them slightly touch the idea of CSR. There are no any reward for social and environmental responsibility. What means that the company does not meet sustainable requirements and expectation.

Table 3. Four levels of CSR strategy in FORTE

LP.	Levels	Indicators
1.	Economic	Financial reports published on the website
2.	Political	No
3.	Social	No
4.	Ethical	No

4. CONCLUSIONS

In current age of globalization Corporate Social Responsibility is one of the most important aspect of every business. This paper has examined responsibility of the Polish timber industry considering two case studies. This study discloses the lack of significant CSR strategies in this sector. However, these findings are subject to the limitations of this study and sources of research. As CSR rating data were taken from secondary source, therefore accuracy of rating depend on the data source, in this study it was website of the companies. On the other hand, internet is the main source of information for many of stakeholders this is why company website should be treated as a reliable sources of information, especially in the CSR field.

There is much to be done in the wood industry in Poland when deliberating corporate social responsibility. The two cases illustrate that apart from economic as well as legal responsibility the other three levels of CSR are poorly covered by the wood firms. There can be many reasons of such a situation. Firstly, being sustainable and responsible is a voluntary obligation for contemporary firms. They are rather co-operators who demand a report on sustainability, rather than clients, who still expect reasonable prices, not responsibility. Secondly, economic and financial crises still touches the industry and timber industry is not an exception. Thirdly, corporate social responsibility is perceived as a cost not investment by shareholders and shareholder value maximization is the unbeatable reference for corporate decision-making. The timber industry in Poland suffers all of these circumstances, nevertheless CSR challenges leaders of the timber industry to think about this business in terms of responsibility and sustainability.

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CHAPTER 3

QUALITY, PRODUCTION AND INNOVATION

ENGINEERING APPLICATIONS OF WOOD WITH REFERENCE TO PROTOTYPE MANUFACTURING USING RAPID PROTOTYPING TECHNOLOGY

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ABSTRACT

In today's era products with outstanding quality, reliability and functionality, satisfying a market niche are prerequisites for a successful organization. Elimination of wastes has become industry standards with a greater emphasis on rapid product development. Continuous research in a quest to attain increased accuracy, shorter build times, use of a range of materials, increased functional efficiencies with critical part geometries and complex assemblies has led to great improvements in process technology and in turn generated the demand of more sophisticated prototypes. A prototype provides a physical and tactile feel of the product and serves the purpose of clear cut communication and interaction not only within the industrial floor but also with the management and the clients. As prototypes play a vital role in design and development cycles and are used in the thinking, planning, experimenting, testing, proofing and learning processes, advanced techniques to generate reliable prototypes from efficient materials has always been a matter of keen interest. In this impatient and fast moving global market industries employing advanced technologies for prototype manufacturing using proficient materials are holding the key to be in pace and overcome the challenging competitions.

The paper deals with the advantages of wood as a competent prototyping material for the innovative Rapid Prototyping Technique (RPT) used to fabricate the intricate component geometries.

Keywords: Wood Prototypes, Rapid Prototyping, Alternative Prototyping Materials.

1. INTRODUCTION

Prototyping is an activity with the purpose of creating a manifestation that, in its simplest form, filters the qualities in which designers are interested, without distorting the understanding of the whole. The best prototype is one that, in the simplest and the most efficient way, makes the possibilities and limitations of a design idea visible and measurable. Prototypes are filters that traverse a design space and are manifestations of design ideas that concretize and externalize conceptual ideas [1,2]. With the increasing demand of diversified products the product development cycle is getting compressed day by day which in turn has increased the pressure on the product designers to generate fast and reliable products with refined forms and functions. Generation of prototypes at a faster rate has gained vital importance. The pressure of the international competition and market globalization has generated a driving force in the industry to deliver high quality products with reduced manufacturing time and cost rendering the conventional machining methods obsolete as they are characterized by long lead times and high cost. The conventional material removal processes used for prototype manufacturing fall short in terms of time and cost to meet the challenges of the rapidly changing market. Moreover it becomes

difficult and cumbersome to fabricate the prototypes of complex and intricate geometries by traditional manufacturing methods. Comparatively Rapid Prototyping Technology (RPT) has proved to be an efficient tool in prototype fabrication. It is a technology that directly transforms the digital designs into three dimensional solid objects without the drawbacks of conventional machining. The capability of producing complex geometries in minimum time and cost frame is remarkable. The technology is significant but suffers from high cost of the raw material used for fabrication. It is proposed to use wood as a raw material for prototype fabrication through RPT to exploit the multiple advantages in terms of low cost, profuse availability and induction of a sustainable and eco-friendly material in the product development cycle. Efforts are taken by M. S. Wahab et.al (2009) [3] and Julien et.al (2010) [4] in this direction with quite satisfactory results.

2. RAPID PROTOTYPING TECHNOLOGY

RPT enables engineers to create prototypes that perfectly reflect their design intent and identify problems that can easily be missed only by a CAD model. It is an additive manufacturing technique in which high quality solid models are built overnight instead of taking weeks or months without the complications of NC programming and jigs and fixture designing (U. Chandrasekhar. 2011)[6]. Many researchers all over the globe are contributing towards the development of this technology and exploring its advantages. Generally all rapid prototyping processes are based on layered manufacturing methodology, in which objects are built as a series of horizontal cross sections, one layer at a time, each being formed individually from the relevant raw materials and bonded to proceeding layers until it is completed. The main stages of the process involved in component fabrication are common to most RP systems but the mechanisms by which individual layers are created depend on the particulars process.

2.1 Fundamentals of a Rapid Prototyping

A number of techniques are developed in the market for Rapid Prototyping but irrespective of these techniques the basic methodology adopted by the various RP systems is same and is sequentially described below

2.1.1. CAD Modeling

RP systems receives input in the form of electronic information describing the 3 three dimensional physical aspects of the object. 3D geometric model of the prototype to be manufactured is built using various advanced CAD software. The advantage of the 3D geometric model is that the engineers from various sections of design manufacturing and sales can concurrently work together to develop better products. The digital model can be built by CAD software or through reverse engineering in which the data points of a actual physical model are captured using Coordinate Measuring Machines (CMM's) or laser digitizers. It should be seen that the model is represented as closed surfaces which define the enclosed volume ensuring that all horizontal cross sections are closed curves to create the solid objects.

2.1.2. Data Conversions in required format

A standard interface is needed to convert the CAD geometry in a RP system readable format which is generally the STL (stereo lithography) file format. Generally all the CAD-CAM suppliers supply the CAD-STL interface and conversion of the CAD data to STL format is a simple and fast exercise to be executed. The STL data transmission can be carried out through e-mails or local area network.

2.1.3. Model Analysis and Repairs

Errors in the CAD model and an improper CAD-STL interface can lead in generation of faulty STL files. As the STL files do not contain any topological data and the commercial tessellation algorithm used by many of the CAD developers is non robust, the created polygonal approximation models exhibit errors in the form of gaps and over lapping facets. The possibility of generation of an invalid STL file because of the problems associated with tessellating trimmed surfaces, surface intersection, complex grooves, etc. makes it necessary to conduct model validity checks to ensure that the model is fit to be sent to the RP system for manufacturing. Generic solutions are developed to repair the abnormalities of the invalid model. After the model validity test the preparations for fabrications of the part is carried out. Decisions regarding the build orientation, spatial assortment and support structures are taken. Various software with on line graphical aids to orient and move the model in suitable positions for ease in manufacturing are developed.

2.1.4. Fabrication

The model is then set for fabrication of the component which is generally an automatic process. Before starting the building process it is ensured that the trays of material cartridges of the part material and the supporting material are inserted into the machine. The fabrication process is then started with the building time extending upto several hours depending upon the size of the object. The RP systems are equipped with alert systems to inform the operator regarding the completion of fabrication process.

2.1.5. Product realization and finishing

This task involves realization of the physical product and carries out the final finishing activities to bring the product in a usable form. The product is first cleaned to remove the excess material lodged in complex contours and blind holes followed with removal of supports. Special solvents are used to clean the products. Post curing is carried out especially in liquid based RP processes. Further the machining processes such as drilling and milling are carried out to add the designed features to the product followed with final finishing such as emery polishing and painting to enhance the surface finish of the product.

There are several RP systems available in the market and are generally classified in three classes on the basis of the form of the material initially used for building the prototype or the component.

2.2 Classification of RP Systems

2.2.1. Liquid Based RP System

The Liquid based RP system generally build parts using liquid resin with photo curable properties that cure or solidify when exposed to light usually in the UV range. The part is manufactured in layers in which slices of liquid resin are laid and allowed to cure by exposing them to the light one after another until the complete part is manufactured. Various liquid based systems are developed depending on the types of liquid resins used, types of light or laser used and methods of scanning or exposure employed. Stereo lithography Apparatus (SLA), Polyjet Rapid Prototyping, Solid Creation System (SCS), Solid Object Ultraviolet laser Printer (SOUP), Per factory Rapid Prototyping and Solid ground curing (SGC) are some of the commonly used liquid based RP systems.

2.2.2. Solid based RP system

The Solid based RP systems use the build material in solid state in various forms like rolls, wires, pellets and laminates. Solid based RP systems manufacture the components either by melting and solidifying or fusing method or by Cutting and Joining method. The Fused Deposition Modeling (FDM), Multijet Modeling System (MJM) and Laminated Object Manufacturing (LOM) system are the commonly used solid based RP systems.

2.2.3. Powder based RP system

These systems use the build material primarily in powder form to manufacture the prototypes. Multiphase Jet Solidification (MJS), Selective Laser Sintering (SLS), Three Dimensional Printing (3DP) and Laser Engineered Net Shaping (LENS) are some of the commonly used powder based RP systems. The systems are similar to Liquid based and Solid based RP systems with a distinct feature that the material used is invariably in the powder form.

3. WOOD BASED RPT

3.1. Advantages of wood as a raw material for RPT

Various types of resins and thermopolymer materials are used in liquid and solid forms as a raw material. The high cost of these raw materials is the major problem with the current RPT. The cheapest material currently available is for Laminated Object Manufacturing (LOM) which is about 9.63-17.08 USD per kg while the most expensive material is for StereoLithography Apparattus (SLA) and Fused Deposition Modelling (FDM) available about 250-458 USD per kg (CHEN Jing. 2012)[7]. Furthermore the high cost of the equipments and operations is another associated deficiency. It is proposed to use wood powder as an alternative raw material for its low cost and eco-friendly nature. Wood supports both in compression and tension .It is capable of being easily combined with other materials to create hybrid alternatives. Induction of wood shall allow a sustainable material to be introduced in the product development cycle. Wood is a biodegradable organic material and can be looked upon as an environmentally responsible alternative with multiple advantages over the other raw materials used for prototyping. Procurement of wood is less polluting than extraction of other materials [4]. The transportation is risk free with copious supply in all types of market irrespective of their location. Manufacturing of wood powder requires less energy and water than other non sustainable materials hazardous for our ecosystem. The wood energy is neutral in CO2 production. Also any material that can be recycled and has less commercial value can be crushed or fiberised to be combined with wood powder to give reconditioned wood flour. The techno economic value of wood makes it a suitable alternative as a RPT raw material. There are many species with different qualities and appearance with teak wood being the most preferred choice. Teak tree can reach in ideal circumstances, a height from 40 to 50 meters, with a trunk useful from 20 to 30 meters. These trunks are of cylindrical form and reach a diameter up to 1,5 meter. Every year the trunk diameter approximately grows by 2 cm. Teak is fatty and rich in natural oils and always allows a very smooth completion. Teak is extremely water resistance with minimum moisture content and safe for any climatic conditions. It does not support rust or corrosion when it is in contact with oxydable metals[8]. Balsa and bamboo are also recommended for prototype fabrication.

3.2. Experimental Equipments and Methodology

3.2.1 Sequential Operations:

The various sequential operations to be carried out for the prototype fabrication are listed below.

1. Development of the CAD Model of the component.
2. Generation of the STL file.
3. Analysis of the STL file for errors and further corrections.
4. Input to the RPT machine and fabrication of the model.
5. Preperation of the wood based raw material
6. Ejection, Cleaning and Inspection of the model.
7. Final metal component casting using RPT models as master patterns.
8. Inspection of the final metal prototype.

The flow chart below shows the sequential operations while the figure (2) shows the CAD and STL files of some aero gas turbine components ready for prototyping.

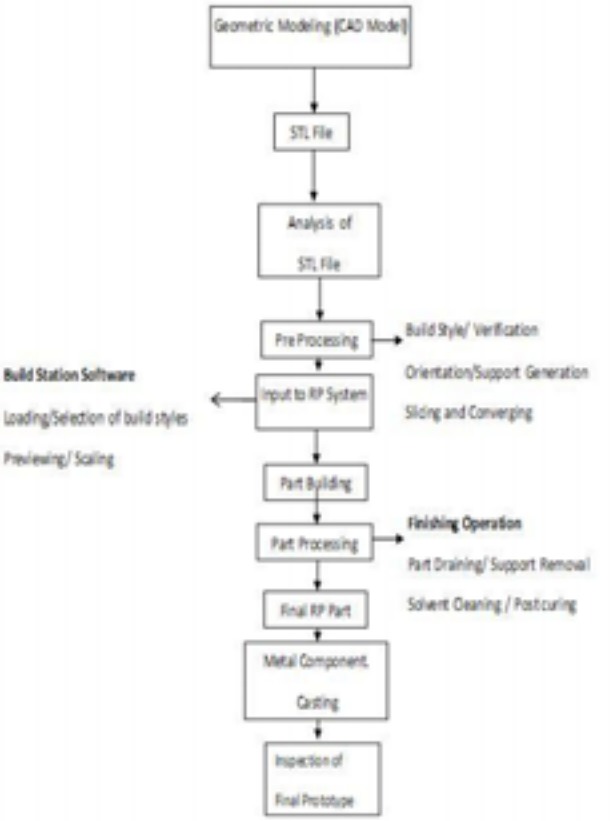

Fig. 1. Sequential flow chart for conversion of a CAD model into solid 3D object using RPT

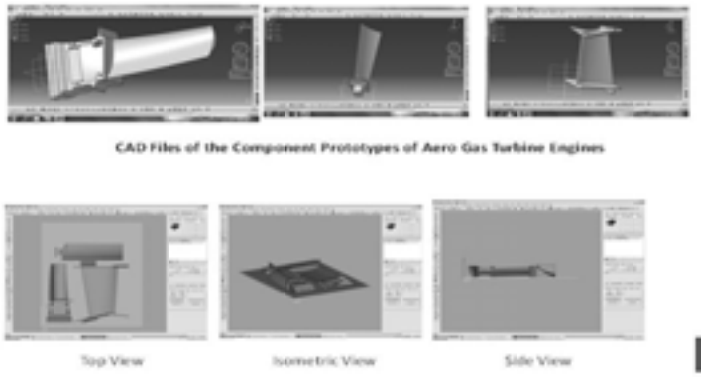

Fig. 2. STL Files of components Oriented to be fabricated in RPT domain

3.2.2 Preparation of wood powder and pulp

The specific wood powder is to be used by the 3D printer has to be prepared. Primarily the wood powder of the required type of wood can be collected from the wood powder collector of any wood processing factory. The powder has to be chemically treated before using it for the RP process. The moisture contained of the powder should be reduced by curing it in a laboratory oven up to 60^{o} C for around 6 hours. M.S.Wahab et al[3] have analysed that a composite material with equal volume s of wood powder and external additive like the commercial ZP102 can be directly used in present 3D printing machine. The material is properly sieved with mesh sized about 100μm and then fed to the 3D printing machine.

Literature reveals that various modified starch can be used along with the wood powder to obtain a homogeneous and isotropic material with improved viscosity and binding property to work at temperatures at which the deposition modeling process operate. A wood pulp of beech flour, ether starch prepared with demineralized water serves as a better feed material. Julien et al[4] have analysed that for a grain size of 40 μm a paste of 24.64g of beech flour and 40g of ether starch mixed with 246.46ml of water has a better stability with minimized crumpling while deposition.

3.2.3. Manufacturing process:

1. 3D Printing :

The 3D printing process like all other RP systems build parts in a layer by layer process using the CAD solid model data. It uses liquid binders to solidify the powder layers to build the prototype. The process starts with depositing a layer of powder on the build piston. A printer then deposits the binder solution on the powder in the area defined by the sliced CAD geometry gluing the powder together and forming the first cross section. The surrounding powder remains loose and supports the fabricated layers. After binding every layer the build piston is lowered for the deposition of new layer of powder over the previous one and the process is repeated until the prototype is completely manufactured.

Fig. 3. 3D Printer[9]

2. Deposition Modelling :

This is a layer manufacturing technology in which the material in the filament form is heated in an extrusion head to bring it in a semi-liquid state. It is further extruded through a nozzle and deposited in form of very thin layers. The material solidifies as it ejects from the head owing to the atmospheric air maintained at a temperature below its melting point. The layers are generated following the defined tool path to develop the required component surface profile. The flexural modules of the material, viscosity, ejection speed, flow rate, surrounding temperature component size and geometry are the important parameters that define the system performance. The process allows the induction of wood pulp as an initial development towards manufacturing of composite wood based prototypes.

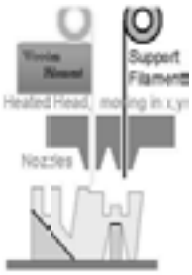

Fig. 4(a). Schematic view of deposition modelling

Fig. 4(b). Deposition modelling machine

3.2.4. Final prototype analysis

The final prototype can be checked for its mechanical properties, surface quality and accuracy. The prototype when tested on a 12 KN load cell of an UTM shows that increase in the proportion of wood powder above 45% in the proposed composition of wood powder and ZP102 decreases its strength and elongation. Furthermore the increased in proportion of the wood powder increases the hardness of the specimen but leads to a reduction in dimensional accuracy. The addition of wood powder in the composition decreases its surface quality which can be further improve by using a more smooth powder (below 100 μm) with more solid form instead of fibers. Specimens manufactured from the wood pulp prepared in combination of modified starch shows that the strength increases with more flour and less water contain. The mixture of flour, starch and water has to be properly optimized. It should be noted that starch is sensitive to humidity and its mechanical properties decrease with increase in the moisture.

3.2.5. Final metal prototype casting

The metal prototypes required for experimental testing were manufactured using investment casting processes. The precision moulds used for investment casting are made from RP components using them as master patterns. The wax patterns further required for investment casting are formed by injecting liquid wax in the precision molds. The wax pattern is then dipped in slurry of ceramic compounds forming a relatively strong investment shell. The process is repeated until the shell gains adequate strength after which the inner wax pattern is melted away forming a ceramic cavity. The ceramic shell is then used to cast the component by pouring the molten metal in it. The shell is further cracked and the component is removed out of it for further finishing processes. The accuracy of the wax patterns in turn determines the accuracy of the final component. Also it is necessary to control the injection parameters like the injection time, injection temperature and holding time to avoid problems like abrupt shrinkages and cavitations.

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ENTERPRISE CONTENT MANAGEMENT SYSTEM (ECM) AS AN AUXILIARY TOOL FOR IMPLEMENTATION OF ISO 9001 STANDARD

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ABSTRACT

Key words: ISO 9001 standard, documentation, ECM, wood industry

1. INTRODUCTION

The standard ISO 9001 Quality management systems – Requirements was developed by International organization for Standardisation, ISO. ISO is the largest and certainly the most recognized organisation for standardization. It consists of network of national standard bodies from 163 countries with headquarters in Geneva. This nongovernmental organization is a link at the global level between the public and the business sector. It enables implementation of solutions that meet the needs of the economy and the broader needs of the society. The series of standards of the ISO 9000 family covers the area of quality management. Today, business at the global market in accordance with the ISO 9001 standard and ISO certificate holding is recognized as a characteristic of reputable organizations and institutions oriented towards continuous improvement of working methods and its outcomes. The Standard describes requirements that organization must meet if it wants to demonstrate to the customers, service users, and to everyone with whom they collaborate that the quality is managed in accordance with the internationally recognized standard. Holding ISO certificate has been recognized as the key to success, but carries with it variety documentation that is difficult to monitor without extensive organization of business operations. The standard prescribes way of managing documents and records that must be predetermined and regulated with the documentation procedure. With the development and application of computers the amount of documentation that is required for the implementation of ISO quality management system can be significantly reduced. The documentation management in electronic form with defined procedures provides fast and efficient management of ISO 9001 system (Džambas et. al., 2010). By using of Enterprise Content Management System (ECM) implementation of quality management system can be easily carried out. Nowadays ECM systems combine: Document management (DM), Web content management (WCM), Collaboration, Records management (RM), Image management, Content Management Interoperability Services (CMIS), Content Platform and

Repository. One of the most important parts of the ECM is a Document Management System, which is used to manage documents, classification, store and retrieval of the document, version control, access control and security. The system includes the whole document lifecycle, which consists of creating, approving, monitoring, versions and modification through to archiving. The documents can be in different forms: Excel sheets on daily production output, Word documents - records on training of employees, scanned documents.

2. REQUIREMENTS OF ISO 9001 STANDARD

According to the latest annual ISO survey, currently ISO 9001:2008 is implemented by over million organizations in 180 countries (ISO Survey, 2011). Organizations that are certificate holders prove the competence in providing of quality that satisfies the customer. ISO 9001 standard raises many requirements on the organizations that want to implement it in their business. Family of ISO 9000 consists of the following standards:

- ISO 9001:2008 - Quality management systems - Requirements;
- ISO 9000:2005 - Quality management systems - Fundamentals and vocabulary;
- ISO 9004:2009 - Managing for the sustained success of an organization - A quality management approach;
- and in addition ISO 19011:2011 - Guidelines for auditing management systems.

Required documentation that is defined by ISO 9001 standard, section 4.2 includes:

- Documented statements about quality policy and quality objectives;
- Quality System Manual;
- Documented procedures and records;
- The documents, including records that the organization has determined.

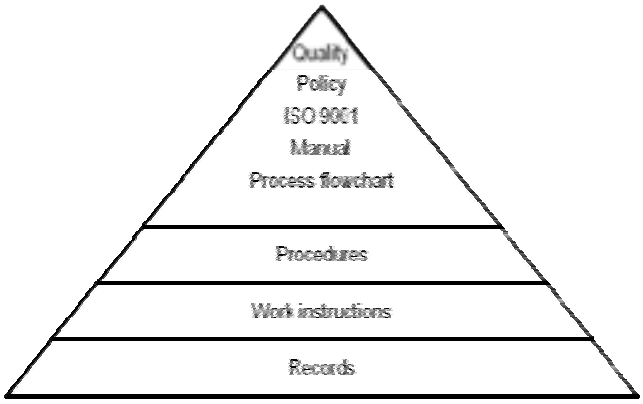

Figure 1. ISO 9001 documentation pyramid

Essential document of quality management system along with quality objectives and quality policy that is located at the very top of the documentation pyramid is a quality management system manual. It must include the scope of the quality system, process descriptions and clarification of omission organization's segments, documented procedures and descriptions of interactions. Mandatory procedures required by this international standard are: Document Management, Records Management, Internal Audit, Nonconformity management, Corrective action and Preventive action. In addition to these six mandatory procedures, the standard requires 21 records.

3. ENTERPRISE CONTENT MANAGEMENT SYSTEMS

Management of documentation, data and organization's business information has become one of the most important conditions for achieving of modern management. Content can be any unit of digital information (Milenković, 2011). Information can be in the form of text, image, flash animation, e-mail messages, video/audio file, blog, etc. According to AIIM (Association for Information and Image Management) definition of Enterprise Content Management (ECM) is as follows: EMC are the strategies, methods and tools used to capture, manage, store, preserve, and deliver content and documents related to organizational processes. ECM tools and strategies allow the management of an organization's unstructured information, wherever that information exists. Broadly speaking, the content management system is a software product that provides support for the implementation of the processes and workflows specified in the definition of content management (Horvat, 2011). Using a content management system any content can be saved, and the access is enabled in a very short time over the intranet or Internet.

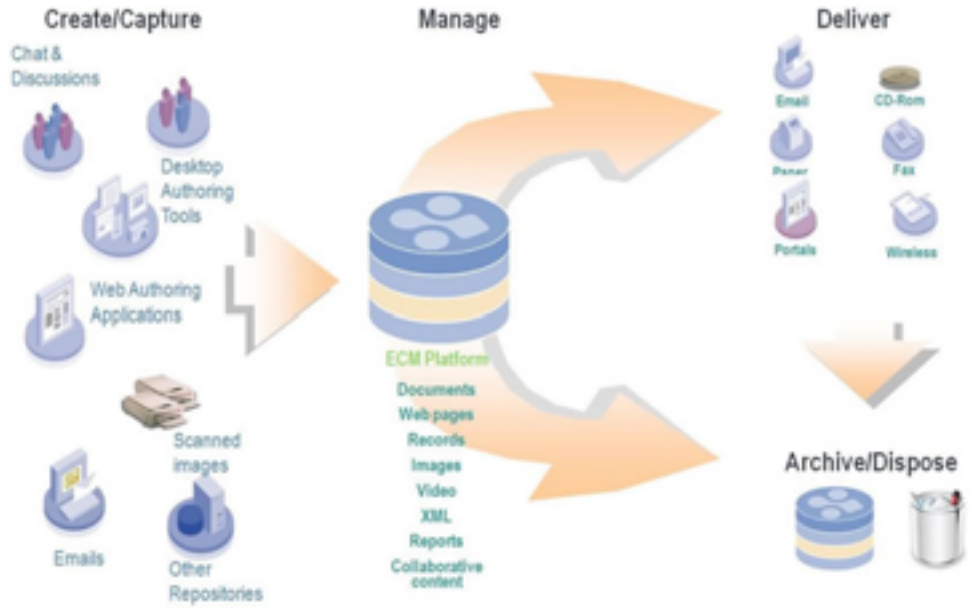

Figure 2. Enterprise content management scheme (source: http://www.mola-mola.hr)

Empirically speaking, wood processing and furniture manufacturing sectors are using less of modern business tools compared to other industrial sectors. Furniture industry is at a higher business management level compared to primary processing. Those companies with systematic content management system use intranet or Internet applications that provide access to information from different locations.

