MANAGEMENT ASPECTS IN FOREST BASED INDUSTRIES

ZAGREB 2020

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MANAGEMENT ASPECTS IN FORESTRY AND FOREST BASED INDUSTRIES

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PREFACE

WoodEMA, i.a. is an international association for economics and management in wood processing and furniture manufacturing establihsed in the year 2007, with members from 12 countries on 2 continents at the moment. Since one of the main goals of the association is to promote science and results of scientific and professional work of its members, Association decided to start issuing scientific books. Each scientific book will be dedicated to a different topic and it will be related to a different field of expertize of the Association and its members.

This is the fourth issue of scientific books and we agreed that the topic for this issue should be dedicated to MANAGEMENT ASPECTS IN FORESTRY AND FOREST BASED INDUSTRIES. Some of our members, but some non-members as well, who have research activites in fields of expertize related to the main topic are involved in creating of this scientific book. In this issue we have 16 chapters with 38 authors from 7 European countries who presented their research results in the area of management related specifically to forestry, wood processing and furniture manufacturing.

Main goal of this scientific book is to stress the problems that forestry, wood processing and furniture manufacturing companies meet in their every day praxis, the way to solve those problems and to improve activities of that industrial branche using scientific methods and models.

This is the fourth scientific book issued by WoodEMA, i.a. to help collecting some knowledge and transfering that know-how further on. We hope to publish many other books this way providing scientific and professional help to our industrial branch in different managerial areas of expertize.

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1. CHALLENGES TO MANAGEMENT OF FOREST INDUSTRY ENTERPRISES IN BULGARIA

Radostina Popova-Terziyska

This article presents the main characteristics and problems of the forestry industry in Bulgaria. The activities of forest enterprises main functional areas are presented - production, quality, ICT and Internet, marketing and advertising, innovations, investments, human resources, cooperation and internationalization. BCMS and BIA data, expert assessments and results of own studies and analyzes over the past 5 years have been used.

The main challenges to the management of enterprises are highlighted because of the managerial evaluation in the sector and the ensuing opportunities for their development.

1.1 GENERAL CHARACTERISTICS OF THE FOREST INDUSTRY IN BULGARIA

The forestry industry in Bulgaria includes woodworking activities such as the production of wood products and furniture production.

Woodworking include activities such as cutting, planing and impregnating timber, production of timber products, cork, veneer and wood panels, hardwood flooring, joinery and timber products for construction, wood packaging, etc. The production of woodworking enterprises is a material in the furniture production and the furniture is a final product and the final main result of the production in the forest industry. (Popova, 2013)

Furniture production includes various stages of the processing to the production of the finished product - furniture that is generally differentiated as public furniture and home furnishings.

The industry can be assessed as promising given the availability of sufficient raw material resources, sustainable market positions of manufactured products and its importance as a source of income and employment for a significant part of the population in the mountain and rural areas.

Imports of timber and derived products are mainly from the countries of Romania, Turkey and Austria. For furniture - from Poland, China, Germany, Italy, Turkey. (BCWFI, 2018, 2019)

Exports of timber are mainly to countries such as Greece, Turkey and Serbia, with furniture - Germany, Czech Republic, France, Italy, and the United Kingdom. Countries from the Middle East, Africa and North America are also showing greater interest in Bulgarian production. (BCWFI, 2018, 2019)

Furniture companies have been increasing their export orientation in the last few years. The reason for this is the development of the large furniture chains in Europe -

from the Far East to Eastern Europe and especially to Bulgaria. Bulgarian production is characterized by smaller-scale producers with competitive pricing and relatively good quality-price ratios; it is also characterised by high adaptability and flexibility to customer requirements. (BCWFI, 2018)

The furniture market in Bulgaria is small but relatively stable - with its declines and improvements at the pace of the construction sector. Regarding the possibilities for increasing the presence of Bulgarian producers in the internal market, the policy of the Ministry of Economy aims at improving business conditions - by reducing the administrative and regulatory burden, stimulating investment in modern technologies and innovative industries and products. The main domestic furniture industries are bedroom, dining and living room furniture. (BCWFI, 2017)

Over the last years, the domestic furniture retail market has undergone a very dynamic development - the bankruptcies of Carrefour and Aaron, the rapid development of Videnov Furniture, the financial difficulties of Yavor Furniture, the intensification of Internet commerce and the role of IKEA in the Bulgarian market.

The main challenges facing manufacturers are the constant pressure from traders to reduce prices or to market analogy of old models, but at lower prices. On the other hand, the prices of materials and wages in the sector are rising and, accordingly, these circumstances lead to a decrease in margins, a decrease in quality and the entry of more foreign products through large chains. (BCWFI, 2018)

1.2. MAIN PRODUCTION AND PRODUCTS OF WOOD

The forest industry is characterized by unattractive working conditions and a lack of career development, especially for the women in the sector. However, in recent years, the industry has managed to get closer to the peak pre-crisis levels and in the industry, there is a serious development of technology, there are numerous trainings and events related to the opportunities for the development of the industry.

The industries in the forest sector are diverse and involve different processing stages. Depending on the purpose and consumption of the end products in the sector, the main outputs by economic activities according to NSI (CEA-2008) are:

Manufacture of wood and of products of timber and cork, including:

- Cutting, planning and impregnation of timber;
- Manufacture of veneer and wood panels;
- Manufacture of prefabricated parquet tiles;
- Manufacture of joinery and other products of timber for construction;
- Manufacture of wood packaging;
- Manufacture of other articles of wood.

Manufacture of furniture, including:

- Manufacture of office and shop furniture;
- Manufacture of kitchen furniture;
- Manufacture of mattresses;
- Manufacture of other furniture.

The largest share in the production in general is the activities "Furniture Manufacturing", "Manufacture of Veneer and Wood Panels" and "Cutting, Planing and Impregnation of Timber", followed by " Manufacture of Joinery and Other Wood Products“. "Manufacture of Wood Packaging“ has the smallest share of total sector production, and “Manufacture of Mattresses“ has increased in recent years. (BCWFI, 2017). Other minor products include wooden toys, sports equipment, writing boards, coffins, household products and other wood products.

Other wood products are primarily used in construction, fuel and heating (wood pellets, wood briquettes, wood chips, firewood), wood packaging (pallets, crates, chests, crates), and paper and cardboard.

Bulgarian owners have dominated the furniture industry; in the woodworking industry, the largest companies including Kronosplan and Kastamonu are foreign owned. Industry is struggling, especially in its gray micro and small enterprises. The gray economy includes any economic activity that is legal, but which is unrecorded and unregulated. Activity in the gray sector of furniture production accounts for about 40% of real production, per BCWFI. (www.timberchember.bg, 2018)

The typical Supply Chain in Forestry includes Logging – Sawmill – Factory – Wholesaler - Retailer – End user. Manufacture of wood and of products includes activities for logging, manufacture of products of wood, cork, veneer and plywood, parquet floors, woodwork and wood products for construction, wooden containers, paper and paperboard, etc. The production of woodworking enterprises is a base material in the furniture factory and other wood-based manufacturing.

Technological operations in Forest Industry includes:

- *Cutting* - production of boards and beams, production of sleepers and production of details;
- *Development and adhesion* - production of veneer, production of plywood, production of matches;
- *Crushing and pressing* - production of wood slabs, production of chips, wood flour and more.
- *Combined operations* - production of furniture, production of packaging, production of musical instruments, other productions.

1.3. TRENDS IN THE MANAGEMENT OF FOREST INDUSTRY ENTERPRISES IN BULGARIA

Trends in the forestry industry in Bulgaria are in the functional areas of enterprises - production and quality management, ICT and Internet, marketing and advertising, innovation and investment, human resources, cooperation and internationalization. The data sources are BCWFI, BIA, expert evaluations and results from our studies and focus group interviews.

Production management

The main elements of the manufacturing process - the materials, machinery and technologies used in the sector - define quality and productivity improvements that are many times lower than the EU average. Owners and managers of companies in the sector highlight the organization of production and supply chain management as major problems.

In recent years, new materials have often been used in combination with traditional wood materials. They are diverse - basic and ancillary, woody and non-woody products. Protective decorative coatings and all types of materials have an increasing environmental focus, aimed at reducing harmful human effects and minimizing waste.

Machinery and equipment are an important part of any enterprise - the efficient processing, storage of materials are equally important for the efficiency of the production process. There is a wide choice of machines depending on the specificity and type of production process. Today, businesses need versatile machines that efficiently produce one discrete part and then can automatically change the configuration to produce another part. An increasing number of companies are using labels and barcodes of materials containing information that directs the processing of subsequent machines.

More than half of the enterprises have foreign technology and / or an international quality management standard in place. In the last few years, there has been significant incentives to implement FSC certification, which guarantees that the products are shipped from well-managed forests providing environmental, social and economic benefits. Enterprises in which foreign technology is introduced are mostly medium in size or small in size, established in the period 1990-2000 (71%).

The role of design is growing both as an innovation activity and as a major competitive advantage in different sectors of the economy including the forest industry. Design is a key element for adding value to consumers. At the same time, responsible use of resources and materials is required leading to creative modern aesthetic concepts and production methods. For example, a Pan-European trend is the increasing use of raw materials from renewable sources, as well as the possibility of recycling.