ECM systems are relatively expensive, but for adequate use ECM have to be implemented in all segments of organization. It is impossible to maintain of product quality without any costs, and without adequate quality it is difficult to retain the costumers (Pervan et al., 2013). The main reason for implementation of such system is easier access to information. According to Gartner's research (2012), currently the leading vendors of commercial content management systems are: IBM, Microsoft, Oracle, Open Text, Hyland Software and EMC Corporation. Alfresco is the only open source system that

continues to be competitive with exclusively commercial systems. The aforementioned research included all vendors who have at least $10 million in total annual content management software revenue. The documentation that is required to fulfill the ISO 9001 requirements, and which is implemented through ECM must meet the following conditions:

- The possibility of approval documentation before distribution;
- Documents are periodically reviewed, updated and re-approved;
- Document's valid version should be available to all users;
- Current / valid version of the document should be evidenced;
- Documents from external sources must be identified, controlled and reviewed;
- Prevention of accidental / unintentional use of obsolete documents;
- Maintain the usability of the document.

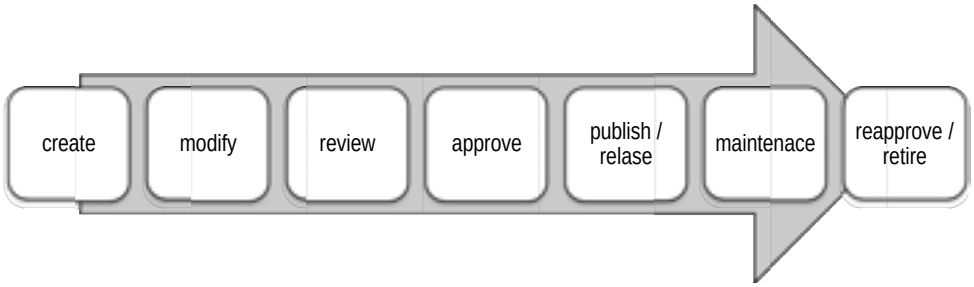

Figure 3. Documentation life cycle

According to the current version of ISO 9001 standard all documents must be approved before use. There are two ways of approving documents: serial and parallel. For example, document approval from sawmill processing such as work instruction for band saw workers. First, assignment of responsible person for development of work instruction and work deadline is determined. In this case, responsible person is assistant of sawmill manager. If serial approval of document is carried out, then the first approval is given by the shift supervisor, after which approval is given by primary production manager, while the last approval is given by the quality manager. Any disapproval at any level document is returned to author for review. In the parallel way of approving all persons responsible for approving receive a request for review of documentation all at the same time. If doing so, the rule could be introduced that all approval are not needed in approval process. So it can be introduced a rule that for the approval of the work instruction for the band saw is enough to have two authorization, but it must be approved by the quality manager.

In the case of paper documents, they are usually approved by signature of authorized person. When document is approved, it should be ensured that approval is not assigned to a large number of persons and thus extends the duration of the approval process. So it is enough to approve work instructions for classification solid wood boards by the person responsible for primary processing. The involvement of larger number of persons can complicate and prolong the approval process. The Standard also requires that documentation is reviewed, updated if necessary, and then must be re-approved. Any change in processes requires update and re-approval of documents. Using a content management system valid electronic version of the document automatically is forwarded to all authorised users. Using the ECM system and activating workflows documentation can be reviewed and approved. Automatically after the development and placing documentation, automatically generated e-mail notification is sent to responsible persons for approvals together with deadline for execution. The same method is used for the approval documentation with expiry date. According to the current version

of ISO 9001 standard all documents have expiry date. After that deadline, notification is sent to all responsible persons about the need for updating the documentation.

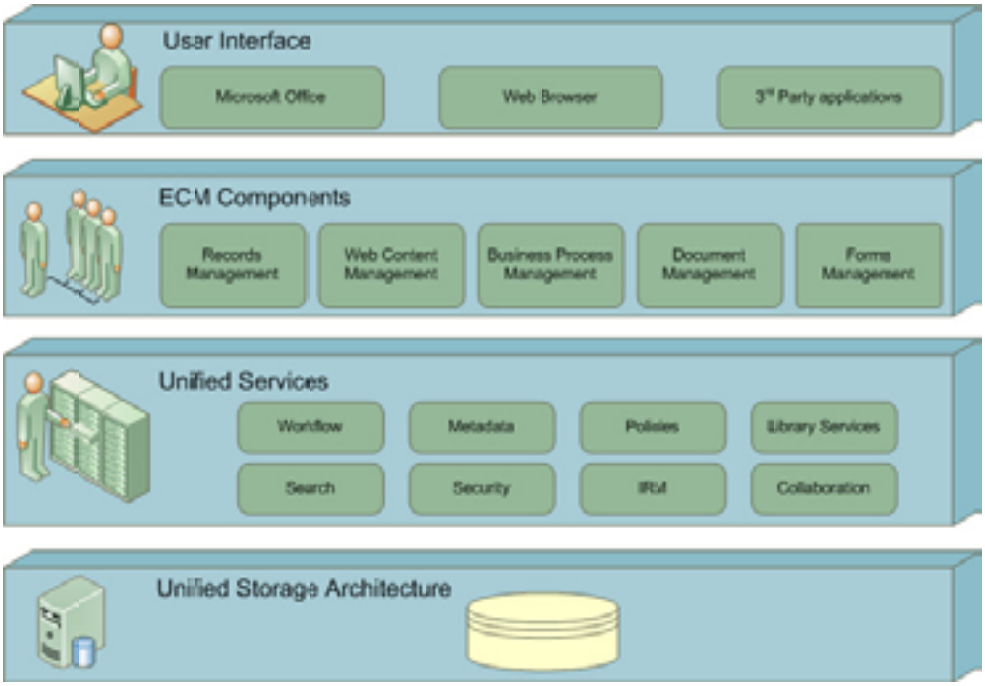

Figure 4. Component of ECM arhitecture (source: brett.maytom.net)

According to Gartner (2012), the core values of an ECM are as follows:

- Document management;
- Image-processing applications;
- Business process management – workflows;
- Records Management;
- Web Content Management;
- Social content;
- Extended components.

The leading open source ECM system Alfresco (Community Edition) is based on Java Enterprise Edition (J2EE) architecture, which is widely spread platform in the world. The integration with email applications enables easier access to all new information. Thus, an e-mail is sent to all interested parties in case of any document change. All users and administrator have access to the repository, and their access is enabled by authentication and authorization. User access to the repository is limited. Such a system is not only in the function of access restrictions for lower-ranking employees, but also serves as a filter of unnecessary information. This is necessary because all actions within the system generate a notification to all authorized for a particular area. For each user access to the repository is managed by certain rules, which means that certain users have access only to certain folders. For example, the head of sawmill production has access to the folder "Sawmill" and has no access to a folder with the information for the furniture production, "Furniture". Many documents from external sources in the form of mail or fax can be stored through the scan. Those documents that were not received in electronic form, additional processing by Optical Character Recognition – OCR is required.

4. CONCLUSION

Nowadays market demands for quality of products and services are increasing, and often certified quality management system is a precondition to enter into the market. To have certified quality management system means to include all processes in the system, without parallel documents management. The amount of information in companies is growing exponentially, and sometimes it seems that the quality management system represents the accumulation of unnecessary documentation. Productivity of the company largely depends on the availability of the right information at the right time, which is a real challenge considering that the information are stored in different forms, in different media and in different locations. The solution lies in use of a content management system (Horvat, 2010). The philosophy of quality management systems is focused on customer satisfaction, which can not be achieved without a quality and timely access to information. Various software solutions for enterprise content management that are integrated into quality management system enable quick access to information, accelerate and increase the reliability of business processes and enable easier tracking changes in the system.

In comparison to other industries in the wood industry there are less ISO 9001 certificate holders (ISO Survey, 2011). Quality management system is a condition to obtain or retain customer today. Therefore, its introduction is a logical sequence of events, and if it is simultaneously introduced with ECM system implementation could be done much easier.

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ROLE OF THE INSTITUTIONAL SUPPORT IN BOOSTING INNOVATION IN WOOD-FURNITURE INDUSTRY. THE CASE OF CEMER

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ABSTRACT

The contribution revises the most relevant projects carried out by Spanish institution in order to boost innovation in the regional woodworking industry. The centre of the analysis is CEMER -Consorcio Escuela de la Madera -the Wood Consortium School dedicated to vocational training, investigation and innovation in the new technologies applied to the Wood-Furniture sector in Andalusia. We revise the institutions' contribution to the sector development in the region by keeping the labour force up to date with the industry know-how and promoting the innovative approach in the sector. The paper makes a brief outline of the current wood industry situation in the region and points out the activities that are taken out by the Cemer to increase sector innovation performance and its competitiveness.

Key words: Knowledge based economy, open innovation, competitiveness, innovation projects, innovation policy

1. INTRODUCTION

Not only the dire local situation but also increasing global competitiveness require more efforts from the industry to adapt to changing requirements of the market and to maintain their share in the highly competitive market. The evolution of market makes the products obsolete in a faster way so there is a special need for workers to continue updating their competences and skills to face the job market demands related with industry needs and foster the change from source economy to knowledge based one. Knowledge has become a strategic resource for firm competitiveness (Nonaka et al., 2000) and as it is embedded in the human mind (Grant, 1996), staff member's capabilities and knowledge sharing are fundamental for upgrading innovative

performance (Caloghirou et al., 2004). While absorptive capacity[1] (Cohen and Levinthal, 1990) affects its potential and capability to process external knowledge, the interaction facilitates this absorption in order to develop new products, process or organizational innovations (Nooteboom, 2004). Therefore as companies´ absorptive capacity determines firms´ growth and development, the work labour takes special importance to enhance the sector development. And taking advantage of external sources of knowledge to fuel these processes took a name of open innovation (Chesbrough, 2003, 2006). In these terms, the role of education and training has a great importance in order to boost innovative attitude. If the qualifications and skills of the labour force are the principal way to implement innovation strategies and activities, explore others innovative potentials (by applying an open innovation concept) could fit perfectly SMEs to avoid financial costs on internal research and development and overcome the fact of lack of material and personnel. It is highly important to create added value of goods and services, as the intensity of the competitive environment will only increase.

The next chapter outlines the situation of woodworking sector in Spain and Andalusia and the third one describes the role of the Wood Consortium School in the regional industry. Finally, the fourth chapter presents innovation projects that are carried out by Cemer and focuses specially on three of them aimed at fostering innovation approach and interaction.

2. SITUATION OF WOODWORKING SECTOR IN SPAIN AND ANDALUSIA

According to the Central Business Register[2] (DIRCE) -Spanish wood and furniture sector involved in 2008 about 36.153 companies; 55% of them dedicated to the furniture and 45% to the wood processing. By 2012, nearly 22% of these companies had ceased their activity to stay at 28.076 units. In 2011 the wood sector turnover suffered 5,4% decrease accompanied by 9,3% loss of personnel occupied with respect to previous year to stayed at 57.484 workers[3]. Meanwhile furniture turnover shrank 14,3% and employed 70.240 workers after loosing a 15,2% of them comparing to 2010. The 18% of whole furniture production was exported. In comparison with national level, the regional decrease was sharper. In 2008 there were about 5.605 companies in Andalusia and by 2012 had declined almost 27%. Needles to say, that it is a sector with especial interest for the Andalusia region as concentrates 14,6% of the total of wood and furniture companies of Spain. Although the crisis impact was robust, it is still the ranking leader in terms of number of furniture companies and third (after Catalonia and Valencia) in wood ones. In 2008 almost 63% of the regional companies were furniture and 37% the wood processing and although the construction and architecture were the most falling sectors in 2011 (being the housing development significant to the furniture performance) these proportions maintained almost unchanged in 2012 with 36% and 64% respectively. The mayor part of the Andalusia

[1] the ability to absorb external knowledge and ideas to generate innovation output

[2] Instituto Nacional de Estadistica, DIRCE (Directorio Central de Empresas) data for 01.01.2012 published 7 of august 2012, www.ine.es, CNAE 2009 (16 and 31)

[3] Instituto Nacional de Estadistica (INE), Encuesta Industrial de Empresas 2011, www.ine.es

woodworking industry is concentrated in Cordoba and Jaen, specifically localized in Ecija, Lucena, Mancha Real, Valverde del Camino, Castro del Rio and San Lucar de Barrameda. The regional production is mainly focused on home furniture. Despite its great participation in national volume, Andalusia furniture exports amounted for only 6,6% of whole national and ranked fifth in national classification in 2012 with a decline of 0,78% comparing to the previous year[4]. Meanwhile Catalonia, Valencia, Galicia and Madrid regions has increased their exports. Low regional levels of exports respect its capacity is an ongoing issue of Andalusia sector as well as the companies' structure. This industry is in mayor part formed by small and medium size companies (and especially over dominated by microenterprises), characteristic that is completely similar to the rest of the sectors in Andalusia or even Spain. Roughly 74% of companies employ two or less employees and only 3% companies have more than twenty workers[5].

3. CEMER -WOOD CONSORTIUM SCHOOL

Cemer -*Escuela de Madera*- School of Wood was created in 1993 and belongs to the regional government of Andalusia (Junta de Andalusia) and the Town Council of Encinas Reales (Córdoba) where it is situated. Amongst the aims of the institution there is: *to create innovative working methods applied to the training of workers and specialization and update of active wood industry workers and so on*[6] with the final purpose focused on growth of the sector by human resources development as it highlighted in its Strategic Plan[7] "*the company value is determinant by value of its personnel*".

The School offers training to employees (Lifelong Learning) as well as to unemployed (Vocational Training). Since its creation it realised approximately 1100 courses for about 6.500 participants[8]. The majority of them dedicated to CAD, Numerical Control Tools, Internet, Management and Computing skills and others like Languages or Quality. The flood of new technologies in the sector was implementation of the course specialization in "New Technologies applied to wood and furniture sector" and "External Trade course". The direct contact with almost 1000 companies as associates permit adjusts the offer and fulfils its necessity. Moreover, the importance of the institution was recognized with the invitation to collaborate within the project for the "*Certification of Professional Skills for the Furniture Sector in Spain*"[9] and accredited as the national centre of reference for Vocational Training for carpentry and furniture. Furthermore, it participated in a project aimed at adjust competences and skills from traditional professional profiles to emergent ones[10]. Moreover, it is highly involved in fostering entrepreneurship culture and employability assets by training.

In order to adequate the training offer to the companies necessities Cemer realised

[4] Instituto de Comercio Exterior de España ICEX, Estacom database (CNAE09- 31) data for 2011 and 2012, www.icex.es
[5] DIRCE, data for 01.01.2012 www.ine.es
[6] Cemer, www.cemer.es, verified: march 2013
[7] Cemer: Memoria de actividades 2012: proyectos
[8] Cemer (2012): *Manual didáctico Fabricación industrial de Carpintería y Mueble*
[9] Project duration: 2003-2006
[10] Proyecto: "*Cualificaciones, capacidades y competencias para el diseño de mapas de movilidad de perfiles ocupacionales tradicionales hacía perfiles emergentes" -SOPDE S.A. 2012*

"*Socioeconomic and environmental impact study of the Wood-Furniture sector in Andalusia"* that primarily permitted to get know the characteristic of the sector with its deficiencies and necessities. On the other hand, it served to design and elaborate the strategy for the sector[11]. Furthermore, the *Sectoral study of wood, cork and furniture and its future prospects 2011-2016*[12] helped to identify the training lacks of the companies and to elaborate more adequate plan for the training in order to boost its development. According to the main conclusions of the study the "*main formative deficits comes not only from production area, but affects as well new technologies, design and marketing"*. This furniture sector survey also revealed that the "*general attitude of the entrepreneurship is reactive than proactive and show that its management capabilities are insufficient to prepare a long term plans and its main strategy is to be a follower rather than a leader on a market"* [13].

4. INNOVATIVE ACTIVITIES TO IMPULSE THE WOOD INDUSTRY

In addition to its training projects Cemer is highly involved in other activities like network construction, mobility, new technologies and technology development. Moreover, there is also a special priority conceived to gender and eco-friendly projects. As the eco-design and design marks the working labour difference, the design training is crucial and CEMER has currently created the "Andalusia Furniture Design Centre" to point out that design is a key factor in innovation and differentiation of Andalusia industry and fostering innovation in sector. For the latter objective, one of the projects -*Guide on good practices to reduce the risk in the handling of Chemicals* -resulted preselected for the European Awards in the field of security and risk management on work environments.

The Cemer applies new management and marketing concepts into practice. One of these is to strengthen the cooperative relations between the actors in the industry by boosting not only formally but also informally communication. Instead of develop new technology; the enterprise can acquire it from exterior but first of all it should be conscious of its existence. The entrepreneurs confirm that fact in the national innovation survey. In 2011 furniture and wood SMEs managers indicated the market (clients, suppliers, competitors, consulting…) as the most important source of information for technological innovation, even slightly higher than the internal sources[14].

This paper pays attention to some of the most relevant projects aimed at fostering innovation in the sector like diffusion, technological brokerage and mobility ones.

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[11] *Strategic Plan of the Wood Industry in Córdoba* in collaboration with the University of Cordoba -Faculty of Economic Studies

[12] Centro Tecnologico del Mueble (CITMA), Junta de Andalusia and Grupo Neteman: (2011): *Estudio sectorial de la madera, el mueble y el corcho y sus perspectivas de futuro 2011-2016*

[13] *Estudio sectorial de la madera, el mueble y el corcho y sus perspectivas de futuro 2011-2016, p.31*

[14] Instituto Nacional de Estadistica: Encuesta sobre innovación en las empresas 2011. *Fuentes de información para actividades de innovación* en *Innovación tecnológica en el período 2009-2011*

4.1. Research Results Transference Bureau

Research Results Transference Bureau (OTRI)[15] started in November 2002 *with the main objective to foster competitiveness of the Andalusia furniture companies through actions contributing to a more efficient technological transparency of research result transference.*[16]

The main tasks of the Bureau is to promote R&D activities in cooperation with companies within different programmes and to provide services and tools to facilitate the interaction between research results and companies. This interface foster relations and technology transfer between science-technology-enterprises agents as well as focuses at fostering the creation of patents and industrial property. These objectives are aimed through the following tasks:

- Manage technology offer/demand
- Collaborate in R&D projects
- Provide information and support in grants applying, industrial property
- Search for finance tools
- Organize seminars and conferences

One of the OTRIs´ tool is the quarterly technological bulletin that reach aprox. 300 companies recipients. The bulletin gathers all issues concerning research, development and technological or non-technological offers/demands as well as opportunities for cooperation within the sector. Furthermore, it manages a digital review -online newspaper- *www.elMuebleAndaluz.com (Andalusian furniture)* as a source of information about all the new that occur in the sector as well as other interconnected items as projects, grants. These tools provide an access to newest technological solutions to foster knowledge and technology transfer in the wood sector. The fundamental aspect of the OTRI contribution to the sector development is the immediate application of projects results to the local companies as arisen from their real needs. The local SMEs can satisfy their business enquiries by contacting the OTRI.

4.2. Mobility projects

Since 1995, Cemer is completely involved in mobility programmes like Leonardo da Vinci that makes possible training exchange abroad within projects called WORKWOOD or CONSORCIA and additionally receives Erasmus students for placement[17]. Yearly, about 20 students can benefit from training in countries like Ireland or Italy, among others, to improve their not only professional qualifications but also linguistics ones. This is also an efficient way to make a

[15] OTRI -Oficina de Transferencia de Resultados de Investigación
[16] Cemer: www.cemer.es, verified april 2013
[17] Cemer: Mobility projects en http://mobility.cemer.es/, verified april 2013

benchmarking of different ideas about woodworking industry and on the other hand the coming students bring their ideas and implement them in their day-to-day working at Cemer. They assist or prepare material for training workshops or assist Departments like the Design one. This exchange facilitates the direct knowledge flow and external source of information that enriches the entity and students knowledge as well. Cemer consider mobility as a tool for industry competitiveness.

4.3. Social Networks

Internet tools play a key role in spreading the important information of the furniture sector and can mobilize to action sourced form the information and knowledge sharing. Social networks permit foster communication between professionals, companies and agencies and put them in contact and all the knowledge triangle agents. From the industry players view, it is highly important tool for market watch and could be fundamental tool to solve problems with the exchange of information. The use of social networks helps to put the open innovation concept in practice by building cooperation and involvement of all market agents in ideas creating. By means of social networks Cemer helps its agents to make visible its projects, conferences, grants, know-how. Furthermore, it also serves as the marketing tool as it makes visible the wood industry offer to all interested public, as well as the platform to launch the students' creations. The aim of the social net presence is to bring together all professionals and provides them the latest up to date development in the branch as well as the awards, labour offers and news related with the sector. The purpose is not only to convey basic professional information but also to make diffusion of the particular outcomes and ecological ideas; to inform about existing and new technologies, design software's, ecodesign, prospective projects and present offer to cooperate in designing and developing furniture proposals. Cemer takes advantage of social networks like Facebook and Twitter (amongst others) to keep agents in contact and get feedback about their training and professional needs. At this moment the Cemer Facebook has 6315 followers[18] and twitter 515 followers with 864 tweets[19].

All in all, the aim is to enforce an open approach to the innovation process and made its players participation more interactive by bringing together entrepreneurs, customers, employees and local communities. Another positive aspect is that this marketing and promotional efforts increase awareness of the local furniture companies.

[18] nearly 5.000 for private profile and 1.315 for institution one: https://www.facebook.com/Consorcio.Escuela.Madera.CEMER, verified march 2013
[19] https://twitter.com/CEMERConsorcio

5. CONCLUSIONS

Due the situation in wooden sector highly affected by the economic and moreover housing sector crisis, institutional support for innovation is highly required to preserve and strengthen the sector. Nowadays, companies not only should focus at optimizing the performance in the context of the actual crisis but also at fostering the ability to differentiate themselves from competitors. The added value could flourish from development of the necessary human resources for the furniture industry to increase enterprise innovativeness. The lack of human and financial resources of microenterprises for own R&D is no longer valid as barrier for avoiding innovating and benefit from using external sources of innovation. Companies need highly skilled workforce to make possible function knowledge based economy and to contribute to the socioeconomic regional development. Make a greater investment in human capital is a crucial role of educational institutions and universities among them as highly qualified personnel arise the potential to absorb relevant knowledge and ideas from external sources and transform them into products/services. Therefore the human capital could be the fundamental way to incorporate innovation despite the limited resources and size of companies. The Cemer took up the mission to encourage and implant innovation culture by supporting innovation processes and creating environment conditions to help create and develop innovations. Hence to this, Cemer projects aim at making the information flow among the market players, as innovation results from interaction between people, enterprises and organizations that create new knowledge, usage of external one to generate new ideas and innovative solutions and innovation approach in the woodworking industry. By applying the open innovation concept to the sector it can fuel its innovativeness. The aim of the Cemer projects is to raise an interest of the entrepreneurs, making a special attention about the effectiveness of innovation. These innovation projects are very important for the sector development but just now these activities takes even more importance than ever before.

The situation challenges creative solutions and new strategies to adapt to changing conditions. The highly skilled workforce is a value that may bring solutions to the sector as the education and training affects the absorption of new knowledge and translate them into the production/organization process. There is still a margin for business improvement by staff training and diffusion of innovation despite the current cut off in the in-house R&D. The current wood and furniture industry situation and difficult competitive environment make a special need for the implementation of economic policies and promoting innovation and support activities to face this instable business environment and create conditions for its further development. Chiefly due to its great relevance for innovation system.

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OVERCOMING RESISTANCE OF STAFF IN INTRODUCTION THE QUALITY MANAGEMENT SYSTEM IN WOODWORKING INDUSTRY

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ABSTRACT

This paper regards to the problem of overcoming resistance to staff in introduction the Quality Management System in woodworking industry. In article authors release different steps, on which managers, who are implementing QMS, can face in organization, looking for reasons and forms of staff's resistance. They founded keys to overcome a problem, allocate factors, which can help to develop a strategy of work to overcome staff resistance in QMS introduction**.**

Key words: Overcoming resistance of staff, Quality Management System, introduction of QMS, forms of resistance, factors to overcome staff resistance

1. STAGES OF QMS AND STAFF'S RESISTANCE

Nowadays, one of the warranties of stability, reliability and organization's potential is the compliance of the quality management system's requirements. Organizations, which workings in sphere of woodworking industry, aren't an exception. The introduction of a quality management system is not possible without specially organized personnel training, which contains management theory of quality, ISO 9000, learning the theory of the basic requirements and the process approach.

Often managers, who coach staff, in the implementation of the QMS face obvious or hidden resistance to this long and complex process in any of the following stages:

1. Description and optimization of processes.

This stage describes the most significant for the QMS processes, as basis of the quality management system is a process-based approach. For some managers and employees of the organization methods of implanting process approach initially seem simple and easy to use, but when you try to implement them in real practice, they face a lot of problems. Often, the documents which were created by the processes are not being used, process owners most of the time are focused on traditional management tasks. In this case, the process approach is formally introduced and does not bring the desired effect on the organization. A consequence of the formal implementation of the QMS is frustrated staffs, who become an observer of no-result efforts of the methodology of the process

approach. This situation arises because of the lack of implementation of such principles as «key personnel' leadership» and «personnel involvement».

2. Development of regulatory quality management system documentation.

At this stage is forming:

• «Quality Manual», which contains general principles and philosophy of quality in the organization;

• «a set of standards of organization», which describes in detail all activities affecting quality;

• «Work papers», which deals with the activities affecting the quality and consists of rules, forms, regulations, plans, etc.

Quality managers cannot be experts in all areas, so a necessary condition for the development of documents is to involve into it the required maximum number of people. Personnel's resistance at this stage due to the fact that employees do not want to break away from his core business, they think that paperwork is a burden, and the creation takes a lot of time and forces.

3. QMS testing and internal audit.

The internal auditing (look back) revealed difference between current work and needed standards that should be recorded and used to further correction of the regulatory documents and employees' work.

In practice, internal auditing is often performed more for the certification body, than for their own leadership. In these cases, the results of the auditing are identifying small and formal inconsistencies, which do not only justify the cost of the auditing, but also reduce the motivation of the internal auditors, who see no reason to be distracted from the main job search for details.

Changes in the organization associated with the implementation of the QMS, face strong resistance in the early stages, as some employees see in the coming changes personal danger, usually related to their self-doubt and uncertainty consequences happening.

Ponomariov S. V. in the article "Overcoming of staff resistance to create the QMS in the organization" identifies several stages through which a worker is on the way to the perception of change:

1. Inaction (inertia) - due to uncertainty, indecision, doubt.
2. Denial of planned changes - being skeptical about utility of the developed plans.
3. Irritation - a protest against the implementation of the QMS.
4. Discussion of plans and negotiations - an attempt to reach a compromise by minimizing the proposed plans or partial acceptance.
5. Declining of resistance to changes - due to the forced recognition of the proposed changes, employees are passive, resistance is reduced down to staff depression.
6. Acceptance, recognition and approval of change - adoption and sincere recognition of the principles of quality management system implementation in practice the organization.

In addition to these, according to Hubert Rampersad reasons why people resist change are:

• The lack of additional (explaining) information and, as a result, this lack of understanding of what is happening;

• A deep distrust and suspicion of the staff.

Experts in the field of organizational development believe that the resistance to the introduction of the QMS is not always easy to recognize, and often it comes in the form of potential conflicts at all levels.

2. PSYCHOLOGICAL CONTEXT OF STAFF'S RESISTANCE

For a more complete understanding of covered resistance of personnel, consider the social and psychological context of resistance to change.

Any organization - it is a social system and its successful operation depends on the quality of human relations within the system. Many attempts to build control systems that are insensitive to the effects of the «human» factor, often fail because they are based on the assumption of rational behavior

of people. But people are not always guided by rational motives, therefore, does not always act in the proposed behavioral model.

The neglect of the social and psychological factors, as a rule, leads to huge losses, provokes resistance of staff, which, in fact, is a reaction to the impact of the social system, that is, can be considered as feedback. From this we can conclude that the resistance - it is a natural life of the organization, which is to avoid, and to try to understand and use to more effective management.

2.1. Forms, reasons of staff's resistance and key resistance properties

Theoretical analysis of the literature, allowed us to describe the most common form of resistance (Table 1.).

Table 1. Forms of resistance to the introduction of the QMS staff

Forms of resistance	Description
Denial	Denial of problems is due to: fear of competition from peers, discomfort, loyalty to a third party, which is disinterested in changes, etc.
Indifference	Indifference of the staff are not opposed to change is open, not interested in the success of the changes.
Demonstration	Demonstration of concern about the potential negative results of the changes.
Manifestation of skepticism	Employees - the importance and need for change. Managers - on the opportunities of employees, projects change.
Doubt about competence of the key manager and coaches	Employees believe that: • Chief himself did not understand all the details of the project; • Consultants do not know the specifics of a particular business, are not sufficiently involved are selfish goals.
Pessimism	Pessimism is an extreme form of skepticism directed at the staff, the project changes, and organization.
Impatience	Accelerating the pace of work, the pressure on staff leads to the manifestation of impatience on their part.

Understanding of resistance cases is needed for developing strategies for responding to it.

Table 2. The reasons for resistance

The reasons for the resistance	Description
Feeling of lack of control of the situation	Even change, the system seeks to preserve its unique nature and the resistance of an agent protecting stability.
The desire to preserve what is valuable	Resistance is an attempt to preserve the norms, traditions and principles that employees feel valued and preferred injected ideas, methods and programs.
The threat of authority, status and autonomy	The threat of authority, status and autonomy of employees often experience changes in demand the prosecution in their own insolvency.
Misunderstanding	Misunderstanding subordinate entry requirements entry requirements often creates a situation that looks like resistance. Misinterpretation breeds conflict.
Conflict of interest	The implementation of changes can lead to the satisfaction of some employees, and not to bring anything meaningful to their colleagues.
The struggle for power	Resistance can be a struggle for control of the situation between those who want to make changes, and those who do not want change.
The interpretation of the confrontation as disobedience	Resistance is imminent to those who exist, and allows managers to not take responsibility for the problem, thus avoiding reflection as to how well they have prepared their employees how clearly they set tasks for them.
Distrust	Lack of mutual distrust responsibility leads to a loss of confidence that their needs, values, and dignity into account in due measure, and constructive dialogue impossible.
Problems across the organization	Problems across the organization as a whole is sometimes resistance can be reduced only through the intervention of a higher-level system, in which the main conflict is.

Table number 2 is a partial list of causes of resistance. For anyone who has experience of change, it is clear that too many of them, to bring them a full review. However, we can identify the main resistance properties (Table 3).

Table 3. Key resistance properties

Resistance	Properties	Good way to overcome
Flexible or rigid	Initial resistance usually is flexible, and the problem can be relatively easily resolved by discussion. However, misinterpretation or trying to suppress it, often lead to polarization between the parties, and the resistance is tough.	If managers change their behavior (eg, to recognize that set targets are not clearly), the resistance will decrease.
Situational or chronic	While resistance is seen only as a reaction to a particular situation, it is easy to move in a constructive direction. However, resistance can become chronic: staff expect unrealistic demands and respond automatically.	Identify the main patterns of behavior of the parties and it is modified.
Direct or indirect, and active and passive	Without feedback managers are insulated from the real practice, which leads to loss of efficiency of management.	Understand the importance of demonstrating incompetence, and other manifestations of passive resistance. The more actively and directly shows the resistance, the easier it is to understand and respond to, for example, by explaining or open discussion.

2.2. How to reduce the negative impact of staff's resistance and overcome it?

To reduce the negative impact of resistance, it is important to keep track of the problems in the relationship, to which it refers, and to take them into the open, reducing the probability of resistance in the passive form.

In order to implement the quality management system that is make changes in the social system with minimal losses, managers must recognize itself an integral part of the system in which resistance develops. In this case, would be a natural understanding of the values and roles of the parties, the interdependence of actions, reactions and behavior. Only with this approach it is possible to build a cooperative relationship and the conditions for a relatively quick resolution to the conflict.

To overcome the resistance of staff quality management system requires a lot of preparatory work, including prevention of resistance, the timely identification of the causes and sources of resistance to overcome them.

As preventive measures, first of all, the training of the personnel, which is able to provide an understanding of the need for change and the involvement of the maximum number of employees in the process of implementing a QMS, which significantly enhances the sense of responsibility of each employee for activities, contributes to enhance them. It is important to support those who are afraid of the problems associated with adapting to the new working conditions. At ISO 9001 there are no direct requirements on the establishment of the enterprise systems of motivation and incentives for workers, but it does not mean that they should not be taken into account. To realize this is necessary to the standard ISO 9004:2009. The second principle of quality management - Leadership suggests that leaders should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives. This will lead to the fact that staff will understand the goals

and objectives of the organization, and are sufficiently motivated to achieve them, the problem of interaction between the different levels will be kept to a minimum. In paragraph 6.3.3. says that for a more active involvement and motivation of its staff, the organization should use opportunities such as:

• Development of knowledge-sharing and the use of staff competence;
• The introduction of appropriate recognition and reward based on individual assessments of achievements of staff;
• Creation of training, career planning, creating conditions for the development of personality;
• Ongoing study of the level of satisfaction of needs and expectations of staff;
• providing opportunities for training and mentoring

In order to reduce the resistance of personnel that accompany the process of implementing a QMS, the management company must build a system of internal communication through which should be conducted educational work among the staff, explaining his goal, the meaning and content of the changes, to introduce the general principles of quality management system and organization's objectives for quality. Also, you should train employees to act in accordance with the regulations of the new processes and quality management system.

Involving staff in the development of the quality management system and the development of the organization significantly increase employee motivation and strengthen internal corporate communications.

Lack of understanding with key personnel leads to interest declining in the initiative and changes. Senior management must communicate directly with the staff, to inform and explain how to make further changes. In order to help staff to understand the significance of innovation, what benefits they can bring, you must create a communication plan. This document should contain the answers to the following questions:

• Why is the QMS introduction project is important to the organization, which working in woodworking sphere, what are the reasons for the project?
• What are the objectives and expected results?
• What is involved in this project required of employees of the organization?
• How, in the opinion of the Director, staff should refer to the project?
• How does the top management is going to take part in the project?
• Who is in charge of the project, the role and status of this employee?
• What is the role of external consultants in the project?

To overcome the resistance of the staff to create an environment in which people are involved in the creative process of creating, maintaining and developing the QMS. It is necessary to achieve understanding among strategy, organizational goals that they seek to improve their performance, collaborated with the leadership of the organization.

It needs to develop a policy motivation to work on the introduction of the QMS, consider not only the system of financial incentives and schemes for self-realization, career development, training and professional staff value.

2.3. Factors for overcome staff's resistance

Table 4. Factors to overcome staff resistance in QMS introduction

№	Factors	Contents
1.	Accounting for the causes of behavior of the individual in the organization	• taking into account the needs, aptitudes and aspirations of staff; • Demonstrations of personal gain;

2.	The value of the authority	• sufficient authority; • formal and informal; • the adequacy of power and influence
3.	Providing information to a group	• important information relating to the case; • timeliness of information;
4.	Develop a common understanding	• common understanding of the need for changes; • participation in the search for and interpretation of data;
5.	The sense of belonging to a group	• sufficient degree of participation;
6.	Authority of group for its members	• coordinated group work to reduce the reaction;
7.	Support for changes to the group's leader	• involvement in the process of change leadership from the staff;
8.	Awareness of group members	• opening of communication channels; • exchange of objective information; • knowledge of the progress changes.

Conducted analysis shows us that in QMS introduction it is important to look at group's needs for quality rising. Key personnel should involve personnel and train them, stimulate them to changes, increase their motivation, and in the first place key personnel should demonstrate their interest in changes, they shouldn't think about resistance as about something negative, they should understand it and use it for effective management.

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SELECTED ATTRIBUTES OF QUALITY MANAGEMENT SYSTEMS CERTIFICATIONS IN WOOD PROCESSING INDUSTRY IN SLOVAKIA

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ABSTRACT

Article discusses about the process of implementation and certification of quality management systems in the wood processing industry in Slovakia. It refers to the real situation in the area of certification in the industry, describes the advantages and disadvantages of holding the certificate from the perspective of individual companies operating in the market of timber and timber products in Slovakia.

Key words: certification, quality management systems, implementation, wood processing industry

1. INTRODUCTION

The term quality is still more and more used in professional practice and also in usual life because it is becoming the criterion according to which is decided about surviving or extinction of companies. Area of quality is one of the substantive components in the company because without quality goods and services, which firms offer or should offer, company cannot exist. Only expressive increasing of quality can guarantee the efficiency of production and competitiveness of the company. One way to increase the quality and performance of organizations is the implementation of ISO 9000 [2].

2. FUNDAMENTAL CHARACTERISTICS OF WOOD – PROCESSING INDUSTRY IN SLOVAK REPUBLIC

The wood – processing industry currently has no position on Slovakia like production of cars, do not be put to the environmental debate as a power engineering, lacks an advertising campaign that have chemical products nevertheless, wood and furniture industry in Slovakia and there is more than necessary.

The wood – processing industry is one of the most dynamically developing industrial sector in the EU that their representation is approximately 10% of total EU manufacturing industry. It provides us with a wide range of materials and products with a basis of renewable raw material - wood. Due to its rapid adaptability to market requirements and significantly lower capital investment supports the development of small and medium enterprises and the development and employment. Its advantage is the relatively small dependence on imported raw material inputs. The development of wood - processing industry had a negative impact of the global economic crisis. The biggest change in Slovakia, see the volume of the timber trade, which in the first quarter of 2009 compared with first quarter of 2008 declined by 46%. Price of wood in world markets fell by 15 to 20%, in Slovakia the average price fell to about 24%. Stabilization and gradual increase in prices began to run in 2010.

The economic situation in wood – processing industry in Slovakia.

Positives:

- export performance highlights the competitiveness of enterprises production on foreign markets,
- development and production of value added tax - a growing trend in these indicators, positive developments in the timber industry, where you can observe the growth of manufacturing products with high added value
- development investment has a positive, upward trend, despite the increasing level of investment is investment in view of the wear of machine-technology equipment is still low,
- improve the economic situation in the wood and furniture industry - since 2002 there is a positive development of all economic indicators. [7]

Negatives:

- high credit debt companies - credit debt equity ranges of around 100%,
- the amount of overdue maturity - a negative situation is mainly in wood and furniture industry, where the pointer is an upward trend,
- adverse developments in the pulp and paper industry - since 2002 there is a decline in investment activity, production, profits, value added [7]

3. QUALITY MANAGEMENT BASED ONM ISO 9000

The organizations today appreciate quality management mainly like implementation and preserve of quality management system by ISO 9000. This is inadequate because the real quality management in organization must be oriented on quality products for customers. [2] Quality management system an assist organizations in enhancing customer satisfaction. Customers require products with characteristics that satisfy their needs and expectations. These needs and expectations are expressed in product specification and collectively referred to as customer requirements. The quality management system approach encourages organizations to analyse customer requirements, define the processes that contribute to the achievement of product which is acceptable to the customer, and keep these processes under control. [5]

The adoption of a quality management system should be a strategic decision of an organization. The design and implementation of an organizations quality management system influenced by:

- Its organizational environment, changes in that environment and the risks associated with that environment,
- Its varying needs,
- Its particular objectives,
- The products it provides,
- The processes it employs,
- Its size and organizational structure.

ISO 9000 specifies requirements for a quality management system where an organization:

- Needs to demonstrate its ability to consistently provide product that meets customer and applicable statutory and regulatory requirements,
- Aims to enhance customer satisfaction through the effective application of the system including processes for continual improvement of the system and assurance of conformity to customer and applicable statutory and regulatory requirement. [4]

4. BASIC ATTRIBUTES OF THE IMPLEMENTATION OF QUALITY MANAGEMENT SYSTEMS INTO COMPANIES OF WOOD PROCESSING INDUSTRY IN SLOVAKIA

The next section of this paper will present the results of research that was conducted in the first half of 2012, 204 companies in the wood processing industry. The research was focused mainly on assessing the status of the certification of quality management systems in wood processing enterprises in Slovakia. At the beginning of the study were the objectives of research and at the same time was set hypothesis, which we wanted to prove respectively. refute the argument that the ownership certificate of quality management system leads to better economic performance of enterprises. For this purpose, a questionnaire was developed, which was conducted through the collection of primary data needed for further analysis. Collection of information is conducted electronically. The next section of this paper presents selected results of the research.

The first question was asked if the companies hold a certificate of quality management system (QMS). As seen from Figure 1, 81% of respondents do not own QMS certificate. Others who own certificate mentioned two types of standards, namely: STN EN ISO 9001 and STN EN OISO 14001.

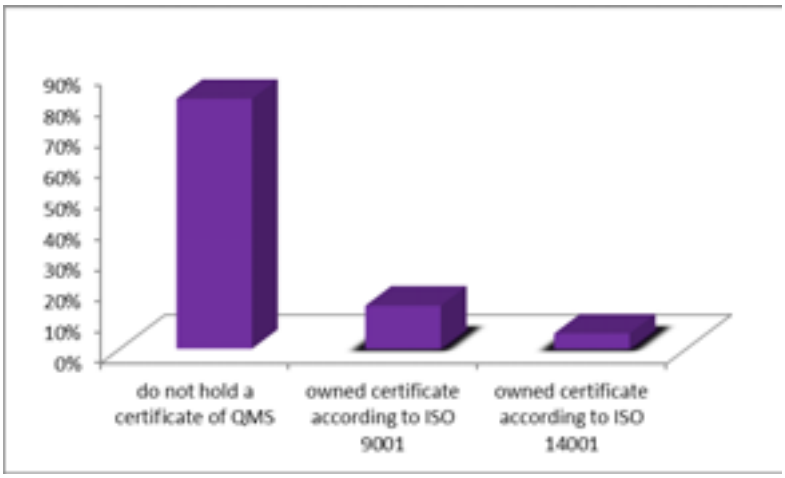

Figure 1. Ownership certificates of QMS in wood processing enterprises in Slovakia

The second question was aimed afterwards or businesses owned by some certification mark of conformity. Of those polled more than 50% said they do not possess any, and those who possess some brand introduced the most general conformity certification. (Fig. 2)

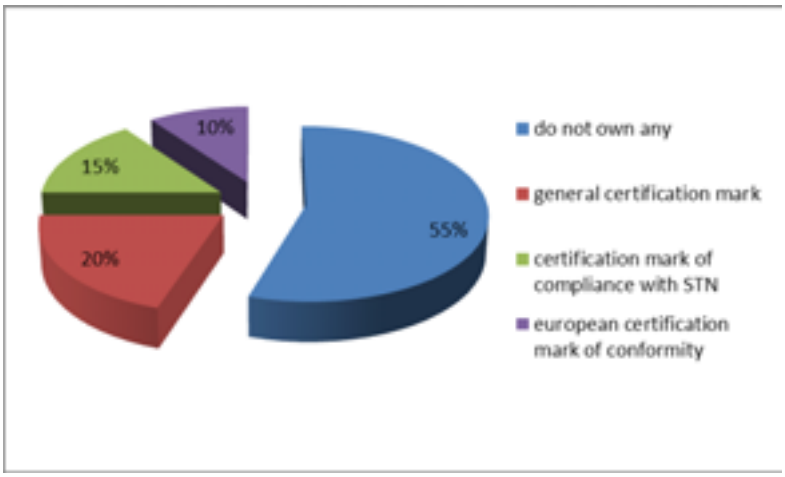

Figure 2.Ownership certification marks in the wood processing enterprises in Slovakia

Another question was raised was the undertaking concerned to bring the benefits of implementing a QMS certification. Identified benefits are presented in Figure 3.

Figure 3. Benefits from the introduction of QMS in the wood processing enterprises in Slovakia

On the other hand, we have to ask whether the introduction of QMS has brought about a negative experience, or whether respondents met with obstacles and shortcomings with the implementation of a quality management system in place. The results present Figure 4.

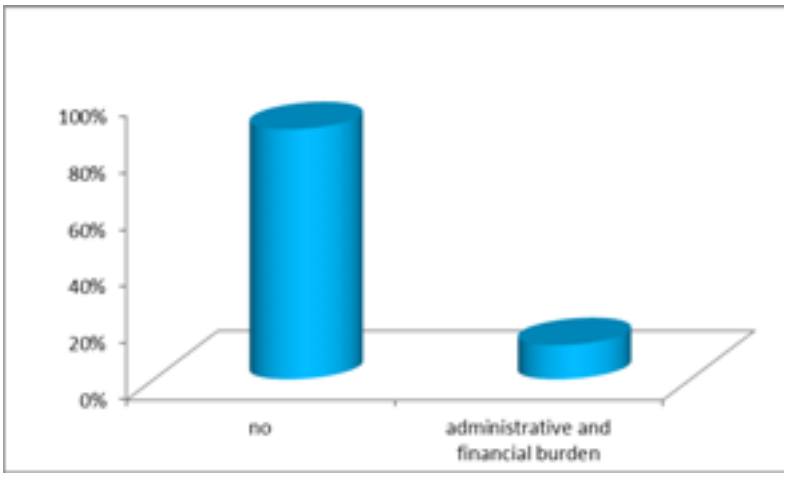

Figure 4.Negative experiences from the implementation of QMS in wood processing enterprises in Slovakia

Another area that we were interested in was to give reasons why companies have decided to introduce QMS. From Figure 5, we see that 33% of respondents stated reasons for gaining competitive advantages relieve uncertified companies for 22% of respondents were reason to improve their own operations and thus productivity and other important factor was to achieve and maintain the quality of the product.

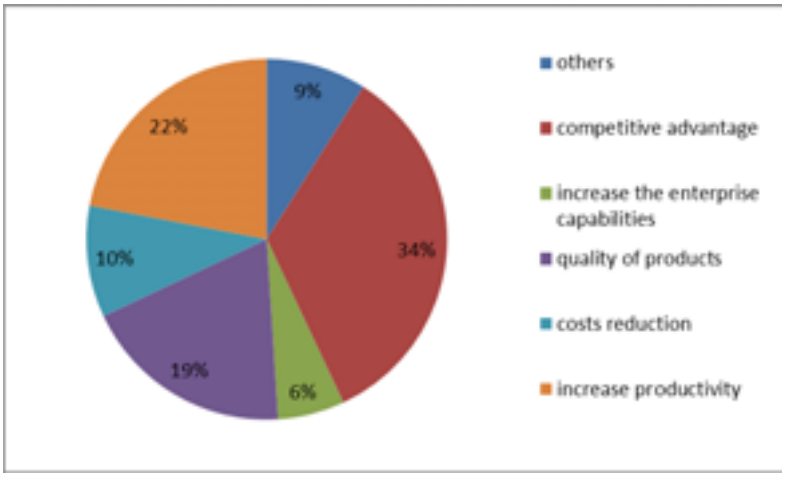

Figure 5. Reasons for the introduction of QMS in the wood processing enterprises in Slovakia

The next part of our research, we looked at the time would have been necessary for the implementation of QMS in place. Results are presented in Figure 6.

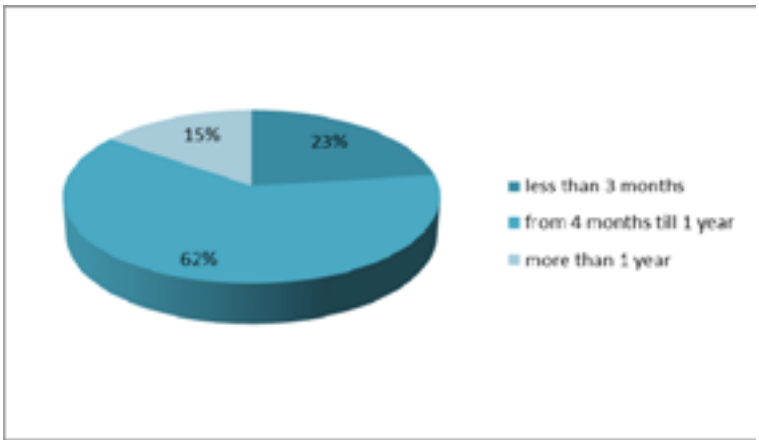

Figure 6. The time required for the implementation of QMS in place in the wood processing enterprises in Slovakia

5. CONCLUSION

Wood processing enterprises are at present exposed of strong competitiveness but they have many new chances too. If they make stronger their productivity they can be on level of successful company. All piece of knowledge's, proposals, solutions, continual development of employees and other factor can be effectively apply in management of all types of companies but we must find appropriate strategy. About success of any company decided individual ability of company employees.

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THE QUALITY OF THE SERVICES IN THE SLOVAK LIBRARY OF FORESTRY AND WOOD SCIENCES AT THE TECHNICAL UNIVERSITY IN ZVOLEN

Jarmila Klementová - Anna Šatanová

ABSTRACT

The main object of this paper is the quality measurement of the library-information services in the forestry and wood sciences in the Slovak Library of Forestry and Wood Sciences at the Technical University in Zvolen. The measurement of the quality, in these services, was focused on the customer satisfaction, by using the questionnaire method with the Likert rating scale.

The results of the partial measurements stimulate the improving of the quality of the individual services for the next period and they are possible to compare not only customer satisfaction, but also they can monitor and evaluate the customer priorities, and through this steps improve the quality management of library.

Key words: the forestry, the timbering, the information services, the customers' satisfaction, the management of the quality

1. INTRODUCTION

In the present time has been creating a huge amount of the information centres, mainly the commercial character, providing the information and the information services of the different types. The competition on the market of information is increasing and because of the fact the information centres operating in the libraries have to account the status. The cooperation among the libraries on the national and international level is increasing permanently. This development requires the continuous improvement and the unification of the system of the processing of the information and the building of the databases for their mutual sharing and another promising cooperation.

The modern information and communication technologies have improved and have facilitated the cooperation and connection among the libraries of the different types. The quality equipment, technology and personnel require the good management, which will be able to maintain the pace of the development and the quality of the offered services in this area in the present time.

The main aim of the organizations provides the service is to gain and maintain the customer. Ultimately all the activities of an organization have to be aimed on the customer, his traditional and new needs connected with the natural development of the sociality in all the areas. This development is necessary to sense, to accept and gradually incorporate it to the internal structure and activities of the organization in the restructuring and the innovation of the services.

The libraries offer the services of the intangible character – the information. The great part of the customers' satisfaction forms another factors, mainly the person who provides the service – the education, the expertise, the experiences and the willingness, the culture of manners, the communication and the ability of the individual approach to the customer.

The atmosphere and the satisfaction of the customer form the quality of the exterior and the interior – the material and technical equipment, cleanness of the space, the number of the green, the lighting, the quality of the information technologies and mainly the library collection.

Just above criteria are the researched objects of the quality of the library and information services in the Slovak Library of Forestry and Wood at the Technical University in Zvolen (SLFW), which is a part of the education at the Technical University in Zvolen. Preserves and opens the information from the forestry and the timbering in many forms. This library creates the information basement of scientific research for forestry and wood processing industry in Slovak Republic.

2. MONITORING OF THE CUSTOMERS' SATISFACTION

The monitoring belongs to the strategy importance activities. It is the most important part of the principle fulfillment of the effective feedback of the quality management. Each customer makes the individual ideal based of the own needs, experiences and information acquired from the surroundings, which represent the expected performance of service providers. When the difference between the reality and the expectation is lower, the rate of customer's satisfaction is higher (Figure 1).

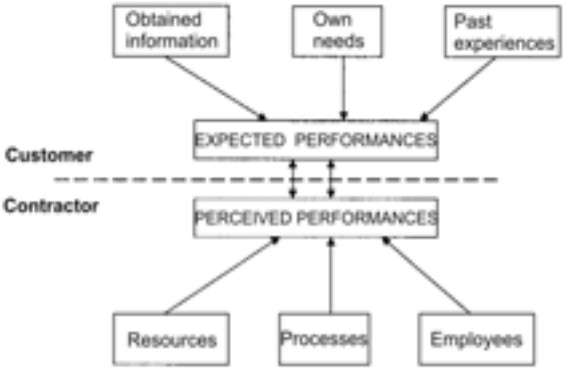


Figure 1. The model of the monitoring of the customers's satisfaction measure (Šatanová et al.,2008)

Monitoring of the customers' satisfaction is important not only from the point of the disposable establish of the reality in a certain moment, but more important is watching the trend of the development of the needs. The reached results can be used by senior management as the information for the examination processes of the SMK effectiveness in the organization. It is very important that SMK fit exactly to the requirements of the organization.