The efficiency of the supply chain and logistics operations, as well as reverse logistics, are key factors in improving the competitiveness of the sector, characterized by a variety of materials, operations and finished timber products. The problems

associated with reducing delivery time and logistics efficiency increase the requirements for information systems to provide functionality and flexibility.

Human resource Management

The sector employs over 40,000 people, but employees are typically low-skilled and need specific training and qualifications. There is also a lack of desire on the part of young people to work in the sector. The fact that there is a lack of qualified personnel in the field of production and constructors is also worrying, but experts also point to the lack of necessary competencies in the employees of the commercial establishments and in the middle commercial management, which, through their daily actions and decisions, directly influence the effectiveness of the enterprises.

In recent years, BCWFI has organized many employee trainings. The main directions of the trainings were the main activities, sales management, pricing and communications.

At the same time, there is a potential for education in higher and secondary education – at the University of Forestry and in Forestry schools, but some of the secondary schools have been closed in recent years. However, the tendency for active cooperation of UF with the representatives of the branch in the training of students and their practical realization, as well as a long-term cooperation with the purpose of conducting internships in enterprises and presenting lectures by managers of companies in the sector, continues.

Marketing and advertising management

Almost half of the companies have a marketing strategy in place, but most of the companies in the sector use only one marketing tool, and most of them lack the use of integrated marketing communications. The efforts of the entrepreneurs are mainly aimed at increasing the market share at the expense of the development of new products and their positioning. There is also a need for improved branding skills.

The advertising campaigns that target only the so-called "price advantages" lead to an extremely unfavourable end-user attitude for the industry. The main challenge for participants in the value chain is to reduce price competition, improve quality and balance price-design-quality.

Investment management

Most often, investments in the sector are made for technological upgrades. However, experts believe that investments must be balanced, both in production capacity and in terms of diversification. About 2/3 of the companies in the sector finance their investment projects with their own funds and the opportunities for financing under European funds and programs are not used sufficiently. Small business owners regard the application procedures as administratively burden and highlight the problem of the lack of project management professionals in the businesses.

Innovation management

Enterprise innovation is mainly technological and innovative activities such as the purchase of machinery related to the development of new products and processes are carried out. About 1/5 of the companies in the sector lack the financial resources to pursue innovation and the registration levels of various forms of industrial property protection, such as patents and industrial design, are low. Collaboration with scientific organizations and universities to develop new products is carried out by about 15% of enterprises, with R&D or unit in just over 10% of enterprises, mainly large firms.

ICT and Internet

Integrated systems for managing almost all processes, such as ERP, are implemented in about 20% of enterprises, particlarly in large woodworking and furniture enterprises. To a lesser extent, customer relationship management (CRM) systems - 12% and supplier relationship management systems (SCM) - 9% are implemented. It is logical that the use of the Internet is highly manifested - 97% of businesses have a website and online orders and sales are made by about 40% of businesses.

Cooperation and internationalization

Inter-company cooperation in the sector is mainly carried out as subcontracting as well as franchising with IKEA. The franchising relationships of Bulgarian companies with IKEA are mainly for the production of chairs, tables and toys.

In many places, there are cluster-like association forms, but they are not yet organized as a cluster. There are 13 particularly favourable industries in Bulgaria for the creation and operation of clusters, including the forestry industry. In the forestry sector, the goal of building clusters is the efficient use of timber resources and increasing the competitiveness of interconnected companies. The practice of creating and operating clusters in recent years shows two unsuccessful attempts - in Velingrad and Troyan. In 2011, a Bulgarian Furniture Cluster was created, with leading furniture manufacturers from the country participating, and today it is the only successful example in the sector.

Outsourcing is mainly used in the design of furniture from design studios and with the support of production machines and equipment.

More than 60% of the enterprises in the sector export, mainly directly. Not many businesses export through large retail chains. The profile of a typical exporting company is the following: created more than 20 years ago; mainly exports chairs, tables and doors; average in size - about 50 staff.

Branch organization

The Wood and Furniture Industry Chamber of Commerce is the only official representative of employers in the Furniture, Woodworking, Manufacturing and Supply of Machines and Materials for Woodworking and Furniture Manufacturing, of which about 300 companies are members.

Through its activities, the BCWFI contributes to the development and consolidation of the Furniture and Woodworking sectors by: (BCWFI, 2018)

- Provision of information on modern materials, technologies, equipment and innovations in the industry;
- Providing information on the state of the international markets and opportunities for commercial relations and cooperation;
- Provision of information on operational programs to support small and medium-sized businesses;
- Provision of information on changes in the regulation of the activities in the sector;
- Conducting specialized seminars, analyses and expert assessments, round tables, workshops, training and retraining of personnel, resources;
- Organizing exhibitions and visits to national and international exhibitions;
- Organizing business meetings with Bulgarian and foreign partners in the framework of the annual international exhibitions, organized jointly by BCWFI with Bulgarreklama, TECHNOMBEL and the World of Furniture.

1.4. CONCLUSIONS AND RECOMMENDATIONS

Studies conducted on the innovation and competitiveness of forestry enterprises indicate that their main problems and weaknesses are related to attracting qualified specialists, lack of long-term strategies, low patent activity, lack of state aid and support, as well as financial and organizational constraints on the introduction of innovations of various kinds.

Therefore, the main challenges facing the management of Forest industry enterprises in Bulgaria are related to:

- Improvement of the organization and operational management in the enterprises;
- Production specialization;
- Marketing positioning and branding;
- Entering new markets and increasing exports;
- Investments in basic and continuing training;
- Collaboration with universities and research centers to develop new products and technologies through EU projects and programs;
- Mergers in clusters and supply chain associations.

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9. www.ipa-cbc-007.eu [INTERREG Cross-border programme of the European commission]
10. www.mi.government.bg [Ministry of Economy of the Republic of Bulgaria]
11. www.timberchamber.bg [Bulgarian Chamber of Woodworking and Furniture Industry]

2. SUSTAINABLE DEVELOPMENT – INTERNATIONAL FRAMEWORK – OVERVIEW AND ANALYSIS IN THE CONTEXT OF FORESTS AND FOREST PRODUCTS

Annika Rantala

Forests and forest products provide opportunities for international trade and offer many possibilities for competitiveness. Quality constitutes a significant factor for the international markets. Markets with trade have an increasing importance nowadays. Quality comprises certification.

Global framework is significant in the sustainable development. Sustainable development is included in the policy of the Green Economy, the Bio-economy and the Green Growth.

This is a qualitative research based on literature. It is based on research articles and literature and organizational literature. Several academic sources are included, for example Proquest, Academic Search Complete (EBSCO), Agris, CAB Abstracts, SCOPUS (Elsevier), Web of Science (ISI) and Google Scholar and Internet sites.

2.1. INTRODUCTION

In Finland, the current legislation permits increasing competition in markets. The new Forest Act followed in 2014. Forest owners can be viewed as a resource with a value-creation potential of forests as ecosystem services. Wood belongs to benefits from the forest ecosystem. Ecosystem services can serve as a background for the analysis of forestry service markets. In Europe, the significance of forests is crucial especially for the Nordic countries. (Mattila, Osmo 2015).

There are opportunities for the forest sector in the shift to a bio-based economy: one solution is to replace fossil-based energy and fossil-based products with renewable and environmentally friendly bio-based alternatives. (Hannerz, Mats; Nohrstedt Hans-Örjan; Roos, Anders 2014).

There are opportunities to enhance the competitiveness of wood as a building material, to achieve greater use of renewable materials in multi-storey construction focusing in lightness and possibilities for prefabrication, and improving these (Riala, Maria; Ilola, Lauri 2014).

Communication is important for sustainability and acceptability in the forest sector. Knowledge of communication and image building is significant. (Korhonen, Elina, Toppinen, Anne; Lähtinen, Katja; Ranacher, Lea; Werner, Andrea et al. 2016)

2.1.1. Theoretical background

Resources are valuable for large organizations. Business concept must work economically. Financing is critical also in new investments. In order for new products to be competitive, they have to be cheaper than the alternatives and it has to provide additional value: technical, strategic or emotional performance. (Roos, Anders; Lindström, Mikael; Heuts, Lena Hylander, Nippe; Lind, Erik; Nielsen, Christian 2014)

The impact of forest certification is in its role to enhance a more holistic concept of sustainable forest management. (Rametsteiner, Ewald; Simula, Markku 2003)

Certification systems with standards may act as incentives in the markets and for market access. Policy and market scan be influenced with market mechanisms, for example certification with a third-party system. (Cashore et al. 2012)

Forest certification was introduced in the early 1990s addressing concerns of deforestation and forest degradation and to enhance the maintenance of biological diversity, particularly in the tropics. Forest certification is a market driven tool. The main idea behind certification is that consumers who are concerned about deforestation and forest degradation will choose to buy timber products from well-managed forests. For a consumer, the label is the sign that the forest product is from a forest that fulfills certain environmental and social standards. Forest certification has an important role in promoting a comprehensive concept of the sustainable forest management. (Rametsteiner, Ewald; Simula, Markku 2003)

2.2. EU FLEGT POLICY

The EU Action Plan for Forest Law Enforcement, Governance and Trade (FLEGT) in 2003 introduced a process and a plan through which the European Commission proposed to address the widening problem of illegal logging and trade related to it (The EU Action Plan for Forest Law Enforcement, Governance and Trade (FLEGT) in 2003 Communication from the Commission to the Council and the European Parliament - Forest Law Enforcement, Governance and Trade (FLEGT) - Proposal for an EU Action Plan).