The standard STN EN ISO 9000:2005 -The system of the quality management – The basics and dictionary, explains the meaning of this concept: "**The customer's satisfaction** expresses the customer's perceived level and how the requirements were fulfilled." The concept of the satisfying the customer's requirements mean the perception and the understanding of the customer's expectations, which the supplier meets or exceeds with the activity. The evaluation of the customer's satisfaction means: "How the customers understand to the organization as a supplier".

2.1. Evaluation of the customers' satisfaction

The basic reason for evaluation of the customers' satisfaction by the satisfaction of the requirements is getting the information, which allows realise to the management the right decisions for maximizing the customers' satisfaction and keep their in this way. The performing evaluation of the

customers' satisfaction and then the internal communication of the research results with all the employees are very important in terms of further increasing of the customers' satisfaction.

In the literature is the separation of the procedures of the customers' satisfaction on the subjective and the objective succeeded. For the measuring of the customers' satisfaction of the library and information services appropriate to use the subjective procedures. These procedures are determined on the comprehension of the individual understanding in the substantive content of the problem and with these connected manners of the behaviour. Within the subjective procedures it is possible to use the implicit and the explicit assessment of the customer.

The implicit assessment of the customers' satisfaction allows less or more clear back end of the existing range of facts. These procedures include the systematic analyse of the complaints, the panels of the problems and the questioning of the staff in the suppliers' companies, which are in the direct contact with the customers. It is the information about the range of the library collections, the accessibility to the information or the new requirement of the customers, which are known to the management.

The explicit assessments find out the stage of the satisfaction directly. The customers see each part of the partial performance of the consuming product differentially. Then are customers principled able to experience the partial satisfaction, which are psychologically aggregate to the extensive overall satisfaction with the consuming performance by the customers (Mateides, Ďaďo, 2002).

2.2. Measuring of the customers' satisfaction and loyalty

The degree of the satisfaction is one of the guarantees of the customers' loyalty. The concept "customer's loyalty" is defined as a way of the customer's behaviour. This reflects on the market in two ways: the repeat orders and the positive references to the environment.

The difference between the satisfaction and the loyalty is caused by the processes of monitoring of the satisfaction, which usually not account on the two serious factors – the dynamics of the market and the range of the offer of the competition.

The main factors of the customer's loyalty in the competitive environment (Nenadál, 2004):

- the exceeding of the customer's satisfaction,
- the complete customer's satisfaction,
- the position of the supplier in the market,
- the degree of the interdependence of the supplier and the customer,
- the inertia and the customer's convenience.

The degree of the customers' loyalty of SLFW at TU in Zvolen, in spite of the competitive in the area of the information, is mainly given by its position on the market and the unique information base.

The majority of the employees and the students of the Technical University and its faculties, mainly from the forestry and the wood technology there can find the basic source of information for their work and studies. There are collected and preserved the information in the range from the newest scientist knowledge to the historical archives about the forestry and the timbering. Because of the first fact we would include the second factor of the loyalty, which is **the degree of the interdependence of the supplier and the customer**.

In spite of the listed reason of the customers' loyalty of the library, it is important the measuring of the customers' satisfaction with the library and information services, mainly for the suggestions of the processes of the continuous improvement of the quality of the services. With the measuring will be investigated the complete customer's satisfaction and the quality of the partial services and on the base of the following information is possible to propose the concrete action on the part of the management.

3. MEASURING CUSTOMER SATISFACTION WITH THE LIBRARY SERVICES

In our research, we have chosen a method of querying - by the use of questionnaires intended to gathering information on the quality of library-information services provided by the Slovak Library of Forestry and Wood Sciences for external users. Relating the fact, the potential basic group is too big, a selective group formed by the students of the Technical University in Zvolen was determined for our re-search purposes (students of the Technical University in Zvolen represent 97% of active registered library customers).

The main object of our research is the evaluation of the total customer satisfaction with delivered services. To fulfil this goal it is necessary to fulfil partial goals of research:

- to determine the importance of factors by specifying priorities that affect customer satisfaction
- to determine the level of customer satisfaction within individual indicators as well as the total satisfaction
- to determine strategically inevitable measures for the quality improvement

3.1. Creating a proposal of questionnaires for measuring customer satisfaction

The questionnaires represent the most used tool of the application of feedback principle. In order to ensure the effectiveness of the system of customer satisfaction evaluation, we have to choose relevant criteria for the measurement process. We have to respect the following rules of measuring:

- we measure criteria that are relevant for the mission of an institution
- we measure criteria that contribute to the satisfaction of a customer.

We have compiled a questionnaire with 10 point Likert-type scale resulting from the fact that every respondent has a possibility of multi-level (scale) evaluation in order to determine the strength of his attitude. One limit state (degree of satisfaction) expresses **completely positive perception** (10 p.), the other **absolutely negative perception** of a customer (1 p.). We have focused on identifying **customer needs and priorities** as well as on his **assessment of the performance of an organization**.

To research the quality of services we have selected 22 evaluated characteristics that are presented in the table 1 with the research results. The characteristics concern particular fields that play role in the complete perception of the quality of services. The table with evaluated characteristics was offered twice in the questionnaire. In the first table a customer expressed the importance of evaluated characteristics from the viewpoint of his needs - **customer priorities** (10 p. extremely important – 1 unimportant). In the second table customers evaluate the **performance of an organization** based on their expectations (10 p. the best performance – 1 the worst performance). The evaluation was realized on the base of instructions, by writing down the numerical value from 1 to 10 in the row of evaluated characteristic to the right column. The questionnaires were distributed to all parts of the library where the library-information services are delivered to customers. We have used a pro-forma method where the customers have the possibility to fill in the questionnaires after delivering the service. 123 questionnaires were included into the analysis.

3.2. Evaluating the data on the customer satisfaction

As the set of ISO 9000 standards requires obligatory realization of data analysis on the customer satisfaction, these data should be permanently evaluated by an organization. When evaluating the data, it is necessary to take into account the following facts:

- different characteristics of satisfaction can have different level of importance for a customer
- the chief factor is knowing the trends in the development of the customer satisfaction rate

- all company employees, not only the top managers should be acquainted with the results of the customer satisfaction rate evaluation

The most common form of quantifying customer satisfaction is the calculation of an **index of satisfaction.** The calculation according to Nenadal et al (2008) is based on the use of multi-level scale, on the presumption that the satisfaction characteristics can almost always be distinguished for tangible products and delivered services. For our measurement of quality we will use only a part concerning the satisfaction with service characteristics.

The partial index of satisfaction with service characteristics is calculated from the relation:

$$I_{ss} = \sum_{i=1}^{N} w_{is} . S_i , \tag{1}$$

where N is a number of features of customer satisfaction with services,
w_{is} is the weight of i-th feature of satisfaction with services. It must be valid:

$$\sum_{i=1}^{N} w_{is} = 1 \tag{2}$$

S_i S_i – evaluation of the level of satisfaction with the i-th feature of services by selected customers:

$$S_i = \frac{\sum_{x=1}^{n} S_{ix}}{n} \tag{3}$$

S_{ix} – evaluation of the i-th feature of satisfaction with services by the x-th customer
n - a range of selection or the sample size, i.e., the total number of customers of given research.

4. QUESTIONNAIRE METHOD EVALUATION OF THE RESEARCH

4.1. Statistical evaluation of the basic files

The evaluation of the results by the statistical calculation (average, maximum and minimum value, standard deviation, median and multiplicity) indicates Table 1. Although the average value has the general denouncing ability, in some case it can leads to the distorted conclusions. Because of this fact it is appropriate to use another statistical calculation as well.

During the evaluation and analysis of the results, it is recommended to focus attention to the characters, which **the maximal score was given in assessing customers' priorities** (extent of the library's collection, availability of literature in the study halls, length of the rental period, etc.). These characters are important for the customer. There is necessary to focus the attention to the management's decisions. Prioritize and improve the quality of these characters, which are important for the customer. The occurrence of the extreme evaluation of the priorities tells us the characters are for the customer very important or irrelevant.

In the case of the characters with the lower **standard deviation value** (1. 82 for the willingness of the staff to help) are the answers centred on the average, what means the evaluation of the customers is largely identical. In the case of the customer's priorities, the higher values of the variance are caused by the subjective requirements, attitudes and opinions of the customers. For example, the high variance 3, 02 we can find in the paid services, what is caused by the different customers solvency. In the low variance the customers agree in the evaluation. It is necessary to respond to the state, mainly in the case of the low evaluation of the organization performance and higher priority value. Their specification is important for the organization, because the customers respond on the change the most sensitive.

Table 1. Customers' priorities – the statistical evaluation (own processing)

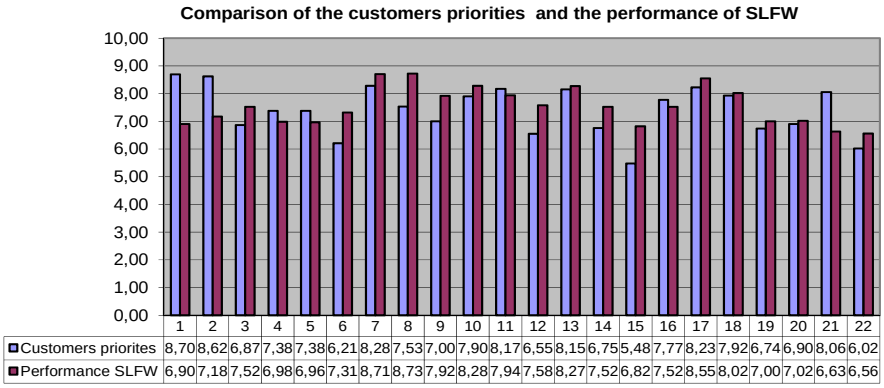
Characteristics of the services	Average	Max	Min	Standard deviation	Median	Multiplicity
1. Extent of the library's collection	8,70	10	5	1,90	10	123
2. Availability of literature in the study halls	8,62	10	2	2,09	10	123
3. Execution of the searches	6,87	10	1	2,28	7	123
4. Quality of the accessible databases	7,38	10	3	2,08	8	112
5. Extent of the accessible databases	7,38	10	2	2,20	8	112
6. Pleasant environment v the study halls	6,21	10	1	2,44	6	123
7. Willingness of the staff to help	8,28	10	2	1,82	9	123
8. Politeness of the staff	7,53	10	1	2,12	8	123
9. Expert advices of the staff	7,00	10	2	2,19	7	123
10. Qualification of the staff	7,90	10	3	2,08	9	120
11. Speed of the service	8,17	10	3	1,92	9	123
12. Information about the provided services in library	6,55	10	2	2,53	7	123
13. The offer of the services via the Internet	8,15	10	4	1,85	8	123
14. Copying	6,75	10	1	2,52	7	123
15. Bookbinding work	5,48	10	1	2,61	5	112
16. Print and save of the found information	7,77	10	2	2,58	8	123
17. Length of the rental period	8,23	10	2	2,45	9	123
18. Opening hours	7,92	10	2	2,48	8	123
19. Height of the registration fee	6,74	10	1	3,19	7	123
20. Prices of the paid services	6,90	10	1	3,02	7	120
21. Facility and technical equipment of the library	8,06	10	1	2,76	8	123
22. Publishing of the library	6,02	10	1	3,23	6	120

By the described method it is properly to analyse the results of **the organisation performance** – the customer's evaluation of the work. The results of the performance average values for the individual characters for calculation of customer satisfaction index are described in the table 2.

In addition to the partial results is important for the organization, on comparing the next measures and their timing, where the characters of the performance surpass the priorities and where is it conversely. The evaluation of the customer satisfaction, disregarding on the priorities, can pose the improvement of the quality for the supplier in the area, which is not important for the customer at the expense of the important characters.

4.2. The comparison of the customer's priorities and the performance of the library

Graphical illustration (figure 2) shows us, in which characters of the services are the priorities higher than the actually perceived performance and which have higher evaluated performance. They show the services, where the potential of the increase of the quality of the providing services exist. All the partial results are necessary to read as the parts of the unit and see the dependence among them. Overall in 7 criteria from 22 are the customer priorities higher than we real see. In others 15 characters of the library services performance of the library surpass the importance of the services for the customer. These services and criteria hide theoretically some rationalization potential, although their reduction can create adverse reactions on the side of the customers. Firstly, it is necessary to raise the quality in the characters, where the priorities surpass the performance.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Customers priorites	8,70	8,62	6,87	7,38	7,38	6,21	8,28	7,53	7,00	7,90	8,17	6,55	8,15	6,75	5,48	7,77	8,23	7,92	6,74	6,90	8,06	6,02
Performance SLFW	6,90	7,18	7,52	6,98	6,96	7,31	8,71	8,73	7,92	8,28	7,94	7,58	8,27	7,52	6,82	7,52	8,55	8,02	7,00	7,02	6,63	6,56

Figure 2. The comparison of the customer priorities with the performance of SLFW (own processing)

Based on the analysis of the result it must be proposed measures for the improving of the quality by the organisation. Partial characteristics of the services hide in itself a lot of related and on-going processes in the organization, which are less or more visible for the customer. It is mainly a process of information processing and the databases building. The customer see the database of the information as a product, with which works and which the final effect of his requirements on the library and information services gives. There is a lot of work of the people behind the product, with who do not come into the contact. The library management has to identify and manage a lot of related activities for the effective operation of the organization. On the base of the set of standards ISO 9000 the management supports the adoption of processing access for the improvement of the services quality. After the realization of the measuring the library went through an extensive renovation, what had an impact on the quality of the services and customer's satisfaction. In the present is being realised the new monitoring of the customer's satisfaction.

4.3. Index of the customers' satisfaction

Often used and relatively accurate way of the quality specification through customer satisfaction is the calculation through **the customer satisfaction index**. Calculated indexes are possible to statistically evaluate, for example according to the time in the way to reliably know the trends in the development of the customer satisfaction. During the index customer observation it is importance the analysis of the effect main measure or the competitive activities is important to increase index explanatory.

The evaluated results of measuring the customers' satisfaction in SLFW are stated in the table 2. On the base of **the weight of the importance** (priority) **w** (2) and **the evaluation of the performance S** (3) we get **the weighted average** of the partial characteristics of the services. Using them based on the given relationship (1) we get final result, which we convert to a percentage.

On the base of the calculations index of the customers' satisfaction with the services of SLFW represent 75, 73%. The gap for improvement of library and information services represents more than 24%. This gap is composed by the combination of the partial lack of the individual characters of services from the customer prospective. Managers and workers of the library have to sense this lacks not only partial, but also from the aspect of continuity partial process as well and mutual independence of some characters of services. It is appropriate for this type organizations within the quality management proceed to the control of the organization based on the processing access. Based on the standard ISO 9004 the advantage of processing access is the continuous management links between the partial

processes in the process systems and also management of the combination and interactions of processes in the organization.

Table 2. Index of customer satisfaction (own processing)

Services characters	Value of priority	Weight of the importance *w*	Value of performance *S*	Weighted average
Extent of the library's collection	**8,7**	0,0535	6,9	**0,3692**
Availability of literature in the study halls	**8,62**	0,0530	7,18	**0,3806**
Execution of the searches	**6,87**	0,0422	7,52	**0,3177**
Quality of the accessible databases	**7,38**	0,0454	6,98	**0,3168**
Extent of the accessible databases	**7,38**	0,0454	6,96	**0,3159**
Pleasant environment v the study halls	**6,21**	0,0382	7,31	**0,2792**
Willingness of the staff to help	**8,28**	0,0509	8,71	**0,4435**
Politeness of the staff	**7,53**	0,0463	8,73	**0,4043**
Expert advices of the staff	**7**	0,0430	7,92	**0,3409**
Qualification of the staff	**7,9**	0,0486	8,28	**0,4023**
Speed of the service	**8,17**	0,0502	7,94	**0,3989**
Information about the provided services in SLFW	**6,55**	0,0403	7,58	**0,3053**
The offer of the services via the Internet	**8,15**	0,0501	8,27	**0,4145**
Copying	**6,75**	0,0415	7,52	**0,3122**
Bookbinding work	**5,48**	0,0337	6,82	**0,2298**
Print and save of the found information	**7,77**	0,0478	7,52	**0,3593**
Length of the rental period	**8,23**	0,0506	8,55	**0,4327**
Opening hours	**7,92**	0,0487	8,02	**0,3906**
Height of the registration fee	**6,74**	0,0414	7,00	**0,2901**
Prices of the paid services	**6,9**	0,0424	7,02	**0,2979**
Facility and technical equipment of the library	**8,06**	0,0496	6,63	**0,3286**
Publishing of the library	**6,02**	0,0370	6,56	**0,2429**
Sum	**∑162,61**	∑ 1,00		**∑7,5732**
Index of customer satisfaction I_{SS} v %				**75,73%**

5. CONCLUSION

In the paper was evaluated the satisfaction of external customers through the characteristics of library-information services using 10 point evaluation scale. On the base of monitoring results, the critical points in the process of delivering services were specified, as the input information for the library decision-making processes in the improvement projects, or as an input and impulse for the processes of deeper investigation of particular characteristics, by using other methods. The results of customer satisfaction measurements have to be the focused to the continuous ob-servation for managers. Increasing or decreasing the satisfaction rate of external customers is largely dependent on the satisfaction rate of internal customers – employees of an organization, as well as on the number of other factors that are not directly perceived by an external customer when delivering the service.

The satisfaction of a customer with a service, as a feedback in applying the quality management systems is a first step in improving the quality and increasing the satisfaction of customers. On the base of these results it is necessary to study other possible impacts on the quality of services from the viewpoint of the organization structure, quality of support processes, first of all the system of processing and storage of information resources, for the purpose of satisfying the customer needs and supporting the service delivery processes in the direct contact with the customer. Selected approaches can be applied to the environment of academic libraries, general libraries as well as to other information and educational institutions what results from the character and division of work.

The influence of the rate of satisfaction should be one of the important impulses for permanent improvement, not only of the service delivery processes but also of all supporting processes. This will gradually reflect on the need for change of organizational structure.

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TESTING OF THE WELDING BLADES MATERIAL FOR THE BEAMS PRODUCTION

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ABSTRACT

Processing of tree trunks (wood) on the other blanks, such as planks, beams, etc., is an important step in the processing of wood for both the construction industry and furniture production. For this processing is an important element a machine and tool. For this type of woodworking are used so-called bole band sawmills and the tool is a saw bands. This article analyzes the welds that are required when using these belts.

Key words: sawmill, saw band, trunk, weld, analyses

1. INTRODUCTION

For the production of semi-finished products for the building and furniture industry is first necessary to process tree trunks.

One of the means that are used for this process are the trunk band saws, where the tool is the saw band. Saw band (Fig.1) has the shape of a thin continuous band and is used for tree trunks cutting. [1, 4]

Figure 1. Saw bends for tree trunks cutting

These bands are operated in quite difficult conditions, and therefore are placed on them as well as high requirements in terms of materials.

They are usually manufactured from tool steels, which have specific characteristics compared to conventional construction steels. By way of loading these instruments are required to have their material

mainly dimensional stability and constant cutting properties, it is sufficient cutting performance, durability, high enough hardness, strength, flexibility, resistance to wear and tempering, hardenability and adequate level of toughness.

Quality bandsaw is determined mainly by the chemical composition of the material and its heat treatment. The size, type and frequency of the dynamic parameters of the cutting wedge followed by size, shape and type of loading indicates the need of material characteristics because the bands material must comply with such requirements. For these saw bands are used tool steels, carbon steels and low-alloy steels. From the carbon tool steels that are usually steel Ck 75 to 12 according to DIN 17222-79, steel class 19301 according to STN 41 9301, steel class 19 191 according to STN 41 9191, as well as steel UHB-15and UHB-15N20 by corporate signage company Uddeholm in Sweden etc. From the low-alloy tool steel for these purposes are usually used C15W according to DIN, GHS (corporate signage), 80 NiCr11 DIN, 50CrV4 according to DIN and 75 CR1 according to DIN. [2, 5, 8]

The actual saw bands for use in sawmills they must be processed. Their preparation consists from the operations unfolding strip of material, cutting teeth, bonding strips, treatment and control of weld, alteration of internal tension by rolling, distribution, pushing and leveling of the saw teeth and sharpening on the last.

The paper deals with the evaluation of welds of these blades. Figure 2 shows a schematic layout of zones of welded joint. Welding of belts can be realized as either electric arc welding in protective atmosphere of gases or resistive touch welding. [6, 7, 9]

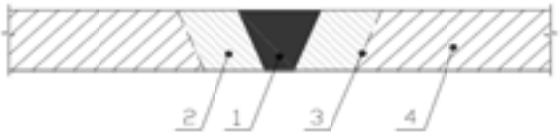

Figure 2. Schematic layout of zones of welded joint, 1 – The microstructure of the weld metal (bainitic), 2 - Weld heat-affected zone (the structure of bainite and sorbitol formation), 3 – Microstructure consisting of sorbitol, 4 - The basic saw band material composed of tempered martensite

Made welds should be tested. One of these tests is the tensile test, namely, according to EN 895 (STN EN 895). According to this standard, the test rod (Fig. 3) is taken in the transverse direction of the weld joint, so that after the mechanical machining the weld axis remained in the middle of the test length of the test bar. When making test pieces from welded samples the surface of the rod is machined to remove surface notches and misalignment of weld edges until a flat surface over the entire active area of the test bar. [2, 8,]

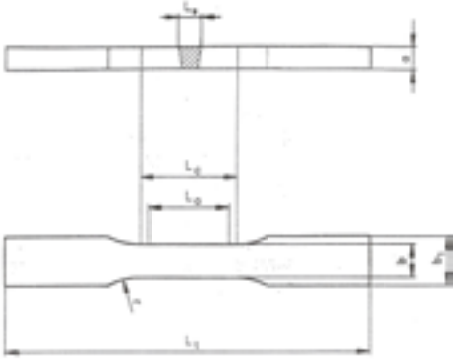

Figure 3. The shape and dimensions of flat test rod for tensile testing of butt welds according to EN 895, L_s – width of the the weld, L_t – total length of the rod, L_0 – test length of rod, a – thick of rod, b1 – head width of the rod, b – neck width of the rod

Due to thermal damage to connected materials, which significantly affects the homogeneity of the structure and thus the mechanical properties of the material, it is necessary to take precaution to mitigate the possible negative effects. These effects are usually alleviated by thermal treatment, in this case annealing. It is understood the thermal treatment in which the material is subjected for some time to elevated temperature and then slowly cooled. This type of heat treatment should lead to the achievement of a state that is closest to the equilibrium state of the material. [4, 5]

2. EXPERIMENT

Welded blades for the experiment were from carbon steel labeled C 75, strip thickness was 1.1 mm. The manufacturer of this material was firm Viking Martin Miller (Austria). The chemical composition of the material by the manufacturer is shown in Table 1. The manufacturer gives the hardness in the range of 373-514 HV.

Table 1. The chemical composition of the material C 75

C [%]	Si [%]	Mn [%]	P [%]	S [%]
0,75	0,25	0,70	0,025	0,020

Bandsaw blades welding was carried out in conditions of developmental workshops and laboratories TU in Zvolen using the device for welding bandsaw blades in protective atmosphere of gases MIG (Fig. 4) using a protective atmosphere of pure argon.

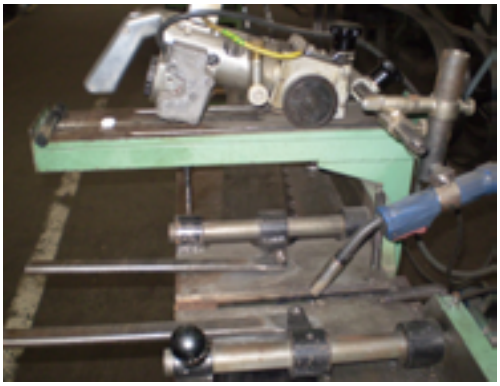

Figure 4. Welding equipment

Additive material for welding had marking OK Autrod 12.56, wire diameter was 1.2 mm. and its chemical composition is shown in Table 2. [10]

Table 2. Chemical composition of additive material OK Autrod 12.56

	C (%)	Si (%)	Mn (%)	P (%)	S (%)
Min.	0,06	0,7	1,3		
Max.	0,14	1,00	1,6	0,025	0,025

Samples were cut off from the bandsaw blades and then welded together. Each sample was welded at a welding current 60 amps. Immediately after welding, the sample is placed on top of propane-butane burner and subsequently it was heated to the annealing temperature (except for unannealed samples for comparison). Samples were therefore treated so that A_0 sample was not

annealed after welding, the A_1 sample was annealed at 350° C and sample A_2 was annealed at 555° C (Fig. 5). After reaching the required temperature the samples were cooled in air down to ambient temperature. The heating time of the samples was 2 minutes for A1 and 3 minutes for A2.

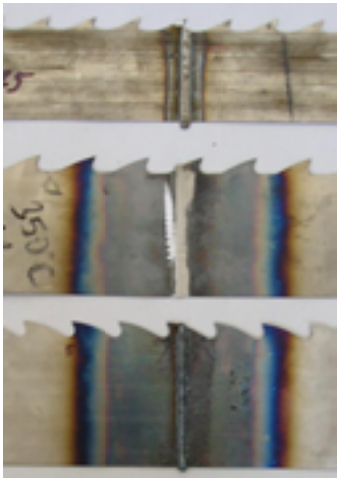

Figure 5. Welded and annealed blades

3. ANALYSES

From welded and annealed bandsaw blades were prepared samples and they were analyzed by mechanical tensile testing. This test was performed according to the standard STN EN 895. [2, 11]

For measurements the samples were used that were removed from the welds by water jet cutting. For all welds were removed two pieces of test samples for tensile test. After cutting the samples were ground to a desired surface roughness Ra 1.6. The shape of of the test sample is in Fig. 3. Example themselves prepared samples is shown in Fig. 6.

When perform the test is always a record of the test, which includes: identification of the base material, filler material, welding method, the method of testing the original material thickness, weld, heat treatment method, the dimensions of the test bar, etc.