COUNCIL REGULATION (EC) No 2173/2005 of 20 December 2005 on the establishment of a FLEGT licensing scheme for imports of timber into the European Community established the FLEGT licensing scheme for imports of certain timber products into the European Community (Council Regulation (EC) No 2173/2005 of 20 December 2005 on the establishment of a FLEGT licensing scheme for imports of timber into the European Community).

Commission Regulation (EC) No 1024/2008 of 17 October 2008 regulated about detailed measures for the implementation of Council Regulation (EC) No 2173/2005 on the establishment of a FLEGT licensing scheme for imports of timber into the European Community (Commission Regulation (EC) No 1024/2008 of 17 October 2008 laying down detailed measures for the implementation of Council Regulation (EC)

No 2173/2005 on the establishment of a FLEGT licensing scheme for imports of timber into the European Community).

Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 regulated about the obligations of operators who place timber and timber products on the market (Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 laying down the obligations of operators who place timber and timber products on the market - Text with EEA relevance). Forest Law Enforcement Governance and Trade, FLEGT, for legal logging and trade with the EU Timber Regulation includes due diligence and Voluntary Partnership Agreements (VPAs) (European Union 2017).

FLEGT belongs to policy coherence where multi-stakeholder participation has been effectively supported (COMMISSION STAFF WORKING DOCUMENT Evaluation 2016).

2.2.1. Competitive Sustainable Business

The Rovaniemi Action Plan for the Forest Sector in a Green Economy describes how the forest sector can achieve the emerging green economy (United Nations 2018).

The Rovaniemi Action Plan for the Forest Sector in a Green Economy consists of five pillars: “Sustainable production and consumption of forest products”; “A low carbon forest sector”; “Decent Green Jobs in the forest sector”; “Long term provision of Forest Ecosystem Services”; and “Policy development and monitoring of the forest sector in relation to a green economy”. The goal of the first pillar is that patterns of production, consumption and trade of forest products are truly sustainable; the second pillar Goal: The forest sector makes the best possible contribution to mitigation (sequestration, storage and substitution) of, and adaptation to, climate change; the third pillar Goal: The workforce is able to implement sustainable forest management, and the forest sector contributes to achieving the social goals of the green economy by providing decent jobs; the fourth pillar Goal: Forest functions are identified and valued and payments for ecosystem services (PES) are established, encouraging sustainable production and consumption patterns; the fifth pillar Goal: Policies and institutions relevant to the forest sector promote sustainable forest management; policy making is evidence-based, policy instruments are effective, efficient and equitable and monitoring is adequate in order to mainstream the green economy in forest sector policies. (The Rovaniemi Action Plan for the Forest Sector in a Green Economy 2014)

The Updated National Forest Strategy of Finland will implement the UN Sustainable Development Goals (Agenda 2030) related to forests (Updated National Forest Strategy 2025)

Sawmill industry’s business strategy is product driven and firms are under price competition. The service-based view recommends that in place of being created by production, customer value originates from processes in which the provider supports the customer’s value creation. This view places the customer at the core of the

business and challenges prevailing business approaches within traditional industries. (Makkonen, Marika 2019).

The growing role of services for business making has been recognised in the forest-based sector. This is also important in the Bioeconomy. (Pelli, Päivi, Haapala Antti; Pykäläinen, Jouni 2017)

40 percent of Finnish end-energy consumption derives from renewable sources, and the aim is to increase the use of renewable energy so that during the 2020s its share grows to more than 50 per cent: in 2018 renewable energy was 37 per cent of gross energy consumption in Finland. (MMM 2020). Enhancing political and public awareness of forest management issues and lignocellulosic-based biofuels fosters the spread of forest biorefineries. (Hämäläinen, Sari, Näyhä Annukka and Pesonen Hanna-Leena 2011).

The process innovation of forest biomass supply chains inlcudes many possibilities: the innovation types can be were divided into incremental, radical and network innovation. Recognizing which processes have to be revised incrementally or completely is required. Achieving cost reduction was possible by innovating traditional forest biomass supply chain processes in a new way. The innovation process for the entire network of a supply chain is crucial. (Karttunen, Kalle 2015). The forest sector has opportunities for new forest products and services aiming at consumer markets with forest products compared to competing materials, such as concrete, steel, and plastics, in lower prices and new product and service innovations targeting end-consumer markets. In the emergence of Bioeconomy with taking along new consumer market opportunities to the forest sector, there is a need to understand the new business ecosystem the model of which includes opportunities brought by various resources and technologies. Better understanding of the concepts can lead to consumer-driven development of forest products and services and enhanced competitive advantage. (Holopainen, Jani 2016)

2.2.1.1. Nordic quality in the markets

Technical performance and appearance are the most important considerations for customers in the case of wood products. Also service and supplier reliability have importance. (Toivonen, Ritva 2011)

The wide utilization of market-based economic policy instruments that are sponsored by government is a way to support green investments (The Nordic Region – leading the way in green growth Outcomes of the Nordic prime ministers' green growth initiative 2011–2015 2016). The Circular Economy is a sustainable alternative to the current linear economic model (Ranta, Valtteri; Aarikka-Stenroos, Leena; Ritala, Paavo; Mäkinen, Saku J. 2018). The Circular Economy belongs to the key policy goals both in Europe and in Finland. Material and energy issues are important in the context of Circular Economy and Bioeconomy at the EU and national level. Wood products can serve as carbon pools during their life cycles and after. More attention is needed on both sustainability and life-cycle thinking in the future. (Husgafvel et al. 2018)

2.2.1.2. Forests and forest products as investment in the markets

Different economic sectors may require different measures (Loiseau et al. 2016). The growing European forest resources provide the globally increasing consumption of forest products and allow the wood based bioeconomy to enhance in the European Union. (Kallio, A. Maarit I.; Solberg, Birger; Käär, Liisa; Päivinen, Risto).

Environmental issues with European Union environmental and energy policies have created pressures for a change (Antikainen et al. 2017)

Increasing the use of wood in construction and for other long-lived uses help in achieving the goals of sustainable development (Wang, Lei; Toppinen, Anne; Juslin, Heikki 2014). Wood-frame multi-storey construction enjoys increasing popularity in the public domain. More efforts should be focused on market creation (Lazarevic, David; Kautto, Petrus; Antikainen, Riina 2019).

Utilization of network-based business models shows as a means of creating competitiveness in the tightening global competition (Mattila O.; Hämäläinen K.; Häyrinen L.; Berghäll S.; Lähtinen K.; Toppinen A. 2016).

2.3. CONCLUSIONS

International and national policies have a significant role for the sustainable development. Forests constitute an important resource in the sustainable development and policy framework including forest certification.

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3. MARKET VALUE AND TIMBER ASSORTMENT SALE MODELS – COMPARATIVE STUDY

Stjepan Posavec, Špela Pezdevšek Malovrh

3.1. INTRODUCTION

Forestry and wood processing industry have significant influence on the development and implementation of the EU bio-economy development strategy (and its Action Plan), the Paris Agreement and the Sustainable Development Goals.

The last 10 years of economic growth of regional and international trade in logs and sawn wood has resulted in increasing demand and higher prices of wood. The demand for wood by forest industries is projected to increase by 15%–35% in 2030 compared to 2010 (Mantau et al., 2010). Natural disasters with ice storms and bark beetle gradation had significant reflection on the wood assortments market in Slovenia, Croatia and other EU countries. In 2014/2015 several factors coincided: high stock of wood in the industry, reduction of consumption of lower quality wood in Austria due to problems in the wood industry (MDF plate plant and damages at the cellulose factory). Such a large imbalance between supply and demand can logically lead to lower prices, which had in the past also occurred in other European countries. Prices of different qualities of coniferous logs oscillate between 10 and 20% in one year (http://wcm.gozdis.si/).

Forestry and wood processing are important sectors of Croatian and Slovenian economy. In Croatia, forest-based industry contributes to 3.6% of GDP, while its share in total exports stands at 10.4%. In Slovenia, forest-based industry contributes to 1.9% in state GDP. Therefore, the Governments of both countries have implemented sector-specific legislation to regulate forest-based industry and also proposed strategic documents and laws to increase competitiveness of the forest-wood chain. For example, in Croatia the draft Law on the Processing and Use of Wood and Wood Products has been prepared (different draft versions prepared in 2008, 2012 and 2017, not adopted in parliament) and in Slovenia Action plan to increase competitiveness of the forest-wood chain in Slovenia by the year 2020 was adopted in 2012. Strategic objective of this sector is to develop and sustain a flexible wood industry, which is competitive on the international market and capable to optimally use wood-based raw material through quality that is recognized on the market, compliance with international standards, well-organized wood assortment market, development centre for the design of production programs and technological processes, as well as investment and development programs. Moreover, the focus is to increase the value of wood-based raw material through highly finalized products with features of high quality, design and recognition, based on professional analyses and standards.

These documents identify several strengths and opportunities, but also weaknesses of Croatian and Slovenian wood-processing sector. The strengths are related to long tradition of sustainable forest management, high wood-processing potential, high quality raw material (sustainable forest management, certification and availability), export oriented industry (particularly in finished products), experience and long traditions of wood industry production as well as skilled labour force. Moreover, there are also various opportunities recognized which include boosting competitiveness on both domestic and the international markets; increasing the export share of finished products, high value-added products; improving product quality and design; establishing new relationships inside the sector, creation of clusters. Among the negative (weakness) factors limiting development of the sector the documents recognized company management lacking adequate management skills, small and fragmented wood industry companies, insufficient cooperation among companies at various stages of the wood value chain, insufficient quality assurance system, lack of investments (especially international) leading to low technological level, and inadequate marketing and wood products branding.

Based on that, the long-term development vision for the sector is to develop and sustain a wood-processing industry that is agile, competitive on the international markets and capable to use wood-based raw material optimally and produce quality products. It needs to be in compliance with international good practices and social and environmental standards. The aim of the analysis is:

1. to see whether international and national legal framework related to forestry and wood-processing industry encourages development and increases competitiveness of wood processing industry
2. to present wood sale models in state owned forest companies in analysed countries
3. to present wood production quantities and values in analysed countries

3.2. LEGAL FRAMEWORK RELATED TO FORESTRY AND WOOD PROCESSING INDUSTRY

3.2.1. International legal framework

In international trade policies, EU's priority is maintaining open global markets through its commitment to the WTO, the multilateral trading system and the Doha Round. While earlier The General Agreement on Tariffs and Trade (GATT) and now World Trade Organisation (WTO) have been remarkably effective in removing tariff barriers to trade and have moved into areas such as the policing of sanitary restrictions on trade, there are still many areas where WTO rules need to be developed and evolved in order to address non-tariff barriers. In the euro area, a broad-based economic recovery gained momentum and became more synchronized. In the new EU member countries, output expanded at the fastest rate in a decade, driven by the

upturn in the rest of the EU, supportive policies, and increased EU transfers (UNECE/FAO Forest Products Annual Market Review, 2017-2018).

The EU is the largest consumer of timber products in the world (EFI Policy Brief 2010), therefore the EU has implemented different strategic documents and action plans and other legal documents related to forestry and wood-processing industry.

The European Commission presented the EU Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan in 2003, as a part of its efforts to tackle illegal logging. The objective of the Plan is to eliminate illegal timber in international trade, acknowledging the shared responsibility of exporters and importers. The cornerstone of the Plan is to establish Voluntary Partnership Agreements (VPAs) with timber producing and exporting countries, and the introduction of FLEGT-licensed timber.

The second key element of the plan is the EU Timber Regulation (EUTR), which came into full force in March 2013 and which applies to wood and most wood products both imported to the EU and produced in the EU. VPAs and the EUTR are meant to reinforce each other, addressing the supply and demand side of the timber product trade respectively. The EUTR obliges timber product importers and producers to take adequate measures (conduct “due diligence”) to minimize the risk of placing illegal timber products in EU markets.

While markets should be based on free competition, state interference can be justified under special conditions. EC Treaty Articles 81 and 82 have as their objective the protection of competition on the market. Regulations adopted for the implementation of these provisions, do not entirely preclude Member States from implementing their own national legislation protecting other legitimate interests, provided that such legislation is compatible with general principles and other provisions of Community law. For example, Member States may implement national legislation that prohibits or imposes sanctions on acts of unfair trading practices. In Croatia, these rules were included in national legislation through amendments to the Law on Protection of Competition. This led to parallel competence between the European Commission, bodies for protection of competition on the market of the EU member states, European courts (the Court of Justice of the European Union and the General Court) and national courts in promoting competition in the market.

In contrast to the first EU Forest Strategy and its associated forest action plan, the 2013 Strategy ventured even further out of the forest to encompass not only rural development, but increasingly also the environment, forest-based industries, energy production and climate change. It also takes into account new developments, including the Europe 2020 strategy for growth and jobs, the resource efficiency roadmap, industrial policy, the EU climate and energy package, plant health and biodiversity, as well as bio-economy strategies.

The Europe 2020 strategy is the EU's agenda for growth and jobs for the 2010–2020 period. Its overall principle emphasizes smart, sustainable and inclusive growth as a way to overcome the structural weaknesses in Europe's economy, improve competitiveness and productivity and underpin a sustainable social market economy.

It provides three basic features required to spur economic growth, which are elaborated on through concrete action both at the EU and the national level:

1. smart growth, which encourages knowledge, innovations, education and digital society;
2. sustainable growth, which simultaneously encourages competitiveness and production in which resources are treated more effectively;
3. inclusive growth, which increases labour market inclusiveness and skill acquisition, which prevents poverty.

In Europe 2020 Strategy industrial development is closely linked with further strengthening of the internal market of the European Union and deregulation of business environment for entrepreneurs. Industry, primarily SMEs, have been severely affected by the crisis and all the sectors are faced with challenges of globalization and adaptation of business processes to low carbon and a more energy efficient economy. Internationalization of SMEs needs to be encouraged, as well as internationalization of transportation and logistics networks, tourism competitiveness, corporate social responsibility and quality and the simplicity of legislation concerning business.

3.2.2. National legal framework in Croatia

The latest National Forestry Policy and Strategy was prepared by the Ministry of Agriculture, Forestry and Water Management (currently the Ministry of Agriculture) and was adopted by the Government in July of 2003. Key priorities in the Strategy are: i) conservation of forest resources through application of ecologically and economically acceptable technologies; and ii) reducing the effects of climate change and its mitigation through increased use of biomass as energy source. The National Forestry Policy and Strategy also emphasized innovation and creativity, and to improve competitiveness of state and private forestry in Croatia. The Forest Law from 2005 (revised in 2006, 2008, 2010, 2012, 2013, 2014, 2015, 2018) defines forests and regulates sustainable forest management, forest management planning, stakeholder involvement, advice and support to private forestry, government-provided financial support to forestry, harmonization with forestry related policies and legislation and protection against forest fires. It also deals with the Pan European Criteria and Indicators of sustainable forest management.

The Strategy of Forestry of the Republic of Croatia 2017–2030 is currently being prepared in the Ministry of Agriculture. This will confirm the future strategic guidelines for the sector. The document aims to ensure that forests continue to be managed in an environmentally, socially and economically sustainable way. It needs to remain a strong element in the green economy and rural development in Croatia.

In April 2017, Croatian Government adopted the Development Strategy of Wood Processing and Furniture Manufacturing of the Republic of Croatia 2017–2020 with Action Plan for Implementation 2017 – 2020. The Strategy complements other recent

national development plans, such as the Industrial Development Strategy Republic of Croatia 2014–2020 (Official Gazette, No 126/14), the Entrepreneurship Development strategy 2013–2020 (OG, No 136/13), the Energy Development Strategy until 2020 (OG, No 130/09), the Innovation Support Strategy 2014– 2020 (OG, No 153/14), as well as relevant EU strategies like the Europe 2020 – European strategy for smart, sustainable and inclusive growth and the Action plan for entrepreneurship development 2020.

The wood processing strategy recognizes that the model for giving the processing industry preferential access to raw material from state forests has not worked. The policy was adopted in 2012 to promote increased added values, but statistical data from period 2012–16 indicates that the anticipated impact was not achieved. During the study period, furniture production, which would create the greatest value added, lagged behind other wood processing industries. It appears that the existing supply model does not guarantee required and sufficient raw material supply for the industry. Additionally, it is not market-based or seen as equitable, transparent and fair. This is seen as an obstacle to the development of a modern and competitive wood industry. Lack of raw material results in, for example, underutilization of installed production capacity.

Croatia has encouraged and provided financial support to the development of business clusters to advance productivity and competitiveness. Some clusters have been formed through a bottom-up approach (launched by the members of the cluster themselves), while others have followed a top-down approach where the Croatian Export Offensive established six clusters to increase Croatian exports. Cluster development strategy was adopted in 2011 and it contained many goals including: strengthening clusters and cluster members, business internationalization and export growth, efficient use of both domestic funding programs and EU funding. (Ministry of Economy, 2011).

3.2.3. National legal framework in Slovenia

The Forest Act was adopted in 1993 and fundamentally changed in 2007. The Act stipulates forest planning and management, forest land transactions, financing as well as public forest service, research activities, supervision and penal provisions. It regulates the protection, silviculture, exploitation and use of all forests in Slovenia, without regard to ownership. Besides, the principles of sustainability, close-to-nature and multipurpose management are included in its core. On the basis of the above mentioned Act, Resolution on National Forest Program was adopted in 2007 to determine the national policy of sustainable development of forest management. As opposed to the Forest Development Program of 1996, the new program is based on a broad participation process of stakeholders (Forest Europe, 2011). The resolution objectives are oriented in development of Slovenian market for forest wood products (FWP), where several guidelines are directly connected with development of market for FWP, introduction of modern marketing forms for sale of FWP and promotion of use

and benefits of wood. The Resolution on national forest program also encourages the wood and paper industry with objectives to increase export of FWP with increased added values in domestic wood industry and to increase the use of wood and FWP in construction and as an energy source.