For testing weld tensile this method consists in the specimen tensile strain at a given strain rate in order to determine the characteristics of mechanical properties. Sample standard prescribed shape and size is clamped into the jaws of the test digging device so that the axis of the sample coincides with the axis of the applied force, which increases the load until it breaks. During the test, graphically records the dependence of specimen extension on the applied load. [2, 11]

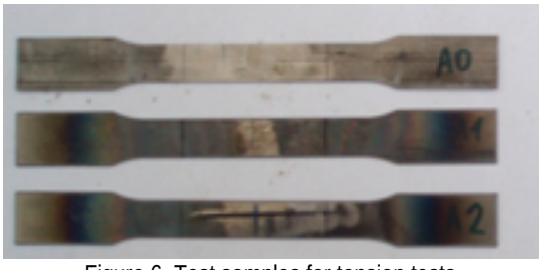

Figure 6. Test samples for tension tests

Experimentally determined tensile strength of each sample is shown in Table 3, Fig. 7 shows an example of the record of the progress made by the tensile test.

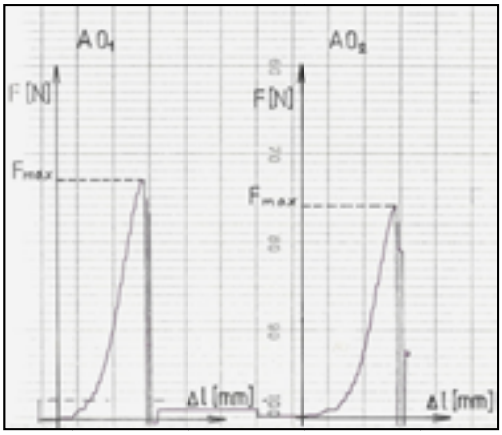

Figure 7. Example of tensile tests record – A_0

Table 3. The measured values of tensile tests

Sample	F_{max} [N]	Δ l [mm]	S_0 [mm^2]	Rm [MPa]	A [%]
A 0 $_1$	14 650	0,50	13,97	1048,68	1,00
A 0 $_2$	13 100	0,60	13,97	937,72	1,20
A 1 $_1$	13 250	0,80	13,97	948,46	1,60
A 1 $_2$	13 050	1,30	13,97	934,14	2,60
A 2 $_1$	13 050	1,50	13,97	934,14	3,00
A 2 $_2$	13 100	1,00	13,97	937,72	2,00

The results have shown that with increasing annealing temperature decreased the force needed to break the sample, which means that also reduce the tensile strength. Ductility significantly with varying parameters not changed, it is possible to observe a slight increase in ductility of the annealed samples in comparison with samples nonannealed.

Break of test samples for nonannealed state occurred in the heat affected zone. For other samples was determined that a break in most cases occurred in the weld area, while in the weld metal and heat affected zone. On Fig. 8 are broken samples. The above showed that the method used of welding and subsequent heat treatment is the correct procedure for welding bandsaw and using appropriate materials and welding methods can achieve the desired result. Here it should be noted that an important factor is also the subject of technological discipline.

Figure 8. Broken test bars after tensile test

4. CONCLUSION

Increased customer demands for quality products sawed wood material necessitate increased efficiency of sawing process. Cutting by band saw has many advantages that provide the desired increase in efficiency and product quality. The quality of the process of sawing depends mainly on the quality of the instruments, ie blades. One of the main indicators of quality saw blades is their bond, in which the frequent infraction. Therefore, research is important in this area.

The results of tensile tests showed that with increasing annealing temperature is slightly reduced the force required to break the sample, which means even a slight reduction in tensile strength. However, annealing after welding is an important element of the technology saw blades, and because the decline was minimal, it is not necessary to consider the negative impact of this operation, because the benefits are much greater than any minor complications that come with it. It should also be noted that this issue should be given more attention.

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IDENTIFICATION OF AREAS TO IMPROVEMENT IN THE NEW PRODUCT DEVELOPMENT PROCESS – A CASE STUDY IN THE POLISH FURNITURE INDUSTRY

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ABSTRACT

The concept of process maturity was popularized by software industry. It was used to indicate the areas in company processes demanding improvement. The idea of accessing the process maturity also has application in new product development. In this article that opportunity was examined relating to furniture industry. Development and implementing Polish furniture on the market first time was diagnosed in 2006 by Rutkowski. Since then any research didn't review the then bad results of furniture plants. Taking up the subject of estimating maturity level for the new furniture development was urge to fill the gap. In this aim the case study in three large furniture enterprises was conducted. The 35 criterions were prepared for accessing in the Lickert's scale by manufactures. Conclusions indicate that the level of maturity of the new furniture development process has increased in the last years.

Key words: Capability Maturity Model (CMM), new product development, furniture industry, case study.

1. INTRODUCTION

There is no doubt that new and innovative products are critical to the future of the company, if it wants to achieve success in the marketplace. However, the rapidly changing competitive conditions and increasing consumer requirements mean that companies are forced to increasingly engage in a process that is new and innovative products creates - the process of new product development. Trends, that draw the attention of the consumer to the product, are already visible in the Polish economy.

Polish furniture is one of the most important groups of industrial products intended for export. Currently, Poland is ranked third among the European exporters. The total value of Polish furniture market in the last year amounted to 32 billion PLN (including micro-enterprises) and was almost 5 billion PLN higher than the previous year. In 2011 export value of the furniture industry was higher by 3.6 billion PLN than the previous year and was estimated at 26.8 billion PLN. Moreover, Poland is today one of the countries, which lead in the world furniture trade. Poland takes 4th place behind countries such as: China, Italy and Germany but before Canada and the USA.[1] 4 position of the Polish furniture industry is significant. China compete mainly by price, Italy - through design, Germany - through quality but Poland little by little through each of these factors. Therefore, specialization of Polish furniture industry seems to be inevitable, if the industry will continue want to grow. The key to success will be the product manufactured by that industry, it means furniture. Thus, actions of furniture manufacturers should be based around streamlining and improving the efficiency of carrying out the process of new furniture development. But no less important is the awareness of the effectiveness degree of a new

[1] Grzegorzewska E., Niziałek I., Jenczyk-Tołłoczko I. (2012), ASSESSMENT OF THE FURNITURE INDUSTRY CONDITION IN POLAND, Ann. WULS-SGGW, Forestry and Wood Technology t. 77.

product development process. The maturity matrix (CMM - Capability Maturity Model) could be used to assess it. Raising awareness of process participants about the possibilities of its improvement, it should be the motivator to improve existing procedures or to verify the employees' perceptions about the process.

The concept of process maturity has been proposed for various management approaches as a way to evaluate "the state of being complete, perfect, or ready" and the "fullness or perfection of growth or development" used two dimensions – effectiveness and efficiency – to rate the condition or maturity of a process.[2] For those reasons, this study was dedicated the evaluation of the effectiveness level of the new furniture collection in large industrial plants.

2. CAPABILITY MATURITY MODEL

Maturity is defined as the extent to which a specific process is explicitly: defined, managed, measured and continuously improved".[3] Capability Maturity Model (CMM) was created in 1980. CMM is a stage model where maturity level of the organisation or process is rated with one figure – maturity level – which is determined based on the performance of key process areas. Its main purpose was application for evaluation of the software development process. The maturity of an organization software development process is assessed to be one of the following levels: *initial, repeatable, defined, managed and optimizing* (tab. 1). [4]

Table 1. CMM's maturity levels and theirs descriptions (Dooley et al. 2001)

Level	CMM's maturity levels	Description
5	*Optimizing*	Continuous process improvement is enabled by quantitative feedback from the process and from piloting innovative ideas and technologies.
4	*Managed*	Detailed measures of the process and product quality are collected. Both the process and products are quantitatively understood and controlled.
3	*Defined*	The process for both management and engineering activities is documented, standardized and integrated into a standardized process for the organization. All projects use an approved, tailored version of the organization's standard process. Activities are well integrated.
2	*Repeatable*	Basic Project management processes are established to track cost, schedule, and functionality. The necessary process discipline is in place to repeat earlier successes on similar projects.
1	*Initial*	The process is characterized as ad hoc, and occasionally even chaotic. Few processes are defined, and success depends on individual effort.

[2] Warrilow D. (2006): PROCESS MATURITY, Logistic & Transport Focus, July 2006, p. 28.

[3] Dooley K., Subra A., Anderson J. (2001): MATURITY AND ITS IMPACT ON NEW PRODUCT DEVELOPMENT PROJECT PERFORMANCE, Res Eng Design 13, 2001, pp. p. 25.

[4] Jokela T., Siponen M., Hirasawa N., Earthy J. (2006): A SURVEY OF USABILITY CAPABILITY MATURITY MODELS: IMPLICATIONS FOR PRACTICE AND RESEARCH, Behaviour & Information Technology, Vol. 25, No. 3, May - June, p. 265.

By virtue of its existence, every organisation is a maturity level 1. In the *initial*, first level the development process is ad hoc. There is no synergy between development projects and work succeeds simply because of the effort of individuals. To reach level 2 (*repeatable*), an organisation should satisfy the goals of seven process areas – such as "Requirements management" and "Project planning". Efforts and actions can be replicated with some consistency across multiple projects. To achieve level 3, an organisation should perform all the process areas of level 2 plus the process areas defined for level 3 – such as "Requirements development" and "Technical solutions". As the process is *defined* it takes on an even greater degree of consistency, repeatability and predictability. When the process becomes *managed*, various performance measures are collected and used to track process performance. Project data is collected and analyzed over multiple projects, and some corrective action takes place. At an *optimising* level, interim measures of project (process) performance are monitored for potential immediate corrective actions. In sum, maturity levels 4 and 5 require the implementation of new process areas as well as those of the lower level process areas. [5, 6]

3. MATURITY OF A NEW FURNITURE COLLECTION DEVELOPMENT PROCESS

The product development process can vary among industries and individual companies in terms of the stages involved, time length of each stage, stage sequencing and the total time of span involved. Given the variability in product development among differing industries, it is important to understand product development activities specific to furniture.[7] A new product in the furniture industry very often means a new furniture collection (i.e. a products line linked through style and a common name), fulfilling the criterion of novelty for first 24 months of sales, which were entered to the sale system by the manufacturer. The newness factor can be expressed in a modified or improved design or construction, use of a new material, a new process, a new method of customer service, satisfying new customer needs or meeting current needs in a better way.[8] Nevertheless, in Polish manufacturing, but also in wood industry, the biggest pressure is applied to technological innovativeness, whereas, the non-technological innovativeness (activities related to organisation, product and marketing) seems to be less important for the entrepreneurs. However proper operating on the market needs introduction of both kinds of innovation activities and it is important to find balance between them.[9]

The only point of reference to the maturity degree of the new product development process in the category "furniture and wood products" are the study by Rutkowski (2006) (but without specifying the size of companies). The result was to determine the maturity of the process in the category: "furniture and wood products". It was evaluated on average 2.5 in a 5 - degree scale, with the minimum 1.8 and maximum 3.2.[10]

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[5] Jokela T., Siponen M., Hirasawa N., Earthy J. (2006): A SURVEY OF USABILITY CAPABILITY MATURITY MODELS: IMPLICATIONS FOR PRACTICE AND RESEARCH, Behaviour & Information Technology, Vol. 25, No. 3, May - June, p. 265.

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4. CASE STUDY

According to Zainal,[11] case study research method is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used. Case studies are considered useful in research as they enable researchers to examine data at the micro level.

The study was conducted from September to December 2011. Three large, Polish case-goods furniture manufactures are considered in this case study. Because of their preferences, they remained anonymous. Therefore they were called: the plant I, the plant II and the plant III. They vary in relation to the shelf price and the quality class of the furniture range. The plant I is the furniture manufacturer within the lowest price and quality shelf. The plant II in its selling offer has got products, which are more expensive, has got better quality, but from this reason the construction and the technology process are also more complicated. The plant III manufactures the furniture of the highest quality, the very advanced level of technology and the highest product prices (i.e. the premium class furniture).

4.1. RESEARCH METHOD

The degree of maturity of the new product development process it was decided to look into using 35 criteria elaborated on the basis of the characteristics of process maturity levels prepared by Rutkowski (2006). The criteria are presented in the form of questions. During the interview, representatives of the three companies were selected to evaluate those criteria in a subjective way, on a scale from 0 to 5 (the so-called Likert's scale):

0 - was the lowest in the hierarchy, and in response to the question meant strong opposition;
1 - granted, if the manufacturer had not planned to take in the future, any changes or improving actions;
2 - when the manufacturer stated that the way of thinking and conduct in his plant is rarely used;
3 - assigned when it was applied for half of the conducted processes;
4 - manufacturer had evaluated specific practices in his company as a frequent and adequate for almost all development processes;
5 - ascribed when the manufacturer was fully confident that the approach (action) is in 100% justified to describe the work under the development projects.

Manufacturers judged the product development processes carried out in the past 5 years, what in all cases constituted the period from 2006 to 2011. Their scores were averaged at the end and the results determined the maturity level of the new furniture collection development.

4.2. RESULTS

The best realization of the new furniture development process diagnosed in the plant III - on 3.8 in the 5-degree scale. The most critical evaluation had came from the plant II, where it was estimated on 3.3. The plant I evaluated its development process on 3.6. It means, that every plant has got the new furniture collection development process on the third (*defined*) maturity level and it going to achieve of all the criteria from the fourth (*managed*) level.

[11] Zainal Z. (2007): CASE STUDY AS A RESEARCH METHOD, Journal Kemanusiaan bil. 9, June, pp. 1, 5.

Table 2. The maturity criteria and theirs evaluation in processes of the new furniture collection development in the analysed plants (based on own study)

	No.	Criteria of development process maturity of the new furniture collection	Evaluation (scale: 0 – 5)		
			Plant I	Plant II	Plant III
I. PROCESS APPROACH	1.	Is a new product development considered as a process in your factory?	4	5	3
	2.	Are company resources and its competencies analyzed before a new product development process starts?	5	5	5
	3.	Are: tasks to perform, preconditions, expected results, techniques, methods and mechanisms of a process defined before a new product development process starts?	2	4	4
	4.	Are procedures and tasks to perform in a process of developing a new product established?	3	3	4
	5.	Are specific ranges of competence and responsibility of participants in a process of a new product development defined?	4	3	4
II. PROCESS REALISAION	6.	Are the tasks and activities documented in a new product development process (e.g. through: reports, design and technical documentation)?	4	4	5
	7.	Are activities in a new product development process led parallel (e.g. two or more tasks at the same time)?	4	4	2
	8.	Does a new product development process provide information to support the formulation of strategy in line with the requirements of customers and prospective conditions of the environment: competitive, technological and legal?	3	2	2
	9.	Are customer's expectations towards a new product taken into consideration in a development process?	4	4	5
	10.	Does a new product development process for different models (types) of furniture look similarly?	4	4	4
	11.	Are suppliers and recipients included in a new product development process?	3	4	4
III. QUALITY OF PROCESS REALISATION	12.	Are errors in new product assumptions detected quickly?	5	2	4
	13.	Are errors in a new product development process removed quickly?	5	4	4
	14.	Does your factory aspire to reduce the number of changes on the final stages of a new product development process?	4	5	5
	15.	Is time of a new product development process considered as important?	5	2	5
	16.	Is an attempt of reduction of new product development time important?	5	5	5
	17.	Is a new product development process carried out by using a minimum level of resources (e.g. people, money, time, competence)?	3	4	3
	18.	Do you make an effort to reduce costs of development and new products manufacturing?	3	5	5
	19.	Are costs of a new product development process on a satisfactory level?	3	1	3
	20.	Can knowledge about conducted processes of developing a new product be rapidly acquired (e.g. from database)?	4	1	3
	21.	Is implementation of a new product development considered to be uncomplicated process?	3	2	2
IV. MAKING PROCESS	22.	Do you define risks associated with a new product development process?	2	1	4
	23.	Are goals (e.g. outcomes, costs, process effectiveness) of a new product development process measured (e.g. by checklists, calculation of indicators, analysis of sales)?	2	4	3
	24.	Do you make attempts to improve a new product development process?	2	4	5

	No.	Criteria of development process maturity of the new furniture collection	Evaluation (scale: 0 – 5)		
			Plant I	Plant II	Plant III
	25.	Are indicators (e.g. financial) used in order to confirm efficiency and performance of a new product development process?	3	1	4
	26.	Do used measures (e.g. indicators, such as Break Even Point, share of income or expenses from the sale of new products) reflect effects of undertaken process improvements?	3	4	3
	27.	Can a new product development process in the plant be regarded as effective (i.e. achieved sales result is higher than the cost incurred to achieve it)?	4	3	3
	28.	Do measurements of effectiveness suggest that a new product development process is devoid of faults and defects?	4	2	2
	29.	Is the highest possible product quality created in the course of the realization of a new product development process?	4	4	5
V. PROCESS SUPPORTING	30.	Is a new product manufacture process automated to the highest rate?	3	4	5
	31.	Is in a new product development process applied a technique of benchmarking (i.e. compare with the best in the industry)?	4	3	5
	32.	Are methods and tools, applied to support a new product development, known and easy available to all employees involved in the process?	3	1	3
	33.	Are methods and tools, used in the process of developing a new product, easy to use by employees?	4	1	3
	34.	Do you apply CAD software as a method to help design and develop a new product?	5	5	5
	35.	Are methods and techniques, other than CAD, applied to assist the development of a new product?	2	4	2
		ARITHMETIC AVERAGE (i.e. MATURITY LEVEL):	**3,6**	**3,3**	**3,8**

Legend
Likert's scale for judgement of the criteria

Points		Criterion evaluation
0	=	*Definitely not*
1	=	*Planned but not implemented*
2	=	*Rarely*
3	=	*Implemented for the half of processes*
4	=	*Usually*
5	=	*Definitely yes*

Legend
Maturity levels of the new product development process

Level	Process maturity level
5	*Optimizing*
4	*Managed*
3	*Defined*
2	*Repeatable*
1	*Initial*

Presented in the table 2 the maturity criteria for the new furniture collection development process ware divided on five thematic groups which successively are: approach to the preparation and conducting of new product development process (I), the process realization (II), then the quality (i.e. the way and methods) of its execution (III), trial bring improvements to it (IV), and support to carry out the process through the use of appropriate tools and techniques (V). Results of average grades obtained by the plants in these groups are illustrated in Figure 1.

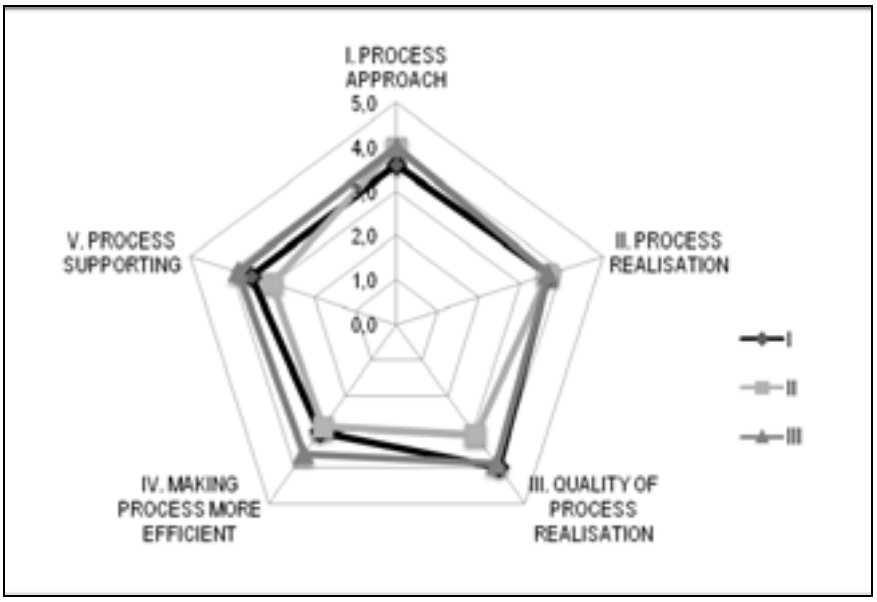

Figure 1. Average grades obtained by the plants in five groups of the maturity criteria (based on own study)

The plant I presented itself the best when it comes to its assessment of the implementation process and the quality of the manner its performance (II and III), while the area which had been evaluated low, was to contribute improvements to the process (IV). Priorities for the plant II were groups I and II: an approach to the process and its implementation, but definitely the role of carrying out and improving the quality of the process was diminished. The plant III the approach to the progress (I) and assess the quality of its development process (III) evaluated on a high level. However the shortcomings saw in a too low rate of improvements introduced in that process, and possibly insufficient application of tools and techniques to support the development of a new product.

4.3. DISCUSSION

In the study carried out for the purpose of this paper, the process of a new furniture collection development, was assessed subjectively by each of the three, large entrepreneurs. The maturity level was the higher than even in 2006 and amount to average 3.6. Now, it hesitates between the third level of the maturity called *defined* and the fourth - *managed*. In 2006 standard (i.e. 2.5) established the border between: *repeatable* and *defined* level. It can be critical to refer to Rutkowski's results. Therefore it could be stated that there is a high probability that large companies from the furniture industry have the maturity level of a development process on a higher level than it was even 6 or 7 years ago.

At all plants, the weakest link in the new product development process turned out to be an area to implementation of improvements in the process. It was oriented primarily to control and measure its effectiveness. Therefore it can be assumed that this is a problem, which furniture manufacturers should undertake in the first sequence. In summary, the introduction of improvements in the new product development process is, or soon should become the necessary area of interest for furniture manufacturers.

4.4. CONCLUSIONS

The current maturity level of the new furniture development process shows its evolution from between the *repeatable* (2) and *defined* (3) on the higher - estimated between *defined* (3) and *managed* (4). Reaching the fourth level with five-stage scale of the process efficiency (i.e. the *managed* level), is possible only through the introduction of improvements in the procedure and area of the process management. The existence of space to take action in this subject was confirmed.

5. SUMMARY

The product is a fundamental component and the result of the business, including marketing actions. However, even the best-made actions to support the sale will not bring results if the product does not meet the expectations and satisfy customer needs. The key to the introduction of the new furniture on the market with succeed is a solid and comprehensive understanding of the customers' needs. At the same time, manufacturers should also aim to increase the efficiency and effectiveness of the new product development process, because in this way they will reduce costs and shorten the duration of the process. Proper activities are necessary if furniture manufacturers want to be more competitive on the market. Thus, in the face of the challenges standing ahead the furniture industry in Poland, changes in the area of new product development process seems to be the beneficial and inevitable solution.

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KNOWLEDGE TRANSFER SOLUTION IN THE ENTERPRISES: BUSINESS-TO-BUSINESS INTEGRATION MODEL

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ABSTRACT

This article elaborates on the model of knowledge transfer between knowledge workers in the sale area in the manufacturing enterprises based on the real case studies. The authors aim at analyzing a solution Business-to-Business for a sale area in the company based on the research results. Specifically, likely consequences using this B2B solution of knowledge transfer between knowledge workers are studied. This was followed by a discussion on the results of the literature and empirical studies. The summary shows the directions of a further work.

Key words: knowledge transfer, B2B solution, knowledge workers.

1. INTRODUCTION

Many research topics focused on knowledge transfer in the enterprises, also effects of knowledge transfer have been explored in depth. Zander and Kogut (1995) explored the effect of knowledge transfer on competitiveness of Swedish manufacturing firms such as codifiability, teachability, complexity, system dependency, and product observability. Lord and Ranft (1998) suggest that i.a. communication mechanisms have important effects on knowledge transfer. Knowledge in a company should be attached to the executed tasks, and workers must capture knowledge as part of their normal work. Knowledge workers are a critical asset of the company to knowledge transfer. The capacity to manage knowledge workers and to convert it into useful product and services - is fast becoming the critical executive skill of the age. According with Kogut and Zander (1993) and Simonin (1999) we argued that in addition to explicit knowledge, such as technology, tacit knowledge like business management know-how is also added in the definition of knowledge. Therefore, the concept of knowledge as an object of transfer is broadened in the dynamic perspective: tacit and explicit knowledge (Polyanyi M. 1966), (Teece D. 2002). Researchers naturally assumed that knowledge, especially technological knowledge, can be transferred. However, knowledge transfer becomes the process through which one unit is affected by the experience of another (Argote l. and Ingram P. 2000).

So the following questions may arise: whether knowledge transfer in the manufacturing companies using communication mechanism between knowledge workers influences competitiveness of enterprises? What is the key integration model which would result in competitiveness of enterprises?

This study aims to explore the knowledge transfer using communication mechanisms between knowledge workers in sale area in the manufacturing enterprises. Based on a survey of 50 polish manufacturing companies this study employed the correlation analysis to investigate the research

hypothesis. The remainder of this paper is organized as follows. Section 2 presents the literature review for introducing key constructs of our research. Section 3 develops a research model to depict hypothesized relationships and data collection. Implications and limitations of this study, research directions, and concluding remarks are discussed in Section 4.

2. THEORETICAL BACKGROUND AND HYPOTHESES

Knowledge transfer in the manufacturing companies

Guerra (2004) suggest, that understanding about knowledge roles in the manufacturing enterprise need to be explained. Knowledge transfer in a company is defined as a process through which one unit is affected by the experience of another (Argote and Ingram 2000).Tan and Platts (2004) provided knowledge-connected networks to encourage managers to have a broader view based on an understanding of variables relationships. Today's knowledge workers should solve problems that facilitate the effective and efficient product manufacture. Numerous information technology based systems have raised knowledge workers' productivity (Wu 2001). According with Berry and Broadbent (1987) we state that knowledge workers are also able to transfer both tacit and explicit knowledge to new contexts. We define knowledge transfer as the process by which knowledge workers receive and provide knowledge so that it could accumulate competitiveness of enterprises.

Information technology in the manufacturing companies

Soilbelman and Kim (2002) proposed that the latest communication and information technology can improve collaboration, coordination and information exchange among organizations. Business-to-business (B2B) integration refers to all business activities that have to do with the electronic exchange of business documents between the companies [Bussler 2003]. B2B integration extends Electronic Data Interchange (EDI) by emphasizing that these business documents are exchanged as electronic messages following public business processes, i.e. business processes between the companies [Bussler 2003]. The purpose of B2B integration is to automate business interactions, i.e. the exchange of business documents in the public business process [Patalas-Maliszewska and Krebs 2012]. So, we suggest, that knowledge workers, who use information technologies such as B2B solution can better transfer useful knowledge in the company.

Knowledge workers in the manufacturing companies

The term ‘‘knowledge worker’’ seems to have started to appear after 1973 when Drucker [Drucker P. 1973] first presented it. However, a clear definition has not yet been established. Davenport’s definition [Davenport T. 2005] is “knowledge workers have high degrees of expertise, education, or experience, and the primary purpose of their jobs involves the creation, distribution, or application of knowledge”.