In 2011 the think-tank prepared an active policy of Slovenia at all levels of wood use, with specific goal to accept timber as the raw material of national importance and forest-wood product chain as a strategic industry. In this regard, a starting point to restructure Slovenian wood industry was designed. The document encourages not only the use of wood at every social level, but also the use of wood as an energy source.

In 2012 The Action plan to increase competitiveness of the forest-wood chain in Slovenia by the year 2020 was adopted in order to revive and progress wood production chain. The government of Slovenia adopted this action plan as a framework to support and promote domestic wood processing industry with the following goals: creation of market for wood, wood products and service; increasing harvesting and management based on forest management plans; increasing processing of timber and production of value added products and using new technologies; and new jobs and growth in value added per employee in the wood processing industry.

Management of state forests Act (2016) in article 7 states that the objective of management of state forests is “to contribute to the establishment and development of forest-wood chain, promotion of wood and FWP and the creation of green jobs”. Moreover, article 9 states that the company for management of state forests may perform other activities that are necessary for economical and efficient performance of the activities of management of state forests, such as organizing centers for the collection and processing of wood and creating conditions for the development and establishment of forest-wood chains as a higher added value.

3.3. TIMBER SALE MODELS IN CROATIAN AND SLOVENIAN STATE-OWNED FORESTS

According to the Forest Management Plan of the Republic of Croatia from 2016 to 2025, total forest and forest land coverage is 2 759 039.05 ha. Of that number, state property is 2.097 318.16 ha (76%), and private is 661 720.89 ha (24%), while in Slovenia 21% (244 473 ha) of forests are state owned, 77% (901 038 ha) private owned and 3% (31 733 ha) owned by other legal persons (Hrvatske šume, 2015, Poročilo ZGS o gozdovih, 2018). In Croatia, Hrvatske Šume manages the state forest of the Republic of Croatia (Hrvatske Šume, 2015) and is the biggest roundwood supplier for Croatian wood industry. In Slovenia, after 20 years of concessions in the state-owned forests, the Republic of Slovenia established the Slovenski državni gozdovi Ltd. Company (SiDG) with the purpose to manage the state owned forests. In establishing and developing forest wood centres in Slovenia, the forests currently owned by the Republic of Slovenia are potentially an important and surely the most reliable source of raw material.

Both companies implemented FSC SFM certificate, which was awarded to Hrvatske šume in 2002 for its forest management holder. In Slovenia, state forest company SiDG, has overtaken the guardianship for FSC certificate by Farmland and Forest Fund of Slovenia. This national institution accepted FSC in 2007 for state forests and in 2010 first private forest owners joined the scheme. In 2011 the FSC was extended also to private wood processing companies. After the organizational changes in state forest management SiDG act as a holder of FSC certificates. Moreover, SiDG possesses a PEFC certificate for state forests. In both countries the certified raw material supply has allowed wood industry sector companies to develop chain-of-custody (CoC) systems and sell FSC labeled products.

3.3.1. Timber sale models in Croatia state-owned forests

The income from wood sales accounts for 75% of company income. These sale revenues cover roughly half of forest regeneration costs and and a significant part of other long-term investments. Timber sales are not market based but are done at administratively regulated fixed prices. Distribution of the roundwood purchase rights is based on specific technical criteria applying a price list approved by the Ministry of Economy. In June 2017 competitive elements in the market were reduced even further when the Croatian government introduced a two-year ban on export of oak logs and oak timber with a moisture content greater than 20%, designed to prevent the spread of the bark beetle Corythucha Arcuata, which had already infested 14 Croatian counties (Timber Trade Journal, 2017).

Timber sales by Hrvatske Šume can be conducted in three ways:

1. Contract with public sale with a 10-year or 1-year supply contract: these sales are geographically limited and logs from a certain area are sold to the wood industry of that area. The main buyers are the export companies dealing with final products (furniture, parquet, structural carpentry, etc.), and some primary processing companies. Exporters are favored and primary processors get only timber that is in oversupply (e.g. logs for veneer and peeling, thin roundwood, pulpwood, timber for wood boards, part of saw logs and firewood) and or in regions where primary processing is of special significance due to lack of other activities).
2. Public bids: domestic public bids are conducted only for the remaining wood assortments with the demand exceeding the supply and the international public bid only for wood assortments for which there is no high interest on the domestic market
3. Cash sales: wood sales to the local population can be done in cash.

Sales through contracts are made based on annual and multi-annual Framework Contracts signed in December of the previous year with roundwood buyers who applied and met the technical criteria provided in Public Invitation for Roundwood

Sales. Quantities per buyer and other contract terms are determined to direct roundwood mainly to industries with higher value added product and product finalization (buyers pursuant to article 20.II.1 of the price list). These sales policies implemented in 2016 were intended to encourage buyers involved in wood processing towards a higher level of finalization, creation of added value and increased employment.

Entering long-term contracts (1 to 5 year agreements) and the subsequent trade before 2017, was an attempt to introduce some regulation on the raw material market. Unfortunately, this model has not achieved the desired effect, since this is not only a matter of roundwood, but also raw material in terms of sawn wood and elements. Consequently, in some cases signatories of long-term contracts occasionally become involved in export of sawn wood through third parties. Hence, they avoid controls and also the objectives for which such contracts had been introduced, or, more specifically, increasing the finalization of raw material (saw logs) obtained in this way.

The wood sales arrangements have been agreed at national level. The Association of Wood Processing Industry at the Croatian Chamber of Economy and the Hrvatske šume signed in December 2017 a Letter of Understanding providing a framework for the annual roundwood supply contracts. The arrangement aims to define a transparent distribution model for roundwood. The buyers, i.e. wood processing industry will hence be able to determine the quantity of the roundwood they will receive in advance and plan their production. As a result of this agreement, small sawmills – which account for 96% of the total number of producers – will see a 20% increase in raw material supply, whereas furniture manufacturers will get 25% of price rebate on all types of raw material. Moreover, it will allocate 20,000 m3 Pedunculate oak for furniture manufacturing in Vukovar.

Prices are negotiated at company level. Negotiations between the parties resulted in a roundwood price increase of 5–9% for oak both in 2018 and 2019; for beech and other hardwoods the rate was lower, 2.5% in both years. Due to high demand, the price increase for Pedunculate oak was the highest as the Hrvatske šume tries to direct demand towards other species. Production of Pedunculate oak is limited to around 2.4 million cubic meters. As mentioned earlier, prices will be lower for wood processing industries with a high level of finalization, employment, exports and economic contribution in rural areas.

The contracts with buyers last for 10 years. They are reviewed annually, but if all contract terms are met, the buyers are guaranteed ten-year stability in raw material supply. This allows long-term planning and gives confidence to investments and contracts with traders (e.g. retailers). In addition to having the general terms agreed at the central level, the Ministry of Agriculture, Hrvatske šume and the Association of Wood-Processing Industry at the Croatian Chamber of Economy also perform regular controls in order to establish whether Hrvatske Šume and buyers are in compliance with the contracts.

After signing the framework agreement in December 2017, a public invitation for roundwood sale for 2018 was launched. It covered a volume of 2,100,000 m³ of roundwood from state forests. Companies and craft businesses involved in production

are eligible to submit “bids” (these are not bids in an auctioning sense, perhaps a better term could be proposal) in accordance with the conditions defined by the Decision on Methods and Conditions of Wood Assortment Sales for 2018. Framework contracts with buyers can last at the maximum until 31st December 2027, irrespective of the time of contract signing. They are based on planned or available annual quantities of wood production by the Company. More detailed annual contracts are based on the framework contracts, and are agreed by the end of the previous year for the forthcoming year. All companies registered in Croatia by 1st December 2017 that own an operating business involved in wood processing and furniture manufacturing in the Republic of Croatia (in accordance with the National Classification of Economic Activities 2007 – NKD 2007,C16, C31) are eligible to submit bids.

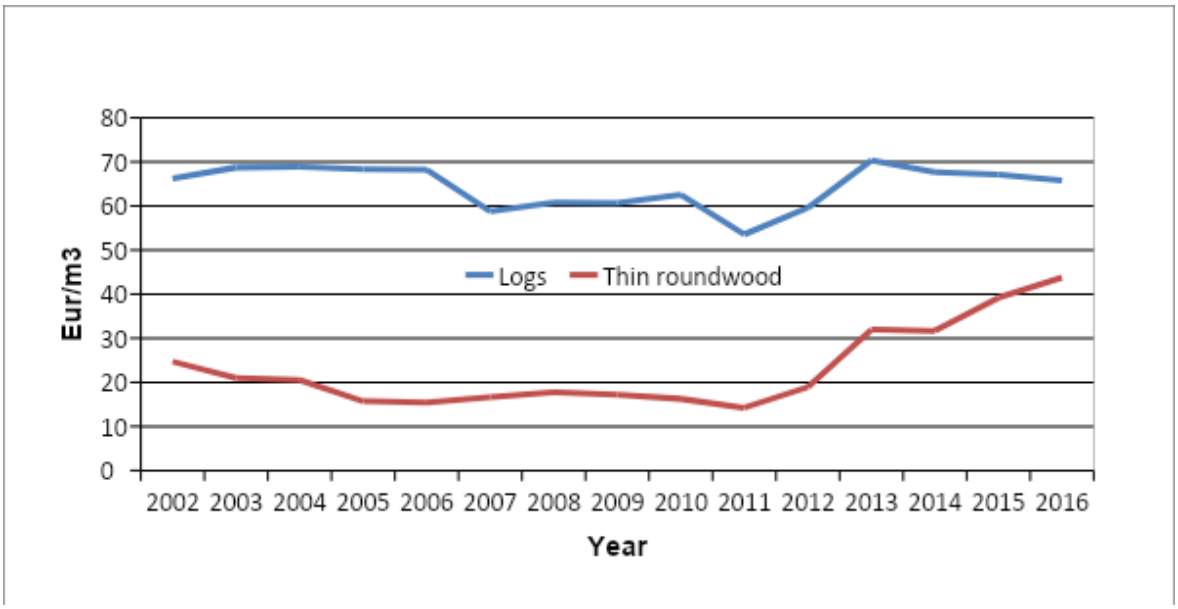

Figure 3.1: Average prices for logs and thin roundwood in Croatian Forests Ltd.

3.3.2. Timber sale models in Slovenia state-owned forests

After 20 years of concessions in the state-owned forests, the Republic of Slovenia established in 2016, the Slovenski državni gozdovi d.o.o. company (SiDG) with the purpose to manage the respective forests. The company was founded on the basis of the Management of State Forests Act (Uradni list RS, št. 9/16).

Changes in management of the state-owned forests has a significant impact on the development of the wood product value chain because of security of provision of FWA to the Slovenian market. An important objective for the Government, in transforming the state owned forest management system is to promote greater cooperation between stakeholders along the wood-value chain and consequently, greater use of wood in Slovenia. Uniform and transparent offer of all wood harvested in the state-owned forests, and the option of entering into multi-year contracts with the

timber industry creates a new business environment that has significantly contributed to further development of Slovenian wood-processing industry.

The income from wood sales accounts for 94,5% of the company's total income. FWP sales are done based on Rules of the SiDG on the manner and criteria for selling forest wood products adopted by the Government of the Republic of Slovenia.

Manners of selling FWP according to the selected method of sale are as follows:

1. *Selling of FWP at public auctions*: In this way, all FWP not sold by SiDG through a public tender for concluding long-term sales contracts and direct sale are sold. FWP with quality, quantity and starting price already determined by SiDG are sold at auctions. FWP are sold to the bidder offering the highest price ex warehouse to which the wood is transported. All bidders can participate in public calls for bids.
2. *Selling of FWP by public bidding rounds*: In this case, short-term contracts are signed for selling FWP. As in public auctions, in this way, all forest wood products not sold by SiDG through a public tender for concluding long-term sales contracts and direct sale are sold. In this kind of sale, quality and quantity are determined on a truck road upon wood transport. FWP are sold to the bidder offering the highest price ex truck road. All bidders can participate in public calls for bids.
3. *Selling of standing timber*: Exceptionally, SiDG can also sell standing timber. In this way, wood is sold only in the case of forests of the lowest quality and at rounded small land plots at other locations with a total surface area up to 5 ha. In exceptional cases, this is used for addressing extraordinary situations related to the elimination of dangers in a forest. The sale of standing timber must not exceed 30 m^3. In the case of natural disasters, standing timber from forests of higher quality can be sold with no restrictions on the quantity.
4. *Direct selling of FWP*: Direct selling is intended for sale of up to 30 m^3 of annual supply to an individual buyer. In this way, the wood is sold to non-profit organisations, local communities and natural persons (wood fuel).
5. *Selling of FWP through long-term agreements to domestic wood processors*: This is the main way (which SiDG uses to sell the largest share of wood) to sell FWP from state forests. By concluding long-term agreements, SiDG promotes wood processing industries. Agreements must be signed only with buyers who manage to prove that they will process all the wood supplied, which is also verified by SiDG. Agreements are usually concluded for the period between 3 and 5 years, except in the case of strategic investors in the field of wood processing which can also sign long-term agreements for the period of 15 years. Long-term agreements provide that the maximum quantity of wood is used in Slovenian wood processing industries. The selling price of wood under long-term agreements is formed on the basis of the market price achieved.

In the year 2018, 1,457,705 m^3 of FWP was sold in SiDG out of 1,724,943 m^3 harvested, of which 53.25 % was sold through long-term agreements to domestic wood processors, 37.60 % by public bidding rounds and 8.74 % at public auctions (Table 1).

Table 3.1: Method of timber sale in SiDG in 2018

Method of timber sale	**Amount (m^3)**	**Share (%)**
Long-term agreements	776 240	53.25
Public bidding rounds	550 479	37.77
Public auctions	127 448	8.74
Direct selling of forest wood products	-	-
Selling of standing timber	3 538	0.24

Basic methods of selling FWP according to the method for measuring FWP in SiDG are as follows:

1. Sale of FWP, the volume and quantity of which are determined by SiDG: This method of selling FWP is used in cases where each individual FWP is measured. The sale is carried out at public auctions, through public bidding rounds and through a public tender for concluding long-term contracts.

2. Sale of FWP to volume processors: This method of selling FWP is used in cases when FWP can be sold as an integrated whole with an individual truck/freight wagon including forest wood products of the same type and quality which can be measured as a whole (with one code plate for the whole truck/wagon). Therefore, this method of selling is used for FWP of lower quality (wood for pulp and boards, wood for obtaining chemicals and firewood). The sale of FWP to volume processors can be carried out as a direct sale of FWP (this applies only for selling firewood), sale at public auctions, through public bidding rounds and sale of FWP through a public tender for concluding long-term contracts.

The long-term contract of sale can be concluded with legal persons and entrepreneurs or with a buyer who has its own facilities for processing and treatment of FWP and who contractually undertakes to use all volumes of purchased FWP in its own facilities for processing and treatment of FWP and not for further sale.

3.3.2.1. Method of concluding the long-term contracts of sale

SiDG annually establishes volumes of FWP that it can sell, based on long-term contracts of sale, and in this regard issues a public call for tenders. The public call for tenders is published in a newspaper available in the whole area of the Republic of Slovenia and on the SiDG web-page.

SIDG divides the volumes of FWP to be sold based on long-term contracts so that qualified buyers[1] receive a proportional share of FWP according to the available FWP quantities and volume of FWP that buyers report. According to the goals of sales policy of SiDG, all FWP sold through long-term contracts are sold at a unified price based on an average market price for individual FWP. The average market price for FWP is determined on the basis of the last average price for individual FWP as published by the reference statistical office. The reference statistical office, the data of which SiDG uses for the next calendar year, is appointed by the General Meeting of SiDG at least 3 months before the end of a calendar year. If the Statistical Office of the Republic of Slovenia does not have suitable reference data, the General Meeting of SiDG may decide that reference statistical data of one of the countries from common European market are used partly or as a whole (Austrian statistical data has been used in 2018). If the General Meeting of SiDG does not appoint a reference statistical office, the data of the respective reference statistical office continue to be used.

The average FWP in SiDG has been changing from year to year. In 2017 the average price for roundwood-conifers was 60.8 €/m3 while in 2018 it has declined and reached the average price 56.67 €/m^3. The situation is opposite for other FWPs – the prices have increased for roundwood-deciduous and industrial wood (Table 2).

Table 3.2: Average prices of FWP in €/m^3

	Average price in 2017 (€/m^3)	**Average price in 2018 (€/m^3)**
Roundwood - conifers	60.8	56.67
Roundwood - deciduous	59.9	64.77
Industrial wood - conifers	30.7	35.67
Industrial wood - deciduous	40.9	44.05

3.4. ANALYSIS OF WOOD PRODUCTION VALUES

3.4.1. Wood production values in Croatia

The data provided by the Croatian Bureau of Statistics dating back to 21/06/2018 provides a cross-section of trends in forestry in 2017. In general, both the trend of a slight increase of sectoral indicators and an impression of sector stability remained. Quantity of total logging in both state-owned and privately-owned forests in 2017 was up by 2.7% compared to 2016. Expressed in wood pulp, this was an increase of around 142,000 m3. Total coniferous roundwood was up by 8.3%, whereas the non-coniferous roundwood increased by 1.7% compared with the previous year, which was attributed to an earlier appearance of spruce bark beetles that affect the quantity of softwood

[1] Qualified buyer is a buyer which fulfils the conditions referred to in and its plant(s) for processing and treatment of FWP is (are) not more than 40 km away from the FMA center where the FWP cut has been carried out and are the subject of the contract.

logs. In 2017 production of fuel wood rose by 5.1%, whereas production of industrial roundwood (wood in the rough) increased by 1.5%, or 52,000 m3.