This brings us to formulate the following hypothesis (Fig. 1):

H1: Use of information technology by knowledge workers has a positive effect on competitiveness of enterprises.

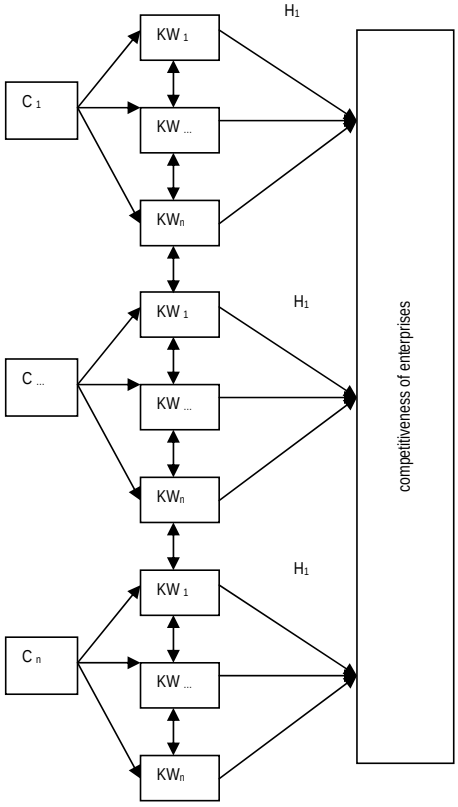

Figure 1. Research model

3. BUSINESS-TO-BUSINESS INTEGRATION MODEL FOR KNOWLEDGE TRANSFER IN THE ENTERPRISES

The aim of this study is to explore the impact of knowledge transfer between knowledge workers using information technologies such as B2B on competitiveness of each company.

A questionnaire was developed to examine the nature of knowledge transfer in the 50 polish manufacturing enterprises. We collected data on the number of enterprises, which use information technologies included B2B solution to transfer knowledge between knowledge workers in the sale area of enterprise. As a research result we obtained, that only 22 manufacturing companies use B2B solution in the sale area of the company. Further regression analyzes were conducted on this group of companies. So we received the following data base:

Table 1. Research results

Companies	*Knowledge Transfer between knowledge workers in the sale area in the polish companies (1- insignificant; 5-very important)*		
	Knowledge on customers	*Knowledge on suppliers*	*Competitiveness of enterprises competition*
C1	2	2	2
C2	2	2	2
C3	2	3	2
C4	2	2	1
C5	2	2	2
C6	2	3	1
C7	3	3	3
C8	2	3	1
C9	2	3	2
C10	1	2	1
C11	2	3	2
C12	2	2	1
C13	1	2	1
C14	2	2	2
C15	2	2	2
C16	3	3	3
C17	2	2	3
C18	3	3	3
C19	3	3	2
C20	3	1	1
C21	1	4	2
C22	2	3	1

The results from the correlation analysis are reported in Table 2.

Table 2. The results from the correlation analysis

	Knowledge Transfer between knowledge workers in the sale area in the polish companies (1- insignificant; 5-very important)	
	Knowledge on customers	*Knowledge on suppliers*
competitiveness of enterprises	0,736460	0,075165

In our research we clearly observed a positive effect of customer knowledge transfer about customer using B2B solution on the competitiveness of the company. It seems that this area should be embraced communication technologies such B2B, which enables knowledge transfer between knowledge workers in enterprises.

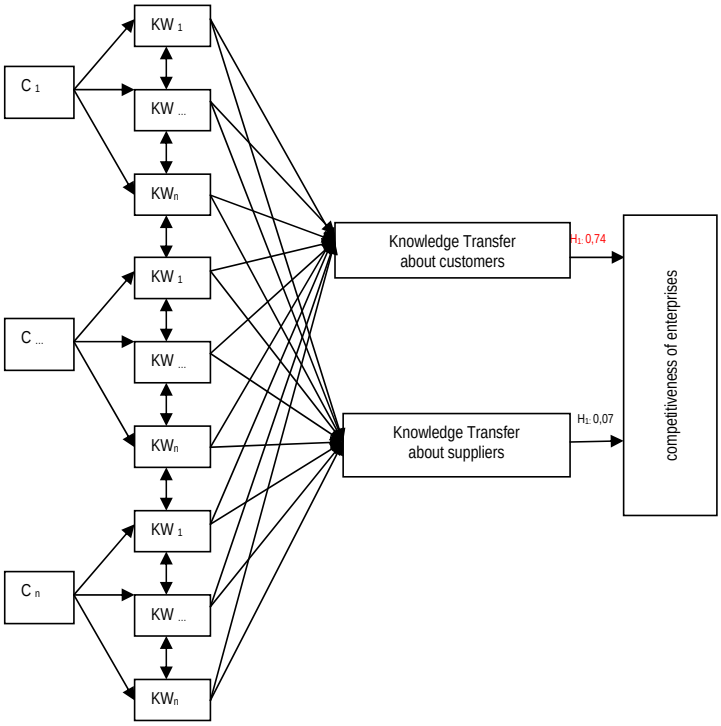

Figure 2. Knowledge transfer solution in the enterprises: business-to-business integration model

The use of B2B can lead interorganizational business transactions. The summarized finding is that polish manufacturing companies are increasingly forced to restructure their use of B2B in a flexible way during operation in the sale area. For these reasons, they are seen as the main force to promote the competitiveness of the economy and improving the ability to compete.

4. CONCLUSION

Company's owners need to find out how information and communication technologies as well as B2B can assist them. This study was motivated by the actual need of the manager, who had a strong desire of improving his own company's competitiveness through suitable managing a knowledge worker.

Hence, starting with the literature review of the knowledge transfer in the enterprises, solutions such B2B and managing knowledge workers. Next, by empirical research in polish manufacturing companies the author's knowledge transfer solution in the enterprises: business-to-business integration model was build, which allows a evaluation of the competitiveness of the company. The next step of the author's research will be more detailed usefulness of this model.

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PROJECT MANAGEMENT CERTIFICATION IN WOOD INDUSTRY ENTERPRISES

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ABSTRACT

Project management becomes one of the key tools for achieving strategic business goals. Increasingly, it refrains from the classical model of „training" and focused on tools of computer-aided project management or project management methodologies. The systematic development of project culture in combination with long-term development of project management competencies with the international certification, and consulting comes to the fore. It points to a specific business solution. At present, the greatest interest in internationally accredited training programs, for example for the Europe IPMA® methodology, for the USA PMI® methodology, or for the UK PRINCE2® methodology. They bring a guarantee of quality and performance of the wood industry enterprises – a project manager with the competencies and Professional qualifications – the business professionals. The paper is focused on brief of the requirements of the project management knowledge – competencies for managing project or the equivalent from another accredited certification authority.

Keywords: project management, project, certification, wood industry enterprises

1. INTRODUCTION

Severe competition and high demands of the open market allow only superior companies to survive. One of the areas in which companies are lagging behind the progressive western companies, is the ability, to implement with certainty the planned objectives. To successfully meet these requirements, it is, necessary to use a clearly defined set of principles, methods and techniques leading to effective planning and, work control in projects. For this reason project management is used for ensuring a high success of new business activities. It is used for scheduling and implementation of complex, usually single activities to be carried out in due time with budgeted costs in order to achieve predetermined goals. Project management can be briefly described as effective and efficient achievement of change. The subject of project management includes the project and its purpose is to plan and implement the project in scheduled time and costs. The change is due to the implementation of project outputs. In

addition, the project management applies the principles of teamwork and systematic work and supports the systemic approach to problems solving.

In practice, the reference of the supplier is first and foremost, followed by the whole range of other criteria, such as certification, standards and ultimately methodologies themselves. If a customer sees that the wood industry company or organization owns a certificate from a worldwide recognized international project management association IPMA®, PMI® or PRINCE2® methodology, or meets standards as ISO 9001, ISO 10006, it is obvious that the process of project includes a standardized and business-driven methodology based on some of issued standards or standardized methodologies. The decision which certificate to use depends on several criterias such as the standard, or methodology used in the company. Conditions for obtaining individual certificates are very different. Also their purpose is different.

2. PROJECT MANAGEMENT CERTIFICATION IN THE WOOD INDUSTRY ENTERPRISES

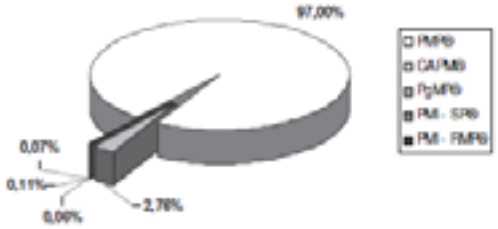
So long as no standardized methodology or standard project management is introduced in the wood industry company it is good to lay a cornerstone. Beginning of companies is often associated with self-educating staff involved in the preparation and implementation of projects. The next step involves a period of external education during which key employees are trained. They pass their theoretical and practical experience and skills acquired through mentoring or coaching (Ernst & Young and TREND, 2009). During this period there is a definition of processes and their subsequent formalization. In case of further growth this is usually followed by harmonization of existing processes largely in accordance with standardized methodologies (such as the PMBoK® Guide, ICB® methodology, PRINCE2® methodology), incorporation of project management into the ISO standards and certification of staffs mostly to leaders of the project (Jelinek L ., 2010).

According to the survey (Ernst & Young and TREND, 2011) undertaken in 2011 by Ernst & Young and Trend in the Czech Republic, PMBoK® Guide methodology (35 %) and IPMA® certification were the most commonly used methodologies. In Slovakia, the PRINCE2® methodology (19 %) prevailed and 22 % of project managers worked on obtaining an official certification – often by PMI® and PRINCE2®. In Poland, the most commonly used methodology was similar to the Czech Republic; the methodology by PMI® (53 %) and certification by IPMA®. The large companies predominated in particular countries. They were part of a database of TOP 100 companies and worked in various sectors.

a. Certification by PMI®

PMI® association (Project Management Institute) is mainly known as the creator of the global project management standard called PMBoK® Guide (A Guide to the Project Management Body of Knowledge). It is the basic standard for certification of professionals in project management PMI®. It currently has five levels:

- Certified Associate in Project Management – CAPM®
- Project Management Professional – PMP®.
- Program Management Professional – PgMP®.
- PMI® Scheduling Professional – PMI-SP® (another part of the certification levels).
- PMI® Risk Management Professional – PMI-RMP® (another part of the certification levels)

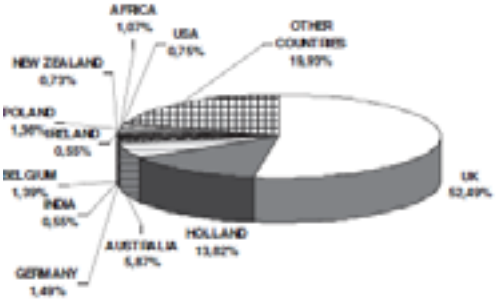


Graph 1. Number of certificates issued by PMI® (processed by Staśto L. 2012)

There is a big difference between the CAPM® level and PMP® level. In addition to PgMP® all certificates are based on fulfilment of input assumptions (the required length of practice, training hours in project management, etc.) and passing a certification exam. PgMP® level is also subject to the Assessment Centre (Jakábová M., 2010). It is considered the highest quality, the most comprehensive and probably the most difficult obtainable certificate in project management in the global market. It is not strictly a part of the multi-level hierarchy, but the scattered certification diploma (Janáč R., 2010).

2.2. Certification by PRINCE2®

PRINCE2® (PRojects In Controlled Environments2®) is a process-oriented and generally applied methodology. It is translated into nearly 20 languages and is taught by more than 140 accredited training organizations around the world. PRINCE2® certificates have been issued for more than 559 000 project leaders throughout the world (Jakábová M.,2010).



Graph 2. Number of certificates issued by PRINCE® methodology in the world
(processed by Staśto,L. 2012)

To obtain a certification no previous experience is necessary. Certificate can be obtained for knowledge of this methodology at the basic level (PRINCE2® Foundation) or advanced level (PRINCE2® Practitioner). However, this knowledge is only a starting point when applied to practice. PRINCE2® methodology always requires the creating of your tailored version of the methodology for specific projects and the company. Both levels of certification relate to the same content. The difference is in level of encompassment (Janáč R. 2010).

The other additional components of the PRINCE2® methodology are ITIL® (IT Infrastructure Library), MSP® (Managing Successful Programmes), MoR® (Management of Risk) and P3O® (Portfolio, Programme and Project Offices) (Janáč R. 2010, Jakábová M. 2010). On 31st March 2010, about 3 500 certificates (with PRINCE2® Foundation and PRINCE2® Practitioner) were issued in Poland (Stašto L., 2012).

2.3. Certification by IPMA®

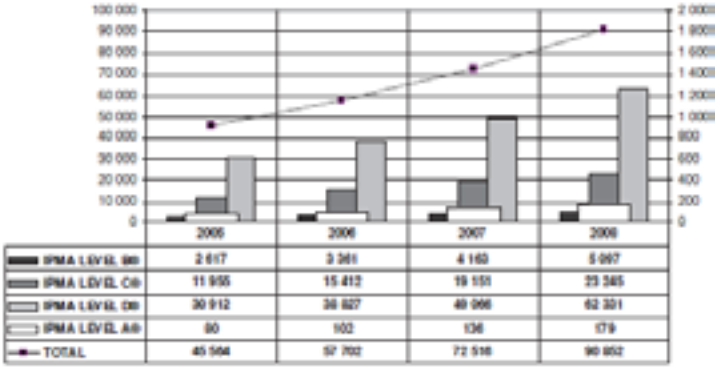
ICB® (IPMA® Competence Baseline) is a methodology comprising a four-level certification system of the international association of project managers in Europe – IPMA® (International Project Management Association):

- Certified Project Director – IPMA Level A®21.
- Certified Senior Project Manager – IPMA Level B®.
- Certified Project Manager – IPMA Level C®.
- Certified Project Management Associate – IPMA Level D®.

Each level of certification varies by level of attained, knowledge and complexity of projects or programs and
portfolios managed by the candidates (Jakábová M. 2010). They are designed for people who want to formally confirm their knowledge and experience in managing project (Janáč R. 2010). To obtain certification, it is necessary to meet entry criterias (references, list of projects, self-evaluation, etc.) and pass the exam (Jakábová M., 2010).

IPMA® certifies a logical and organized approach to managing project to maximize the chances of success, but does not certify particular methodology and its application (Janáč R. 2010).

The number of certified project or program managers continues to grow. Since 2005, totally 55 664 certificates were issued (Jakábová M. 2010).



Graph 3. Number of certificates issued by IPMA® (proceed by IPMA® 2012)

Since 2012 the Slovak Republic and Poland are represented in the IPMA Level A® (1 project manager in the Slovak Republic and 1 project manager in Poland). In the Czech Republic the IPMA Level A® is not represented, yet.

2.4. Other Certifications

In addition to above mentioned, there are also other important players in the field of, project management standardization. We can mention the certification by the Australian AIPM (Australian Institute of Project Management). It has its own three-level certification that is relatively unknown and unapplied in Europe: Certified Practising Project Practitioner – CPPP, Certified Practising Project Manager – CPPM, Certified Practising Project Director – CPPD. The AIPM certification is also used in New Zealand.

Another very interesting methodology is the Japanese P2M methodology (A Guidebook for Project and Program Management for Enterprise Innovation) and English APMBoK methodology (The Association of Project Management Body of Knowledge). Certification by P2M methodology is classified according to job descriptions and experience, distinguishing three levels of certification: Project Management Architect – PMA, Project Manager Registered – PMR, Project Management Specialist – PMS. APM activities are carried out by four IPMA® certification approach, which approves its content and professional levels: APM Project Risk Management Certificates, Certificated Project Manager – CPM – IPMA Level B®, Practitioner Qualification – IPMA Level C®, APMP – IPMA Level D®, Introductory Certificate (Jakábová M., 2010).

In the European Union PCM methodology (Project Cycle Management) and its supporting Logical Framework method (Logical Framework Approach/Logframe – LFA) are used for project preparation and management. The methodology promotes „Best Practices“ and decision making in the project life cycle – from programming through the identification, formulation and implementation to evaluation. However it can not be talked about a knowledge base according to IPMA®, PRINCE2®, PMI® or similar certification (Janáč R. 2010, Jakábová M. 2010).

3. CONCLUSION

Individual certificates in accordance with methodologies PMBoK® Guide, PRINCE2®, ICB® are equivalent only in the vertical view from top to bottom. If the certification has a hierarchy (and almost each one has it), then certificate placed higher in the hierarchy has always more difficult conditions for obtaining and there is a lower number of occurrence among experts. Therefore it is clear and it should also be accepted that with a higher certification the requirements of the lower one can be met. For example, if the certification of IPMA Level C® is required, IPMA Level A® and IPMA Level B® are definitely accepted. If the conditions define PRINCE2® Foundation, they are certainly met by the PRINCE2® Practitioner certificate. Or in case of the request of CAPM®, a PMP® can certainly be submitted. It is essential that a company realizes that (Janáč R. 2010).

ICB® methodology provides only a basic knowledge of project management and soft skills, which a project manager managing people in projects should have. This part is left out in the PMBoK® Guide and PRINCE2®. PMBoK® Guide also shows how it looks in the project and what else from this area must be known. It provides various techniques and tools that arise during the life of the project in stages, but it does not mention of how to work with people or what specific tasks must be realized for the project progress. PRINCE2® exactly says what and when must be done, when it is necessary to cancel the project, when proceed and so on. But no mention of how to treat and get along with people. Therefore, each individual using methodologies and obtaining a certificate should fulfil each level of certification of a particular methodology. Also a factor in the project management– risk management – is a good qualification for the project manager, because it forms an essential part of its functional duties.

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BAMBOO: AN ALTERNATIVE SOURCE FOR PRODUCTION OF TEXTILES

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ABSTRACT

Bamboo is fastest growing woody plant on this planet. It grows one third faster than the fastest growing tree. Bamboos growth is approximately three feet over a night thus considered environment friendly. This growth pattern makes it easily accessible in a minimal amount of time. Size of bamboo plant ranges from minimal to 60 meters. Bamboos are plants of global interest because of their distinctive life form, their ecological importance and the wide range of uses and values they have for humans. Bamboo has tremendous economic potential. Bamboo use in India has a long and all-encompassing history. Millions of people in India depends on bamboo for housing, food, fuel, paper and even cloth. Bamboo and its related industries already provide income, food and housing to over 2.2 billion people worldwide. Governments such as India, China and Burma with 19,800,000 hectares of bamboo reserves collectively, have begun to focus attention on the economic factors of bamboo production. As expected, the numbers of species of bamboo existing in India are approximately 130 and India is one of the largest producers of bamboo in the world next to China and Brazil. Bamboo fiber is biodegradable textile material. As a natural cellulose fiber, it can be 100% biodegraded in soil by microorganism and sunshine. The decomposition process doesn't cause any pollution environment. "Bamboo fiber comes from nature, and completely returns to nature in the end" therefore bamboo fiber is praised as "the natural, green, and eco-friendly new-type textile material of 21st century".
Physical properties of knitted bamboo fabric produced in single jersey and double jersey structure were discussed. Yarns of 30 Ne & 34 Ne 100% bamboo were used for producing these fabric samples. All these fabric samples are produced on circular knitting machine with selected fabric specifications such as wales/cm, course/cm, stitch density & loop length etc. Yarns samples of 30 Ne & 34 Ne were tested for physical properties and its factors influencing properties of single & double jersey fabric were studied. All type of fabric samples were tested for physical properties such as Bursting Strength, Thickness, Fabric Areal Density, Air Resistance and shrinkage% etc. It was found that fabric thickness decreases with increase in yarn count; yarn of coarser count produces thicker fabric than finer yarn. Double jersey fabric produced from both yarn counts shows higher bursting strength than single jersey fabric produced from same yarn counts. Also double jersey fabric produced from both yarn counts shows higher air resistance than single jersey fabric produced for same yarn counts.

Key words: Bamboo, Physical, Properties, Knitted, Wood.

1. INTRODUCTION

Bamboo plants are commonly cultivated in Asian countries. It is one kind of plant with hallow and woody stem. There are so many varieties of bamboo plant across the world. Nowadays, bamboo is widely used in the field of building and construction because of its toughness and other properties

Few decades ago, bamboo was traditionally used for making variety of household goods such as furniture, sporting goods, handbags, flooring and cutting board etc. Nowadays, due to developments in manufacturing processes. It possible to produced fibre from bamboo stem, which has remarkable properties for its use in yarn and fabric.

Bamboo is fastest growing woody plant on this planet. It grows one third faster than the fastest growing tree. Bamboos growth is approximately three feet over a night thus considered environment friendly. This growth pattern makes it easily accessible in a minimal amount of time. Size of bamboo plant ranges from minimal to 60 meters. Bamboos are plants of global interest because of their distinctive life form, their ecological importance and the wide range of uses and values they have for humans. Bamboo has tremendous economic potential. Bamboo use in India has a long and all-encompassing history. Millions of people in India depends on bamboo for housing, food, fuel, paper and even cloth. Bamboo and its related industries already provide income, food and housing to over 2.2 billion people worldwide.

India has one of the richest bamboo resources in the world, second only to China in Bamboo production. The annual bamboo production in the country is estimated at 3.23 million tons. According to Forest Survey of India (FSI), in India bamboo grows in 8.96 million hectares of forest area, which constitutes about 12.8% of total forest area of the country. Of this, nearly 28% occur in the North Eastern States, followed by 20.3% in Madhya Pradesh, 9.90% in Maharashtra, 8.7% in Orissa, 7.4% in Andhra Pradesh, 5.5% in Karnataka and the balance is spread over in other states.

Bamboo is a versatile plantation species and its forestation is ecologically sound and economically viable. It is also adopted by farmers as agro forestry species, planted along field bunds and in concentrated blocks. It has great demand both in domestic and industrial sectors. Besides meeting the basic necessities of life i.e. food, shelter and clothing, it is also used in making baskets, fencing mats (thatties), toys, house hold articles and raw material in paper and pulpwood industries. Thus it provides livelihood to millions of people. Bamboo is everything to some and something to all.

Bamboo occurs naturally in the forests and is also raised as plantation crop. It is a woody perennial grass with life span of about 30 – 40 years. Potential bamboo growth is found naturally in well drained, high rain fall zones up to an altitude of 800 M. It also occurs in dry deciduous forest with rainfall as low as 1000 mm. Rainfall plays an important role in the distribution and growth of quality bamboo.

Government of India runs National Bamboo Mission (NBM) to promote growth of bamboo sector and for generating employment opportunities for skilled and unskilled persons, especially unemployed youths. Governments such as India, China and Burma with 19,800,000 hectares of bamboo reserves collectively, have begun to focus attention on the economic factors of bamboo production. As expected, the numbers of species of bamboo existing in India are approximately 130 and India is one of the largest producers of bamboo in the world next to China and Brazil. Bamboo fiber is biodegradable textile material. As a natural cellulose fiber, it can be 100% biodegraded in soil by microorganism and sunshine. The decomposition process doesn't cause any pollution environment. "Bamboo fiber comes from nature, and completely returns to nature in the end" therefore bamboo fiber is praised as "the natural, green, and eco-friendly new-type textile material of 21st century". It is facts that Linen, Hemp based fabrics are coarser than bamboo fabric. Bamboo can be spun purely or blended with other materials such as cotton, hemp, silk, polyester and viscose etc.

Bamboo is a regenerated cellulose fiber produces from bamboo pulp. Physical and chemical properties of bamboo fiber are nearly close viscose. It has good durability, softness, luster, stability,

moderate tenacity and thus good spinability. Bamboo products are further characterized by its good hydrophilic nature, excellent permeability, soft, feel, excellent dyeing behavior and its antimicrobial property.

Bamboo fiber is naturally anti-bacterial, UV protective, biodegradable, breathable cool, strong flexible, soft and has a luxurious shiny appearance. Bamboo fiber can be softer even than silk fiber when spun into yarn. It has a basic round surface which makes it very smooth and to sit perfectly next to the skin.

Bamboo fiber absorbs and evaporates sweat very quickly. Its ultimate breathability keeps the wearer comfortable and dry for a very longer period. It is 3-4 times more absorbent than cotton fabric Fabrics made from bamboo fiber are highly breathable in hot weather and also keep the wearer warmer in cold season. Bamboo is naturally cool to the touch. The cross-section of the bamboo fiber is filled with various micro-gaps and micro-holes leading to much better moisture absorption and ventilation. It is also very warm in cold weather, because of the same micro structure as the warm air gets trapped next to the skin.

2. MATERIALS AND METHODS

2.1. Materials

2.1.1. Fibre Properties

Table 1. Physical Properties of Bamboo Fibre

Physical Properties of Bamboo Fibre	
Strength (gm/tex)	34.3
Elongation (%)	16.0
Short Fibre Index	5.58
Uniformity Index (%)	92.7
UHML(mm)	38.745
ML (mm)	35.62
Moisture (%)	6.5
Micronaire	4.0

2.1.2. Yarn Preparation

Yarns of 30 & 34Ne count are produced from above said bamboo fibre.

2.1.3. Fabric Preparation

Single jersey and Double jersey (Interlock) knitted fabric samples of bamboo fibre are produced on circular knitting machine with following specifications.

Table 2. Fabric Specifications

Structure	Single Jersey (Plain)		Double Jersey(Interlock)	
	30 Ne	34 Ne	30 Ne	34 Ne
Wales/cm	11	11	08	08
Course/cm	12	12	16	14
Stitch Density	142	142	128	110
Loop Length(mm)	3.34	3.38	4.27	4.44

2.2. Experimental Methods

2.2.1. Fibre Properties

Fibre properties such as strength, elongation, micronaire and uniformity index and moisture % etc. of bamboo are measured on Uster HVI SW 3.1.1.0 version.

2.2.2. Yarn Properties

Yarn properties such as strength and elongation are measured on Uster Tensorapid Tester (3 V 6.1) with gauge length- 20 inches, velocity of jaw 2000 mm / min. While unevenness, imperfection and hairiness were measured on IQ Qualicentre (version A 3.0.2) with 400 meter test length.