Wood assortments production plan in state company in 2016 was 5.9 mil m3. Based on sales methods in 2016 through contracts with domestic companies involved in wood processing, 1.985,542 m³ were sold, accounting for 85% of the total roundwood sales. Bids at the national level resulted in sales of 318,409 m³ (13%), as opposed to 17,804 m³ (1%) by foreign customers. Raw material sales for personal needs totalled 13,765 m³ (1%). (Croatian forests Ltd. Annual Business report 2016)

While the total volume increased, due to decline in average prices, the total value of wood sold decreased by 0.8% in 2017 compared with 2016. A decrease was mainly caused by a 3.0% decrease in the value of industrial roundwood (wood in the rough) and a 6.0% increase in the value of fuel wood sales. An average price of non-coniferous wood (86% of sales) decreased by 2.2% and that of coniferous wood (14% of sales) by 5.1%. Average prices declined by 2.7%.

The market values and average prices for broadleaves and conifers (in total), in the period from 2016 to 2018, are presented in table 3.

Table 3.3: Value and prices of forestry products sold (source Bureau of Statistics 2019)

	2016		**2017**		**2018**	
	Value	**Price**	**Value**	**Price**	**Value**	**Price**
	Euro	**Euro/m3**	**Euro**	**Euro/m3**	**Euro**	**Euro/m3**
Fuel wood	53 197.718	22.78	56 369 261	22.56	58 414 899	23.99
Industrial roundwood	168 107 785	57.43	163 119 060	56.89	184 637 584	63.00
Of which						
-logs	153 460 268	6.,83	149 317	6.,04	171 792 349	7.,70
-pulpwood	3 493 557	31.11	1 833 960	26.04	1 181 208	25.66
-Other	11 153 960	23.06	11 967 517	22.34	11664 027	23.87
Total	**221 305 503**	**42.05**	**219 488 322**	**40.91**	**243 052 483**	45.29

1 EUR= 7,45 HRK

In 2018, the production of fuel wood increased by 17.1%, while that of industrial roundwood (wood in the rough) decreased by 6.8%, i.e. by 235 thousand m3, as compared to 2017. Both total value of wood sold and average prices increased in 2018, as compared to 2017 by 10.7%. The increase in the total value of wood sold in 2018, as compared to 2017, was caused by an increase in the value of fuel wood and industrial roundwood (wood in the rough) sold, 3.6% and 13.2% respectively.

Both production and exports by the Croatian wood processing industry (primary and secondary wood products) has increased significantly after the global recession in 2009. The value of exports almost tripled from €333 million in 2009 and €930 million in 2016. While exports have increased, also import of wood products have been increasing the past few years after a slump in the early 2010's.

Table 3.4: Sales values of wood assortments in Hrvatske Šume Ltd. from 2008 to 2018

Year	Logs	Other roundwood	Pulpwood, commercial wood	Fuelwood	Total
	– Euro –				
2008	155 196 539	1 902 548	26 925 556	18 433 195	202 457 838
2009	137 099 315	2 408 870	20 129 645	17 841 473	177 479 303
2010	123 712 944	438 544	23 300 557	22 355 817	169 807 862
2011	149 888 709	1 639 369	28 420 753	24 325 987	204 274 819
2012	146 793 596	1 137 752	24 994 907	25 431 938	198 358 194
2013	155 817 026	1 307 711	22 586 746	33 135 411	212 846 894
2014	151 651 006	1 140 939	17 543 624	41 865 771	212 201 340
2015	146 663 924	562 690	13 135 994	49 361 553	209 724 161
2016	153 709 238	417 936	14 267 718	54 210 009	222 604 901
2017	150 024 429		70 359 866		220 384 295
2018	172 281 297		69 167 843		241 449 140

Source, Croatian Forests Annual business reports (€1 EUR=HRK7,45)

Domestic wood industry uses 94% of domestic roundwood supply, employs 35 000 workers – mainly in rural areas – and 53 000 workers if forestry is included. Wood and paper processing industry plays an important role, in accordance with its share in the GDP of the Republic of Croatia. In 2016, there were 1631 wood processing companies, 295 paper production companies, and 948 companies in manufacture of furniture.

Over 60 % of wood processing companies are small and employ no more than 5 workers while only 15 % of companies are medium sized, employing between 20 and 200 workers. However, these medium size companies account for most of the industrial production volume. Around 6% of companies involved in furniture manufacturing and other processing industries (DN 36) employ over 200 workers and the share is much lower – 1% – for companies involved in wood processing and manufacturing of wood and cork products (primary processing, DD 20). Wood processing industry, furniture production and forestry have 3,6% share in national GDP, with export share of 10% of total export with 1.1 billion euro income from export.

In 2018, furniture manufacturing and wood processing sectors have continued their positive development having continuous growth for months, both in industrial production and that of export indicators. Throughout the entire first quarter of year 2018, furniture manufacturing (C 31) rose by 15.8% compared to the same period in 2017.[2]

3.4.2. Wood production values in Slovenia

Data provided by the Slovenian Statistical office provides yearly a cross-section of trends in forestry and wood-processing industry. According to their data, in 2018, the removal in Slovenian forests was about 22% larger than in 2017. 6,060,959 m^3 of timber was felled, of which 4,367,576 m^3 of coniferous trees and 1,693,383 m^3 of deciduous trees. There was still a lot of wood that had been felled due to damage from the 2014 - ice storm and bark beetles, and the wind damage in 2017. Thus, sanitary felling amounted to approximately 67% of the total timber removals. The total removals represented 89% of the allowable removals under forest management plans (https://www.stat.si/StatWeb/en/News/Index/8384).

According to the data of Slovenian forest service, in 2018 in total 4,281,059 m^3 timber was felled in private forests, of which 2,931,546 m^3 of coniferous trees and 1,349,514 m^3 of deciduous trees. In state-owned forests 1,724,943 m^3 was felled, of which 1,398,982 m^3 of coniferous trees and 325,961 m^3 of deciduous trees. Wood assortment production plan in state forest company SiDG was 1,451,694 m^3 in 2018. Overall in 2018 SiDG has harvested 1,724,943 m^3 and exceeded the plan by 18%. Due to wind damage in 2018 there was a large share of coniferous trees in an assortment structure of FWP. The share of sanitary cuttings amounted to more than 85 % in state forests.

In SiDG, in total, in year 2018 1,451,694 m^3 of FWP were sold on road and from storage facilities, which represents an increase of 27 % compared to 2017 (1,141,205 m^3). An average selling price of 50.09 €/m^3 was reached. The achieved average price is 0.11 €/m^3 higher compared to 2017. In addition to the sale of FWP from road and storage facilities, 3,538 m^3 of wood was sold as standing timber and 2,473 m^3 of green chips (calculated from cubic meters of chips in m^3) were sold. Data on the structure of the harvested FWP in SiDG showed that in 2018, 60 % of the quantities sold are coniferous logs, followed by conifer industry wood (22 %), industrial wood from broadleaves (14 %) and logs of deciduous trees (4 %).

The value of roundwood purchased from private owners in 2018 amounted to 59.7 million €, which is about 4% more than in 2017. The value of purchased sawlogs and veneer logs was lower by almost 3%, while the values of purchased other categories of roundwood were higher: of wood fuel by about 69%, of pulpwood by almost 24% and of other industrial roundwood by about 1%. The value of roundwood purchased from private owners in 2017 amounted to 57.6 million €, which is about 12% less than

[2] Data released by the Croatian Bureau of Statistics

in 2016 (mainly due to lower quantity of purchased roundwood). The value of purchased sawlogs and veneer logs was lower by 14%, of wood fuel by almost 17% and of pulpwood by about 1%. The value of purchased other industrial roundwood was more than 6% higher. The value of roundwood purchased from private owners in 2016 was worth 65.8 million €, which is almost 34% more than in 2015 (mainly due to higher quantity of purchased roundwood). The value of purchased sawlogs and veneer logs was higher by almost 43% and of pulpwood by almost 13%. The value of purchased wood fuel and of other industrial roundwood was lower (by more than 16% and 13%, respectively). Compared with the previous year, the value of roundwood purchased from private owners in 2015 was 49.3 million €, which is almost 16% more than in 2014 (mainly due to higher quantity of purchased roundwood).The value of purchased sawlogs and veneer logs was higher by more than 23%, while the value of purchased wood fuel and other industrial roundwood was almost the same as in 2014 (the quantity was higher, while the average prices were lower, both by about 20%). The value of purchased pulpwood was lower by about 8%, mainly due to lower average purchase prices of this wood (Table 5).

Table 3.5: Sales values of roundwood purchased from private forests

Year	Logs (€)	Other industrial roundwood (€)	Pulpwood, round and split (€)	Fuelwood (€)	Total (€)
2015	38 315 299	1 264 716	6 543 729	3 132 774	49 256 518
2016	54 737 587	1 095 231	7 382 471	2 628 672	65 843 961
2017	46 953 179	1 163 055	7 280 613	2 189 404	57 586 251
2018	45 789 242	1 170 823	8 997 275	3 703 443	59 660 783

The revenue from the sale of FWP on road and from storage facilities in SiDG was almost 11.5 million € higher than planned and was 72.7 million in 2018 €. Revenue from the sale of FWP increased by 27% in 2018 compared to 2017.