3. RESULTS AND DISCUSSION

3.1. Yarn Properties

Table. 3. Properties of Bamboo Yarn

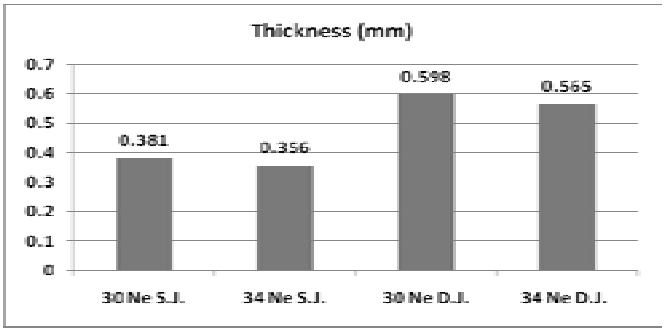
Properties	30 Ne	34 Ne
Strength (Rkm Kgf*Nm)	11.63	13.42
Elongation (%)	14.7	19.23
Unevenness (U %)	9.14	10.27
Hairiness Index	7.63	6.43
Coefficient of variation (CVm %)	11.54	12.98

Table. 3. Properties of Bamboo Yarn

Breaking Force (N)	2.26	1.99
Breaking Work (N.cm)	10.38	10.6
Time to Break(sec)	2.2	2.9
C.S.P	2291.44	2171.25
T.P.I.	20.37	21.27

3.2. Fabric Properties

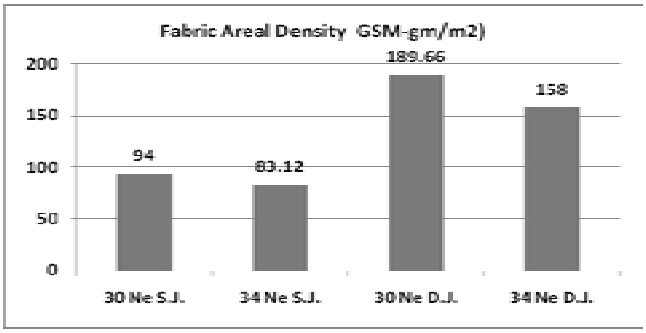
3.2.1. Thickness



Graph 1. Thickness

Graph-1 shows results of thickness. Thickness of 30 Ne & 34 Ne 100% bamboo single jersey fabrics is 0.381mm & 0.356mm respectively; hence thickness of 34 Ne is 6.56% lower than 30 Ne. In case of double jersey interlock, thickness of 30 Ne & 34 Ne 100% Bamboo Double Jersey fabrics is 0.598 mm & 0.565 mm respectively. Hence thickness of 34 Ne is 5.51% lower than 30 Ne fabric sample. These differences in fabric thickness can be attributed to differences in yarn fineness. As per one way ANOVA, results of fabric thickness are significantly differing.

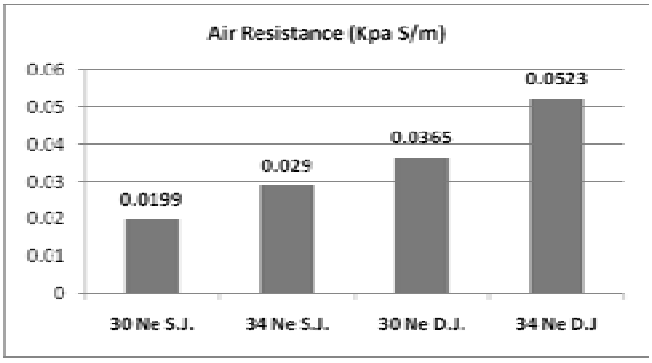
3.2.2. Fabric Areal Density



Graph 2. Fabric Areal Density

As shown in Graph-2, GSM of 30 Ne & 34 Ne 100% bamboo single Jersey fabrics is 94 & 83.12 respectively, hence GSM of 34 Ne is 11.57% lower than 30 Ne. And in case double jersey fabric, a GSM of 30 Ne & 34 Ne 100% bamboo double jersey fabric is 189.66 & 158 respectively. Hence GSM of 34 Ne is 16.66% lower than 30 Ne fabric sample. These differences in fabric areal density (GSM) can be because of difference in linear density of yarn. As per one way ANOVA, Results of GSM are significantly differing. Also gsm of double jersey fabric compared to single jersey fabric is significantly higher.

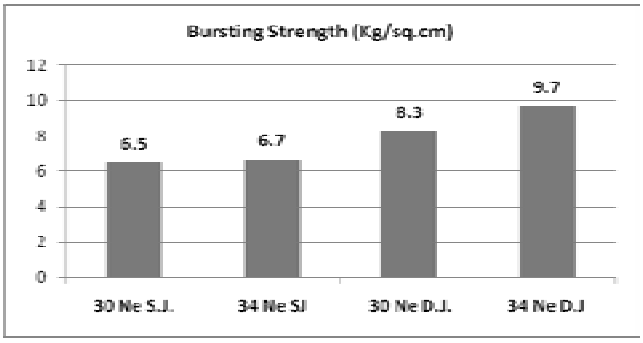
3.2.3. Air Resistance



Graph 3. Air Resistance

As shown in Graph-3, Air Resistance of 30 Ne & 34 Ne 100% bamboo single jersey fabric is 0.0199 & 0.029 Kpa.S/m respectively, hence Air Resistance of 34 Ne is 31.37% higher than 30 Ne. But in case of double jersey fabric, air resistance of 30 Ne & 34 Ne 100% is 0.0365 & 0.0523 Kpa.S/m respectively, hence air resistance of 34 Ne fabric is 30.21% higher than 30 Ne fabric sample. Double jersey fabrics are showing more air resistance due to it's dense structure.

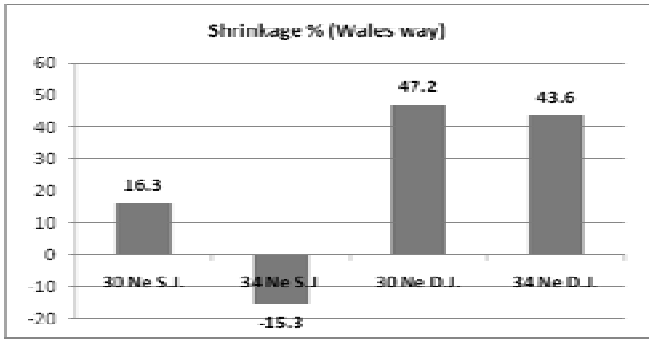
3.2.4. Bursting Strength



Graph 4 Bursting Strength

As shown Graph-4, Bursting Strength of 30 Ne & 34 Ne 100% bamboo single jersey fabric is 6.5 & 6.7 Kg/sq.cm respectively. Hence bursting strength of 34 Ne fabrics is 2.98 % higher than 30 Ne fabrics. In case of double jersey fabric, bursting strength of 30 Ne & 34 Ne fabrics is 8.3 & 9.7 Kg/sq.cm respectively. Hence bursting strength of 34 Ne fabrics is 14.4 % higher than 30 Ne fabrics. In overall, bursting strength of double jersey fabric is significantly higher than single jersey fabric which could be because of its dense & compact structure.

3.2.5. Shrinkage %



Graph 5 Shrinkage %

As shown in graph-5, Shrinkage% (Wales way) of 30 Ne & 34 Ne 100% bamboo single jersey fabric is 16.3 & -15.3 % respectively. In case of double jersey fabric, shrinkage% of 30 Ne & 34 Ne fabrics is 47.2 & 43.6 % respectively.

4. CONCLUSIONS

- ✓ Double jersey fabric is showing higher thickness, fabric areal density, air resistance and bursting strength than single jersey fabric.
- ✓ In case of double jersey fabric, 34 Ne fabric sample is showing higher air resistance and bursting strength than 30 Ne fabric sample. While 30Ne fabric sample is showing higher thickness and fabric areal density than 34Ne fabric sample.
- ✓ In case of single jersey fabric also, 34 Ne fabric sample is showing higher air resistance and bursting strength than 30 Ne fabric sample. While 30Ne fabric sample is showing higher thickness and fabric areal density than 34Ne fabric sample.
- ✓ Hence, in both knitted fabrics, finer yarn count is giving better air resistance & bursting strength than coarser yarn count.

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THE USE OF KANO QUESTIONNAIRE TO STUDY THE WOODEN FURNITURE QUALITY ATTRIBUTES

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ABSTRACT

The article presents the results of researches of implementation of Kano model to evaluate quality of wooden furniture as perceived by customer. The basis of using this method to evaluate quality of wooden furniture is the assumption that the higher the degree of quality implementation, the greater the degree of customer's satisfaction and vice versa, the higher the degree of customer's satisfaction, the higher the degree of implementation of wooden furniture quality.

Key words: quality, Kano's theory, wooden furniture

1. INTRODUCTION

An important problem that should be solved while designing some new furniture understands the concept "perceived quality". From experience it is obvious, that perceived quality for the selected product (in our case - furniture) not always is identical with the technical quality. It, how we perceive the quality of a product, especially after it is purchased, depends on many outside factors. Customer satisfaction has been a matter of concern to most of the companies. Satisfaction ratings are being used as an indicator of the performance of services and products and help to formulate strategies of the companies. Hanan and Karp [1] have stated that "Customer satisfaction is the ultimate objective of every business: not to supply, not to sell, not to service, but to satisfy the needs that drive customers to do business." Market success of a product is also important from the environment point of view, since a product which is not sold, becomes the most useless product from both economical and environmental point of view. It has environmental impacts without having any value for the customer [2,3]. Perceived quality is not usually equal with the delivered quality. Kano [4] decided to make analysis of the relation between the satisfaction level of the customer and the offered quality. On this base it is possible to divide all attributes of the product in three groups (Fig. 1 - model Kano):

- Obligatory (expected indirectly) - these are features that participations is requires by the customer. If some product or service does not have them, then the customer is dissatisfied. If these features are present, it does not have the influence on the customer' satisfaction. Because these expectations are obvious, it is danger, that customers when are asked about preferences and expectations connected with the product or service will not list them. It should be paid special attention for exact defining them.
- One-dimensional (expected directly) – these are features that the customer is searching. If we deliver him the product which having these features, his satisfaction is growing. If these features are offered in the product (furniture) then the customer is more satisfied. If however their quality level is too low, the customer is becoming dissatisfied. This dissatisfaction is growing much more slowly than in the case of obligatory features. Usually the relation between offered quality of the given feature and the satisfaction of the customer has in the case of expectations one-

dimensional character of linear relation. Direct features are in practice relatively easy to determine, because the customers have the awareness of these needs existence.

- Lure (arousing the admiration, attractive) –these are features that the customer did not expect to receive and which turned out to be very useful. These attributes are increasing the satisfaction of the customer in a large extend. If this feature is not appearing, it is not arousing the greater dissatisfaction of the customer. The attributes that arousing the admiration have diversifying the offer, distinguished it from the competition and arousing attractiveness. These needs are very difficult to define because the customers are not conscious of their existence.

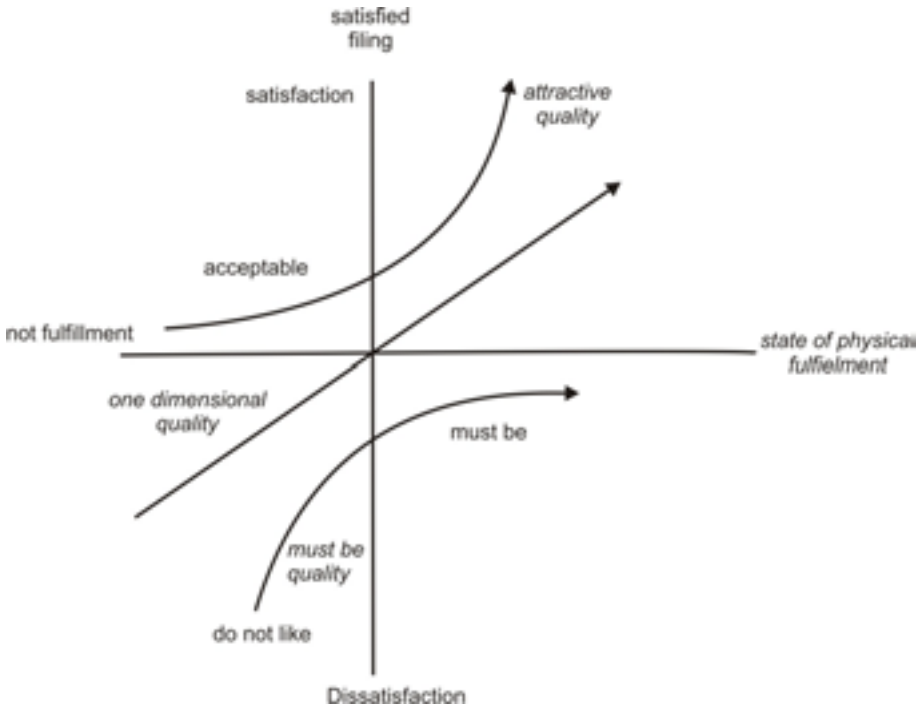

Fig. 1. Original Kano model [4]

2. PRODUCT QUALITY ASSESSMENT

The research of the perceived quality for the self-assembly furniture were carried out basing on the questionnaire survey for 60 customers. In the research was used Löfgren M. approach [5]. He used Kano model for the assessment of the perceived quality by the customer during normal using the package.

According to the theory of attractive quality, the relationship between the degree of sufficiency and customer satisfaction with a quality attribute can be classified into five categories of perceived quality [6]:

- Attractive quality attributes (A) provide satisfaction when fulfilled and no dissatisfaction when not fulfilled. These attributes are often referred to as surprise and delight attributes.
- One-dimensional quality attributes (O) provide satisfaction when fulfilled and dissatisfaction when not fulfilled.
- Must-be quality attributes (M) are taken for granted when fulfilled but result in dissatisfaction when not fulfilled.
- Indifferent quality attributes (I) are perceived as neither good nor bad and therefore do not result in customer satisfaction or dissatisfaction, i.e., these are quality attributes that customers do not care about.
- Reverse quality attributes (R) result in dissatisfaction when fulfilled and satisfaction when not fulfilled. For example, when you want a basic model of a product you will be increasingly dissatisfied the more functions it has.

Determination of quality characteristics for defined attributes requires to carry out meticulous survey. One form of such research is use of so-called quality game to determine the nature of individual characteristics [6, 7].

Kano uses appropriate questionnaire that helps with use of researches carried out on clients to include particular feature to one of three main groups. In this method are examined customer's responses to researched feature. Client has two possible options [4]:

- when given feature is present in product and functions normally,
- when given feature is not present in product, or does not operate in satisfactory manner.

After categorising of every feature it should be started designing furniture that fulfils particular features. During designing furniture it should adapt the procedure with the given feature depending on it kind. In table 1 was presented in what way the kind of the feature should influence on decisions in the realization of furniture project.

Table 1. An influence of the feature kind on proceedings during furniture designing

Feature	Way of proceedings during furniture designing
Obligatory (M)	In furniture should be included all obligatory features. It should not be tried to reach the excessive quality level of these features and only to realize them in the minimal step, with the lowest costs.
One-dimensional (O)	One-dimensional features should be designed with consideration the products' features that are offered through competition. The offered feature should not be differing from the level of the realization of this feature through competition.
Lure (A)	In case of attractive features (lure) not every of them should be realized. It should be made the choice a few the most essential features ranked to this category and to provide maximum level of realization. Because of that the furniture that are offered by our company will be unique on the market. The best solution is to choose the ones lure, in the case of whom we are in the state to get the better realization of the given attribute, than competitors can make it.

Accepted Kano model, has the dynamic character. Determined character of the feature is not constant. It is undergoes change if the perception of features by the customer will be different. We are dealing with the change of given customer's attribute for the determined group in the model. We have here two rules:

- features (lure), with time are a little more often adopted by competition and are becoming normal one-dimensional features,
- together with the innovation development the meaning of the competition is reducing in the scope of one-dimensional features. Existing them in the furniture is obvious and then these features are becoming obligatory.

Figure 2 shows the proceedings algorithm for use of the questionnaire of Kano method.

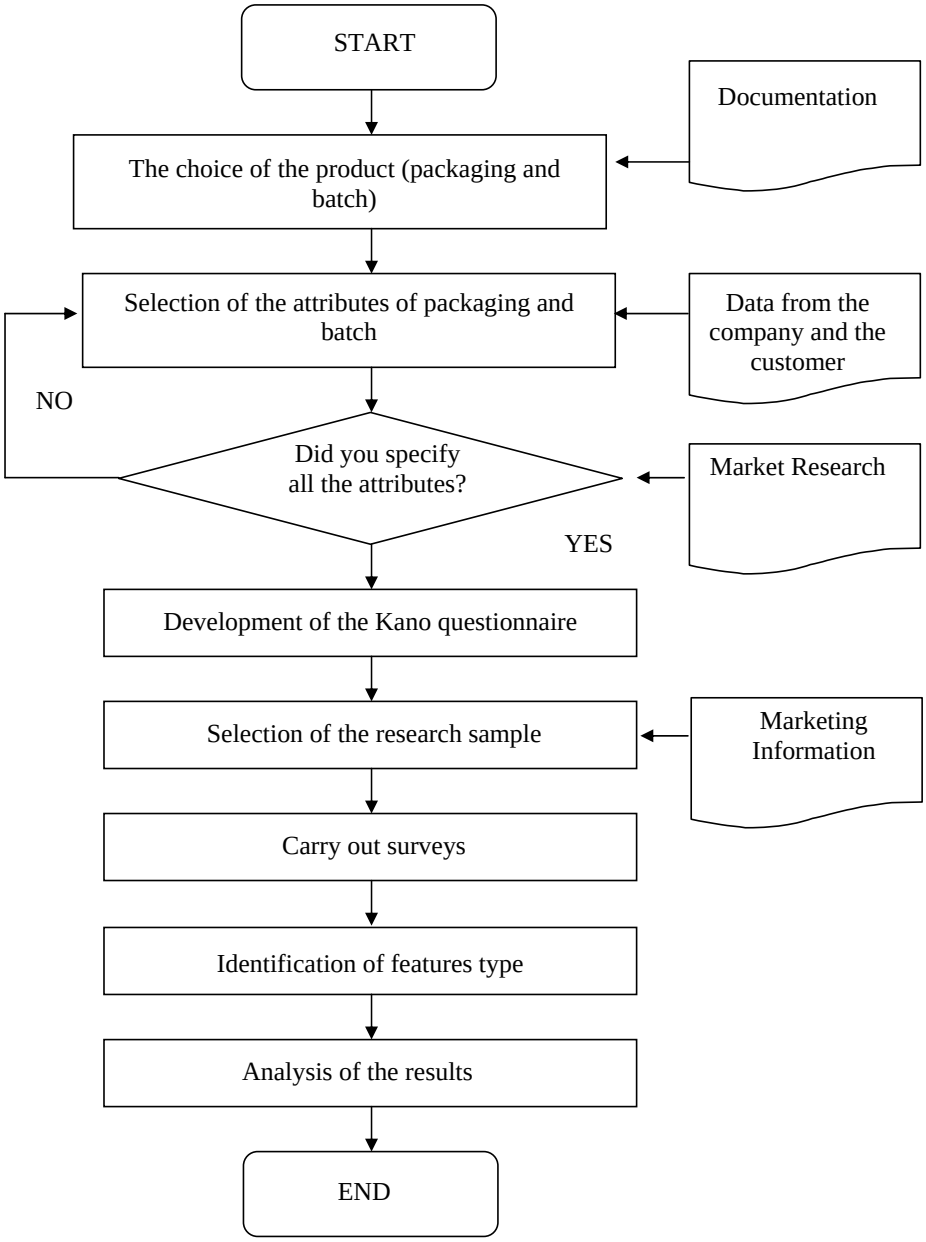

Fig. 2. Proceedings algorithm of the Kano method.

After carrying out preliminary research of customers that purchasing the self-assembly furniture the features of perceived the product were divided on two categories. First, the most essential category of perceived quality of furniture is a set of features connected directly with the material side of furniture such as: material, the way of the assembly, etc. It is set of direct features that have decisive meaning at making a decision connected with the purchase. The other set of features is connected with the package but exactly with the way of securing furniture during transport to the customer. In the research the set of features connected with package (indirect features) appeared secondarily after making a purchase. It was at the stage of the transport of purchased furniture and during unpacking and also during the process of the furniture assembly by the customer.

3. OPINION POLL

Two set of questions directed to potencial customers of the furniture company and to customers that already purchased or are using the self-assembly furniture were elaborated. The first set of questions concerns directly the quality of the furniture and the other set of questions concerns the quality of thepackages. All things considered 60 opinion poll was carried out.

Most attributes was classified as one-dimensional, part of attributes is associated with ergonomics, desing and technical properties of materials. Table 1 shows comparison of the results of surveys. There was used scale from 1 to 10 where 10 defines the most important attribute.

Table 2. The meaning of the quality attributes of the of furniture for the self-assembly according to customers

No	Quality attribute	Classification	Stated importance
1	Shape of the edge	M	9,5
2	Possibility of choice the front of furniture	M	9,4
3	Type of material	M	9,3
4	Declaration of contents	M	9,0
5	Stability of furniture after the assembly	M	9,3
6	Modular system	O	8,1
7	Safety of materials	O+M	6,0
8	Instructions descriptive and pictorial	A+M	5,0
9	Easiness of the components identification in the set	O	7,8
10	Assembly with a peg	O	6,1
11	Assembly with wood screws	M	9,2
12	Glue joint	R	7,0
13	Stem with protection before scratching the floor	O+I	5,0
14	Possibility of finish the edge with the PVC slat	O+I	5,0
15	Set of tools for the assembly	O	5,5
16	Completeness of the set	M	4,0

Table 2. The meaning of the quality attributes of the of furniture for the self-assembly according to customers

17	Possibility of buying spare elements in case of damage during assembly or utilization	O+M	4,2
18	Communicates a certain brand	A	7,1
19	Communicates furniture family category	A	5,6
20	Aesthetically appealing	M	6,1

In the aim of settlement the perceived quality of attributes for customers was introduced furniture that was joined with the different methods and some demonstrative pictures were presented. Hypothetical figures of the way of fixing furniture with a metal screw, treenail was presented in Fig. 3.

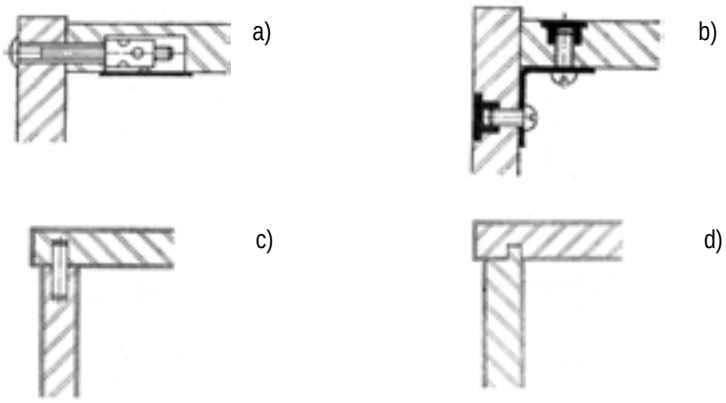

Fig. 3. Joining method: a) screw , b) screw-angle bracket, c)treenail, d) screw glued

The quality of the packaging includes the following features:

- Natural and technical parameters - sizes, technical strength, water vapour permeability and smells permeability, fat permeability, light permeability, resistance to acids, alkalis action, susceptibility to dyeing.
- Aesthetic parameters - colour, shape, graphics, lettering - relation in mutual distribution of patterns and inscriptions.
- Ergonomic parameters - ease of opening, removing the content, ease of handling, transport (compliance with dimensional series).
- Ecological parameters - ability to complete decomposition, susceptibility to recycling, the possibility of multiple use.

Under the quality of packaging, however, lies primarily protective function, which is the fundamental role of the package. Specific conditions for preparing the product, in which takes place storage and transport, and above all, the product itself, cause the necessity of use of packages with minimal susceptibility to these conditions [8].

In table 3 were introduced some results of the opinion pull concerning the quality of furniture's package for the self-assembly.

Table 3. The importance of attributes of packaging quality according to customer

No	Quality attribute	Classification	Stated importance
1	Easy for the loading	M	9,5
2	Easy to move for two persons	M	9,2
3	Protected against mechanical damage	M	9,6
4	Declaration of contents	M	9,4
5	Easy to open	O+M	8,6
6	Safey in using	O	8,1
7	Easy for the recycling	A	6,0
8	Well marked	M	5,0
9	Easy to empty	O	7,8
10	Easy to grip	O	8,1
11	Appearance	M	7,0
12	Easy to throw in the household waste	O	9,0
13	Facilitates the sorting out of household waste	A	5,0
14	Recyclable material	O	4,2
15	Communicates a certain brand	M	7,1
16	Communicates furniture family category	M	5,6
17	Suitable for vehicle loading area	A+O	7,3
18	Contains just the right quantity	A	6,0
19	Aesthetically appealing	I+A	6,1
20	Attractive and nice-looking print	I	5,9

4. CONCLUSION

Carried out researches showed that an important element in the concept of product development is quality assurance at appropriate level. In this area there should be consided importance of quality factors perceived by customer, which may differ from that perceived by manufacturer.

This study uses a robust design approach that integrates the Kano model to optimize quality with multiple-criteria characteristics to achieve aesthetic satisfaction. The proposed robust design approach can be applied to objective and subjective quality, especially for multiple-criteria optimization. Using the Kano model helps to differentiate between multiple criteria affecting customer satisfaction. It can also reprioritize criteria to resolve the trade-off dilemma in multiple-criteria optimization. Presented in table 1 and 2 combination of quality attributes is a generalized version of the questionnaire form that was carried out among customers. As a result of conducted investigation we can state that in the case of furniture among obligatory attributes there are: the shape of the edge, the possibility of choice the front of furniture, the kind of material, the declaration of contents, the stability of furniture and the aesthetic. To one-dimensional atributes it was rated: modularity of the system, an easiness of the identification of

elements in the set, an assembly with treenail use, protection before scratching the floors by furniture, the tool kit for assembly, possibility of buying some spare elements. To lure was ranked: a pictorial and descriptive instruction and communicates and certain brand and furniture family category. As inverse quality atribute the customers recognised glue joint. In the case of the furniture‘s package customers as the most important quality attributes recognised the protection against mechanical damage, the easiness for the loading and transport and factors connected with waste management concerning packaging. A major challenge for producers can be the new Act on waste management and connected with it the need to segregate household waste (Act will apply from July 1, 2013). The question arises to what extent this factor will influence the customer's perception of the quality of the product? And which product and rather which packaging will choose customers in the store.

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INNOVATIVENEES OF WOOD SECTOR ENTERPRISES IN POLAND

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ABSTRACT

Innovation is one of the most important factors which determine company development. The implementation of innovations allows the company to obtain competitive advantage and, even though it usually entails risk, as a rule it leads to achieving better financial results. Every decision concerning investment, which involves considerable financial outlays, should be economically justified. This subject is gaining particular importance in the face of negative consequences of the world global crisis. In the following study evaluation of innovative activity of wood sector companies has been presented (furniture production, production of woodenware, cork and straw, manufacture of paper and paper products) in Poland as compared to other sectors of the economy.

Key words: innovative activity of companies, wood sector, Poland, global crisis

1. INTRODUCTION

The growth of competitive intensity resulting chiefly from market globalization is an inevitable effect in current economy. Events of recent years show that all countries are economically related to each other. Negative consequences of the financial crisis which started in 2007 in the USA, to a greater or lesser degree, have been noticed all over the world. As a result of the crisis thousands of companies went bankrupt, which caused acute results not only in the economic but also social dimension. The age of discontinuousness and the increasing pace of the changes forces, under pain of negative consequences, not only continuous monitoring of the ongoing changes, but also their constant analysis, as well as modification of current activities. (TKACZYK T. 2010). In order to achieve success in the present world affected by recession – in many cases it is the choice between the implementation of innovative solutions and the bankruptcy of the company. Certainly the global crisis is a chance for these companies which will cope with such a difficult economic situation and will focus on innovation and its implementation into cooperation with the client (GATTORNA J. 2012). Therefore, innovations are a prerequisite in the present world. Under the conditions of variable surroundings and newer and newer clients' requirements, company innovative activity is the key element of every enterprise.

2. COMPANY INNOVATION - PRELIMINARY ISSUES

Innovation has been the field of interest of both economy practitioners and scientists. The growth in importance of this research issue occurred in the 90s of the 20th century after publishing Organization for Economic Cooperation and Development report (*Organization for Economic Cooperation and Development – OECD*) entitled „The technological and economic program"(RATAJCZAK E. 2009).

However, it was J. Schumpeter who introduced the terminology into economic literature in 1911 defining it as an introduction of new products as well improvement of the already existing, introduction of a new or improved method, application of a new distribution model, or usage of new materials or half-

products (SCHUMPETER J. 1960). The term "innovation" was treated by Schumpeter in a broader sense because the definition comprises different aspects of organizational activities. The narrow sense of the word defines "innovation" as an invention which finds specific application. Such definitions were put forward, for instance, by Ch. Freeman according to whom "innovation" is the first trading application of a new product (KOTLER P. 1994) or by E. Mansfield who defines "innovation" as the first usage of an invention (BIELSKI I. 2000).

An important element of the issue in question is classification of innovations. The most common, both in literature on the subject and scientific research, is the division into the following types of innovation: product, procedural, organizational and marketing.

Product innovations are connected with launching new or greatly improved products and services which haven't been introduced in the company until now.

Procedural innovations deal with launching significant variations within organizational activity. These innovations comprise, for instance, application of a new method of processes' organization or a change in the workplace organization.

Organizational innovations comprise introduction of new improvements in the workflow or important changes in establishing and fixing relations with the environment.

Marketing innovations aim the introducing of new concepts or marketing strategies which will be significantly different from the methods already used in the company. These innovations in general concern significant changes in the packing, appearance of the products, their promotion or pricing.

3. THE IMPORTANCE OF WOOD SECTOR IN POLISH ECONOMY

Wood sector is an important industry of Polish economy. According to Central Statistical Office (GUS) the value of sold production in wood sector amounted to 86.4 billion PLN in 2011, which constitutes 9.1 % of sold production of the whole secondary industry. In that period in wood sector 343 thousand people were employed, 160 thousand of them were employed in furniture industry, 126.9 thousand in the production of woodenware, cork and straw, while companies manufacturing paper and paper products employed 56.1 thousand people.

In wood sector furniture industry is worth paying particular attention to because Polish furniture is an important export product. Almost 90% of furniture sold production is destined for export. Poland ranks fourth in the world and third in Europe as regards furniture production. On the European market only Italy and German rank higher. In the global ranking apart from the above-mentioned countries China should be paid attention to which is the leader among furniture exporters (GRZEGORZEWSKA E. ET. AL. 2012).

Statistical research results concerning companies of secondary industry confirm the significance of wood sector in Polish economy. Over the years the value of sold production in the wood sector has been increasing. Its highest score has been noted for furniture companies. In the years 2005-2011 the value of furniture sold production increased from 21.6 billion PLN to 30.2 billion PLN (table 1). It needs to be noted that in 2010 this value was lower of above 1.5 billion PLN than a year ago. The reason may be the negative effects of global crisis which occurred in Polish economy in 2009. In 2005-2011 companies manufacturing paper and paper products noted the highest growth in production (from 16.7 billion PLN to 28.1 billion PLN). Participation of furniture sold production in the total sold production of industry in Poland since 2005 has been constant (about 3%). Similar tendencies may be noticed in other branches of wood sector (GRZEGORZEWSKA E. ET.AL. 2012).

Table 1. Sold production of wood sector compared to secondary industry in selected years

Specification	*2005*	*2009*	*2010*	*2011*
Secondary industry	571 664,4	741 741,4	814 956,9	950 361,0
Manufacture of furniture	21 664,7	27 237,7	25 728,2	30 181,8
Manufacture of products of wood, cork, straw and wicker	20 122,9	23 665,7	25 456,1	28 140,5
Manufacture of paper and paper products	16 743,1	20 043,9	24 100,9	28 062,1

Source: Study based on „Rocznik Statystyczny Przemysłu 2012 r." www.stat.gov.pl

4. RESEARCH INTO INNOVATIVE ACTIVITY IN WOOD SECTOR IN POLAND

Level of innovation in wood sector companies is varied. Important data on the innovation in Poland is provided by reports submitted by GUS under the title "The innovative activity of companies". This article presents significant research findings from the years 2008-2011. It needs to be noted that studies concerning introduction of innovations in wood sector are rare. Research into the field was conducted under the supervision of E. Ratajczak (RATAJCZAK E. 2009) H. Pachelska and I. Jenczyk –Tołłoczko (PACHELSKA H., JENCZYK-TOŁŁOCZKO I. 2008).

According to GUS, innovative activity entails getting involved in all kinds of academic, technical, organizational, financial and commercial activities, which lead or should lead to introducing innovations. In this research company innovation is divided into two categories. The first group comprises companies which are innovatively active, that is the ones which in the analyzed period (The innovative activity of companies 2008-2010 – GUS):

- introduced at least one innovation,
- realized at least one innovative project which was withdrawn or abandoned in the analyzed period, or has not been finished so it is being continued .

It means that the group of innovatively active companies comprises these economic subjects that undertook an activity the aim of which was to introduce innovation. However, innovative companies are those which introduced at least one innovation in the analyzed period.

Research conducted by GUS showed that in the years 2008-2011 one of the most innovatively active companies are the ones which employed at least 250 people. Over 59% of industrial enterprises and 46% of service companies made an effort to introduce at least one innovative solution. The companies that employ between 10 and 49 people were the least eager to introduce innovations. Every tenth industrial enterprise or service company was regarded as innovatively active. Every third industrial enterprise with an average level of employment was innovatively active. In the case of service companies the issue of innovativeness concerns every fifth of them. Data regarding innovative companies, that is the ones which introduced at least one innovative solution, slightly differed from these which implemented any innovative activity. In companies employing at least 250 workers, 58% of industrial companies and 44% of companies in the service sector were regarded as innovative.

Research findings presented in the division into sections by Polish Classification of Activities Criterion– PKD show the significance of wood sector as regards company innovation.

Companies dealing with manufacture of pharmaceutical products rank first in terms of innovative activity in the industry sector. In 2009-2011 nearly 57% of enterprises from this sector made an effort to introduce innovative activity. Next rank: hard and lignite coal mining (50%), manufacture of chemicals and chemical products (45.7%), manufacture of computers, electronic and optical products (36.3%) and manufacture of motor vehicles, trailers and semitrailer (35.2%).

However, in earlier period, when similar research was conducted i.e. in the years 2008-2010, the same branches of the section „Manufacturing" took leading places as regards company innovation. Only manufacturing of tobacco products noted a clear decrease in the number of innovatively active companies. Over the years 2008-2011 the percentage of innovatively active enterprises decreased from 46.2% to 33.3%, which caused a fall from the second to the seventh position.

As mentioned above, according to PKD, wood sector comprises the following: furniture production, production of woodenware, cork (excluding furniture), and also manufacture of paper and paper products.

From the conducted analysis it follows that in the wood sector the highest share of innovatively active companies in the general number of registered subjects is occupied by manufacture of paper and paper products (table 2). It needs to be noted that in the analyzed period the percentage of companies which made an effort to introduce an innovative solution increased from 17.5% to 17.9%. In 2008-2010 this group of subjects was 16th in 24 positions in the ranking of industrial companies. However, in the next research period the companies ranked 19th in 29 positions. In the case of companies dealing with furniture production a slight decrease has been noted as regards company innovation. In the analyzed period the percentage of furniture companies which are innovatively active decreased from 13.9% to 11.7%. The lowest level of innovation in the wood sector regards companies dealing with production of woodenware, cork and straw. In 2008-2010 and 2009-2011 every tenth company made an effort to implement innovative solutions.

Table 2. Wood sector companies innovatively active in 2008-2011

	Percentage of innovatively active companies		*Occupied position in the ranking*	
	2008-2010	*2009-2011*	*2008-2010**	*2009-2011***
Manufacture of furniture	*13,9*	*11,7*	*18*	*24*
Manufacture of products of wood, cork, straw and wicker	*10,9*	*10,0*	*21*	*26*
Manufacture of paper and paper products	*17,5*	*17,9*	*16*	*19*

Source: Own study based on "Działalność innowacyjna przedsiębiorstw w latach 2008-2010"; "Działalność innowacyjna przedsiębiorstw w latach 2009-2011"; www.stat.gov.pl

In evaluation of company innovation the key element is the type of the innovation introduced (chart 1). The highest level of product innovation was noted in companies dealing with manufacture of paper and paper products. In 2009-2011 over 12% of companies from this branch introduced at least one new or greatly improved product. Furniture factories ranked second, 6.7% of which introduced innovative products. Companies dealing with the production of woodenware, cork and straw took the last place. In general classification of industrial companies in the lead there are: manufacture of pharmaceutical products (51.4%) and manufacture of chemicals and chemical products (35.4%).

The highest level of procedural innovation was again noted in the companies manufacturing paper and paper products. In 2009-2011 nearly 15% of them introduced innovations. In the case of furniture companies innovation was implemented in 9%, while in the companies producing woodenware (excluding furniture) about 7% of them introduced the procedural innovation. In the ranking of industrial companies the most common procedural innovations were introduced in the manufacture of pharmaceutical products (40.4%), manufacture of chemicals and chemical products (33.9%), manufacture of motor vehicles, trailers and semitrailers (26.3%).

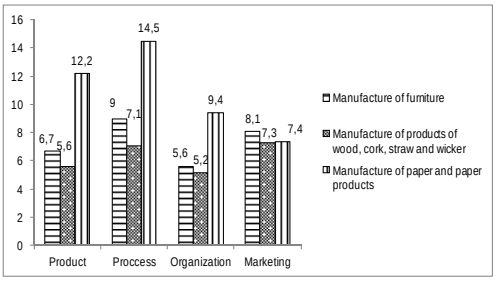

Chart 1. The percentage of wood sector companies which in 2009-2011 introduced innovation

Source: Own study based on "Działalność innowacyjna przedsiębiorstw w latach 2008-2010"; "Działalność innowacyjna przedsiębiorstw w latach 2009-2011";

Organizational innovations meant to implement new organizational methods in the established rules of functioning, workplace organization or relations with the environment, were generally introduced in companies dealing with manufacturing of paper and paper products. Other branches of wood sector were at the same level. The organizational innovations were introduced in every 20th company. In general classification of industrial companies as regards the introduced organizational innovations the following ranked first: manufacture of tobacco products (33.3%) and manufacture of pharmaceutical products (27.5%).

However, in the case of marketing innovations which include introduction of new concepts or marketing strategy, in wood sector furniture factories ranked first. In 2009-2011 over 8% of them introduced marketing innovation. The percentage of innovative companies in other branches of wood sector was slightly lower. Once more in the general classification companies dealing with the following appeared in the lead: manufacture of pharmaceutical products (30.3%), manufacture of chemicals and chemical products (28.5%), manufacture of tobacco products (25%).

Introduction of innovation is on the one hand an answer to the increasing clients' demands and market environment, on the other hand it is a chance for improvement of the company's financial condition. In 2009-2011 the highest share of sales income of new or greatly improved products in the total income was noted in the manufacture of other transport equipment (21.5%), manufacture of motor vehicles, trailers and semitrailers (19.5%). Among the wood sector enterprises companies manufacturing paper and paper products ranked first (14.5%), next the furniture companies, where 10.2% of total income was connected with introduced innovations.

An important aspect in the innovative activity is defining its funding sources. Innovations, particularly these introduced in the production companies such as wood sector enterprises, often call for bearing considerable financial outlays. Innovations are also connected with taking a risk because they deal with new solutions which the market may receive either positively or negatively.

The research conducted by GUS show that in the wood sector the basic source of funding is own capital (table 3).

Table 3. Sources of funding innovative activity in 2011.[%]

	Funding sources			
	Own	*Collected from abroad*	*Bank loans*	*Other*
Manufacturing	*77,1*	*6,0*	*11,2*	*5,6*
Manufacture of furniture	*57,4*	*8,3*	*23,1*	*11,2*
Manufacture of products of wood, cork, straw and wicker	*84,6*	*3,9*	*8,2*	*3,3*
Manufacture of paper and paper products	*58,9*	*5,3*	*10,3*	*25,5*

Source: Own study based on ,,Rocznik Statystyczny Przemysłu w 2012 r."; www.stat.gov.pl

In 2011 the share of own funds in financing innovative activity amounted to 57.4% as regards companies in the furniture sector and 58.9% in companies dealing with manufacture of paper and paper products. However, in the production of woodenware almost 85% of funding sources was own capital of the company. Bank loans ranked second. In financing innovative activity in the furniture production the percentage of bank loans was the highest and amounted to 23.1%. However, the share of bank loans in financing innovations in the case of woodenware production (8.2%) and manufacturing of paper and paper products (10.3%) was twice as low. It is worth noticing that funding sources collected from abroad were also destined for financing introduction of innovations. The highest percentage was noted in furniture branch (8.3%) and was higher than the average for the "Manufacturing" section.

5. CONCLUSION

Running an innovative business is a prerequisite in present economy. Companies, in order to gain competitive advantage, take action which, on the one hand entails a lot of risk, but on the other allows them to surpass competition and improve financial results.

Research conducted by GUS shows that in the wood section the highest percentage of innovatively active companies was noted in the manufacture of paper and paper products. The highest percentage of companies which introduced productive, procedural and organizational innovation was also noted in this group of companies. Companies of furniture branch ranked second in the field. They were also the leader of innovative marketing activity. The least innovative companies turned out to be the enterprises dealing with production of woodenware, cork and wicker. It needs to be noted that innovative activity of companies in the wood sector, the same as other industrial enterprises, was chiefly financed with the use of own capital, and next the money was obtained from bank loans.

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DOLOMITI PRO. A RESEARCH ABOUT PASSIVE WOODEN HOUSES IN CASE OF EARTHQUAKE AND FIRE: FINAL RESULTS. A VIEW ABOUT NEXT RESEARCHES

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Ing. Renata Stasiak-Betlejewska, PhD.

ABSTRACT

Dolomiti Pro research introduced the idea of a new certification in building wooden houses. New researches and new technologies suggest to build such houses in a safer and way.
New topics in this certification proposal go from building techniques to a specific planning of the project so that it's possible to predict the behaviour of the structure after an earthquake or a fire.
New researches will focus on the behaviour over time, decades, and the whole building lifecycle from the environmental point of view.

Key words: wood, earthquake, fire, quality, environment

1. INTRODUCTION

With the Dolomites Pro project researchers wanted to develop and implement an innovative construction system for the construction of energy efficient buildings based on building technologies that exploit the prefabrication of wood.

1.1. Construction of wooden buildings in Italy

A research published in September 2011 by the Promo_Legno shows that "the market of timber construction begins to have a market share of some interest and it is expected that the number of buildings and their percentage will increase further, and quite quickly. This prediction is derived from the recorded data according to which the "number of wooden houses has increased five-fold between 2006 and 2010 and increase by 50% over the next five years"
From the point of view of the use of different construction systems it is evident as "The construction system to the frame (platform) is the most used, followed by the system massive X-lam. The blockhouse system maintains a not insignificant share of the market. Other construction systems, mostly based on a mixture of the systems described herein, or on special boards, sometimes patented by a single manufacturer, also have a certain market share."

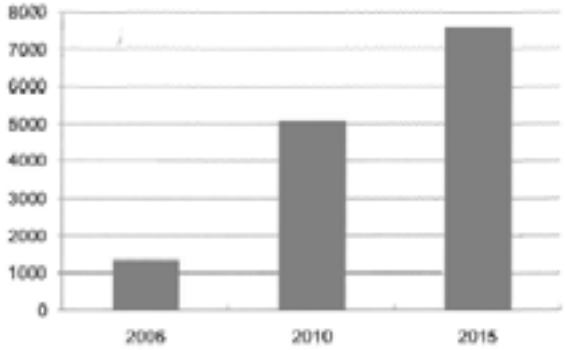

Figure 1. Trend of the construction of wooden houses from 2006 to 2015. Number of dwellings

Dolomiti Pro research is designed to identify and subsequent study of a construction system that present particular features that differentiate it from those currently employed in national and international achievements of the pre-fabricated buildings to the wooden structure.

2. QUICK OVERVIEW ABOUT ACTUAL CONSTRUCTION TECHNIQUES

2.1. The construction system supporting panel (x-lam)

The supporting structure of the building is made of wood baffles made by bonding an odd number of successive layers and mutually orthogonal boards of solid wood.
The number of layers is functional to the dimensioning of the structural element and therefore depends on the amount of load that must absorb the panel operates.

The main feature of the construction system is therefore a clear separation of the inside walls of the various functional layers: the structural function is in fact discharged completely from the wooden panel while the isolation of the partition is entrusted to the insulating layer, usually on the outer side of the panel.

2.2. The supporting wall construction frame - type Platform Frame

It is the most widely used constructive settle for the construction of wooden buildings. The structural pattern remains the carrier of the septum. In this case the walls are constituted by a series of uprights solid wood which form the backbone can lead to ground the vertical loads, the horizontal thrusts are absorbed instead of boards or panels stiffening plated on the two sides of the frame structural. These panels are generally plywood type OSB (oriented strand board), LVL (Laminated Veneer Lumber) or similar.

The main feature of the construction system is to have a correspondence within the wall between the supporting layer and insulation that is precisely inserted between the various wooden uprights. Generally, the stratigraphy is completed with an additional external insulation that allows to standardize the thermal behavior of the partition.

3. DOLOMITI PRO BUILDING SYSTEM

It is an innovative system constructive frame of wooden buildings with low energy and environmental impact.

The Dolomiti Pro construction system comes from the idea of transferring the concept of frame structure beams and pillars typical of the traditional reinforced concrete of the second part of the twentieth century to the technology of timber construction. Such a shift is made possible by the recent development of new products and technologies in the field of woodworking.
The construction system Dolomites Pro consists of a bearing cage made of beams and columns generally made of laminated spruce, are possible solutions with laminated wood floors exposed or double blade larch; Linear elements that make up the main structure are connected together by means of appropriate interlocking wood-wood, stiffened with metallic carpentry and have a thickness of 16 cm.
The pillars have a fixed size of 16x16cm and can if necessary be accompanied by additional pillars reduced section 16x8cm with horizontal support function of the deck. The main beams having a width of 16cm have a height dimensioned in function of the loads agents and equal to a multiple of the height of the individual lamellae generally equal to 4 cm.

Figure 2. Test carried out at the laboratories Eucentre - 2011

3.1. Analysis of static behaviour

The development of the new system constructive frame Dolomites Pro has provided an analysis of the constituent elements initially the cage wooden bearing identifying critical points of the structural model and defining planning and implementation solutions.

For each constructive node have been identified the correct methods of carrying out the connections wood-wood and wood-concrete preparing a schedule of work for each of the constituent elements of the structural cage (root, pillar, middle pillar, main beams, joists, dock, etc.).

3.2. Laboratory tests

Tests for determining the mechanical properties of the 4 wooden walls were made according to the standards set out in the UNI EN 12512:2006 Timber structures - Test methods - Cyclic testing of joints made with mechanical fasteners.
The tests were carried out by preparing a loading apparatus comprising:

1. No. 1 500 kN MTS hydraulic jack, equipped with LPM023 dynamometer (load cell): a cycle of horizontal loads in accordance with UNI EN 12512:2006
2. n ° 4 hydraulic jacks Parker; static loading on the wall, for a maximum vertical load of 135kN.
3. Set of displacement transducers.

3.3. Analysis of behavior during an earthquake event

After performing the tests on individual elements we proceeded to design the building to be tested on a shaking table to the actions of the earthquake. The project is based on the maximum size of the laboratory EUCENTRE of Pavia. You have designed a three-storey building construction system according to the Dolomites Pro, in a seismic zone with a PGA (Peak Ground Acceleration) project of 0.35 g (PGAcode) and an attempt to q equal to q = 1.
The building has a plan dimension of 610x474cm and rests on a concrete curb of 640x510cm. Consists of a structural grid of the artifact 3 +3 pillars spread over a height of 9.9 m for a total of 3 floors. 4 sides are scheduled openings of variable size deduced from those on the walls tested to a dynamic test in the laboratory IVALSA.

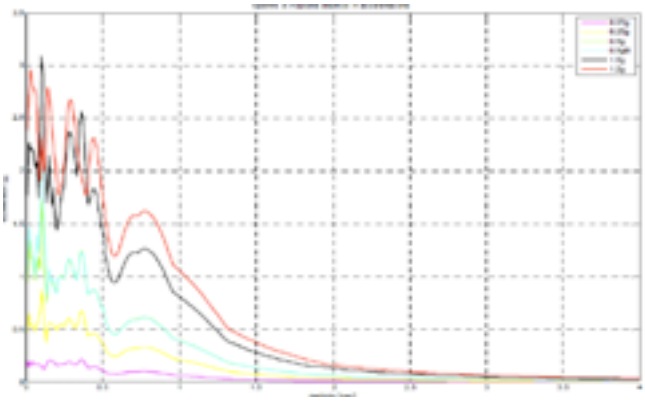

Figure 3. Elastic response spectrum acceleration in one of the tests

During all phases of the test, the structure was monitored with the use of 2 acquisition systems. The first consists of traditional instrumentation, composed of acceleration transducers arranged in two main directions of the plane, and by displacement transducers for monitoring of any slippage or excessive deformation of the substructure of connection. The second system consists of high-definition cameras for monitoring movement between floors.

3.3. Results

The prototype subjected to different seismic tests of increasing intensity did not show evident damage to the structure and has been completely removed in the days following the end of the experimental tests. Disassembly of the prototype has highlighted some deformation and breakage in the elements of metal used. Overall, however, the building has demonstrated a very high dissipation capability demonstrating a good response to seismic actions.

3.4. Analysis of behaviour towards fire

The research project has developed performance study of fire resistance of the building system Dolomites Pro were carried out a series of destructive tests in the laboratory. Subsequently it was possible to proceed to the implementation of a spreadsheet internal able to evaluate different resistances provided in relation to different stratigraphy and the different materials used.
The growing interest in recent years towards the wood, facilitated by the recognition as a building material within the Technical Standards for Construction, has meant that this material is compared to other materials for the requirement of safety in case of fire.
The tests were performed in accordance with the UNI EN 1365-1:2002 and EN 1363-1:2001.
After 73 minutes on the side facing the wall did not show it yet passage of smoke loss of load-bearing capacity. Furthermore the measured temperatures were still in line with the parameters required for obtaining certification REI.
For this reason, having abundantly exceeded 60 minutes of the test trial was interrotrta and we proceeded to the analysis of the specimen.

3.5. Improvements

After the tests performed on the specimens it was possible to identify the strengths and weaknesses of the major building system. The design solution with passage of cavedi interior to the wall thickness considerably weakens the capacity of reaction to fire of the structures, the choice of coating such Riser with special plasterboard plates baffle plate has, however, proved an effective solution that can guarantee a resistance more satisfactory system wall.

4. NEXT RESEARCHES

In Italy there is the widespread belief that a reinforced concrete house is more secure and lasting of a wooden house. This is recognized despite an excellent elastic property to wood, clearly superior to that of reinforced concrete, and as far as durability is concerned, even if there are (still in perfect efficiency) wooden houses built 3 or 4 centuries ago (and therefore with construction techniques of that time).

4.1. Durability

An excellent way to disprove this belief is to conduct research on the durability of a wooden house.In this regard we are conducting initial experiments involving multiphysics aspects, namely the links between chemistry and physics to predict the behavior of stutture wood after decades.
The behavior of the wood is heavily non-linear and is strongly influenced by environmental conditions, temperature, humidity, light, pressure, multiphysics, in fact.

For this reason such a study, carried out on samples whose projections of the behavior must be brought forward for decades, the need to use the best systems for numerical simulation.
In any case, the simulation must then be compared with wood samples aged in suitably appropriate specialized laboratories.

4.2. Wooden houses lifecycle

Another area of interest is the environmental impact of the construction of a wooden house, from design to demolition.

This is one of the finer aspects of new research: the aim is to use techniques, technologies and materials that have the least impact on the environment. The calculation is done on a statistical basis by calculating the cubic feet of CO2 produced throughout the life of the house, the equivalent of deforestation square meters, cubic meters of water used and the KWh of energy. In some European countries (in France, for example) there is a growing perception of the added value of a home with low environmental impact, and are spreading appropriate certifications, which are related to the construction permission in specific areas of the territory.

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