In 2018 the value of forestry production amounted to EUR 589 million, which was a 7% increase compared to the previous year. The reason for that is a volume increase of forestry products and high value of forestry services; values had been high due to bad weather conditions and consequently still quite extensive rehabilitation of damaged forests due to the multiplication of bark in 2018, which affected the intensive provision of forestry services. After extensive damage to forests in 2014 due to the ice storm and the multiplication of bark in 2015, 2016 and 2017, and additional wind storms in 2017 and 2018, it continued in 2018.

The value of sawlogs and veneer logs was estimated at EUR 187 million in 2018; this was 32% of the total forestry production value in that year or 3 p. p. more than in the previous year. Volume of production was higher by 14% in 2018 in comparison to 2017, and the prices increased by 7%, therefore the increase in the production value

by 16% was also observed. The production values were also higher for pulpwood (by 25%), fuelwood (by 24%) and other industrial roundwood (by 37%).

According to the Statistical office of Slovenia in private forests the share of logs was the highest compared to other FWP and accounted to 65.3 % or 697,237 m^3. Pulpwood accounted for 23.8% or 254,592 m^3, followed by fuelwood (8.3% or 88.434 m^3) and other industrial wood (2.6% or 27,572 m^3) (Figure 3). Ice break and bark beetle damages cause significant increase in logs production from years 2015-2017.

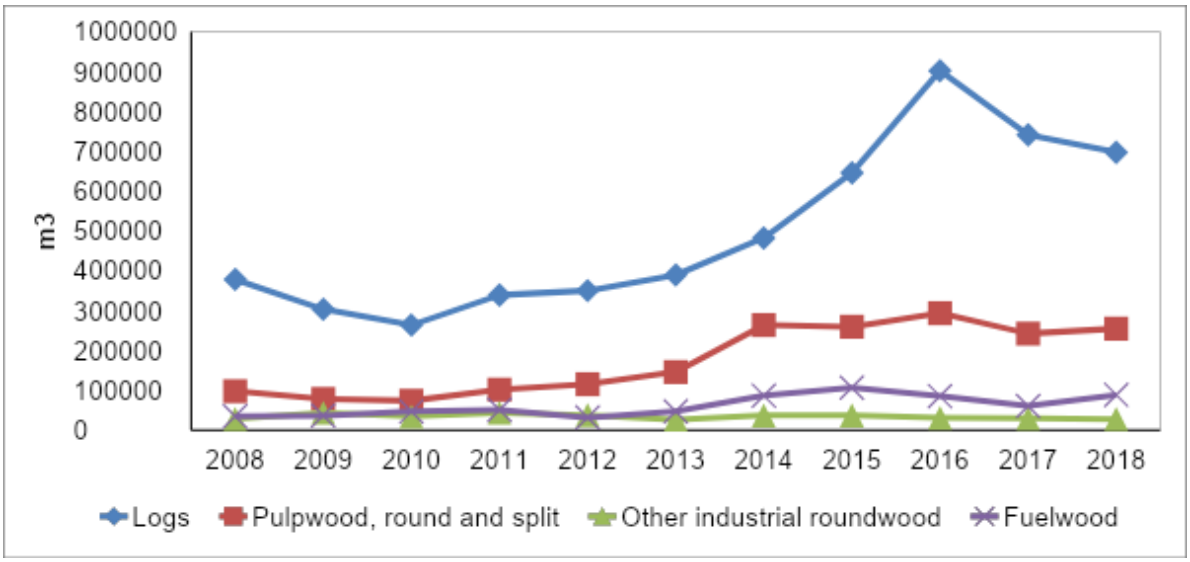

Figure 3.2: Production trends for FWP in private forest (2008-2018)

Due to wind damage in 2018 there was a large share of coniferous trees in an assortment structure of FWP from state-owned forests. Coniferous and deciduous trees accounted for 82.85% and 17.15%, respectively. In 2017, coniferous and deciduous trees accounted for 61% and 39%, respectively. The share of coniferous logs was 73.13% or 918,500 m^3, while other roundwood accounted for 26.87% or 377,500 m^3. The share of spruce logs (538,500 m^3) and fir logs (383,000 m^3) in coniferous tree species assortments was the highest. Other logs include pine (10,000 m^3) and larch (4,500 m^3). The share of deciduous logs was 19.48 % or 50,600 m^3, while other roundwood accounted for 80.52 % or 209,300 m^3. Beech logs (44,000 m^3) accounted for almost all deciduous logs in 2018. A notable share of logs was detected also for oak (3,700 m^3). Noble deciduous species, i.e. maple, ash, linden, elm, accounted for a small part.

According to external trade data, 2.6 million m^3 of roundwood were exported in 2018 or about 14% less than in 2017. Compared to the previous year, the exports of industrial roundwood decreased by almost 8%, of which the exports of coniferous industrial roundwood were lower by 1% and of deciduous industrial roundwood by 32%. Wood fuel exports were also lower than a year ago (by about 40%). About 524,000 m^3 of roundwood were imported in 2018 or about 7% less than in 2017. Compared to the previous year, the imports of industrial roundwood increased by 2%, of which the imports of coniferous industrial roundwood were higher by about 17%,

while the imports of deciduous industrial roundwood were lower by almost 20%. Wood fuel imports were also lower than a year ago (by 21%) (Table 6).

Table 3.6: Export and import of Roundwood

	Export		**Import**	
	2017	**2018**	**2017**	**2018**
Industrial roundwood, total	2 466 364	2 278 154	342 751	349 855
Industrial roundwood, conifers	1 937 882	1 919 201	201 427	236 528
Industrial roundwood, deciduous	528 482	358 953	141 324	113 327
Fuelwood	595 432	357 881	219 822	173 763
Total	**3 061 796**	**2 636 036**	**562 573**	**523 619**

The share of sales abroad in SiDG was modest and with 1.68 % significantly lower than in the previous years (8% in 2017 and 10% in 2016). Of the total volume, 24,383 m³ of forest wood products have been sold abroad. The main customers were in neighbouring Croatia, where 16,871 m³ (69%) was sold. Small quantities were also sold to Italy (3,304 m m³ or 13.6%), Romania (2,969 m³ or 12.2%), Bosnia and Herzegovina (1,066 m³ or 4.4%) and Austria (173 m³ or 0.7%) (Table 7).

The Slovenian wood processing industry has traditionally been a major net exporter, with an average of 54% of the output being exported due to the small Slovenian market. In 2017, the growth in the sales and exports of the timber and furniture sectors continued at between 6% and 7% and employment in the order of 2.5 %, the expected revenue of the wood industry for the last year is estimated to be around EUR 1,450 million (https://www.gzs.si/Portals/SN-informacije-Pomoc/Vsebine/GG/2018-februar/23-25-lesna%20industrija.pdf).

Table 3.7: Export of FWP from state forests in 2018 and 2017

Country	**Sale in 2018**		**Sale in 2017**	
	m3	**%**	**m3**	**%**
Bosnia and Herzegovina	1,066	4.4	-	-
Croatia	16,871	69.2	1,587	1.7
Italy	3,304	13.6	721	0.8
Austria	173	0.7	89,081	97.5
Romania	2,969	12.2	-	-
Total	24,383	100.0	91,389	100.0

In Austria, which is our largest export market, around 20% of exports of timber products are exported, of which around 40% of logs, 14% of furniture, 13% of prefabricated buildings, and 6% of builders' joinery. Exports to Austria have almost doubled over the last five years, but unfortunately mainly due to exports of raw wood — logs and wood for heating.

According to AJPES data, in 2018, 2,475 legal and natural persons were operating in the wood processing industry (C16 + C31), employing 12,736 people. Revenue in the wood processing industry amounted to EUR 1,570 million and expenditure amounted to EUR 1,489 million. The industry closed the 2017 business year with net profits of EUR 74,309 million as a whole, the value added per employee in 2018 was EUR 33.651. The share of export earnings from sales of net turnover was 55.7% (C16 + C31). The most intensive destinations for exports and imports in both timber areas remain Germany, Italy, Austria and Croatia in 2018.

3.5. CONCLUSIONS AND RECOMMENDATIONS

Wood industry is recognized as an important sector for the national economy in both analysed countries. Therefore it was selected as one of the key sectors in the Croatian Industrial Strategy (2014-2020) and Slovenian Action plan for forestry and wood processing industry. Public forest enterprises play a key role and have important influence in forest management and social role as employer. On the other hand, the sawmilling industry is characterized by overcapacity and use of low level technologies in many cases. Technological innovation and coordinated production clusters would be needed to increase productivity and competitiveness in the sawmill industry.

With the high quality raw material in Croatia (such as oak wood), and Slovenia (conifers), there is a potential to further sector development and creation of higher domestic value-added final products. A new paradigm for the sector is needed if countries wish to move up on the value-added position. This new concept needs to provide opportunities for connecting businesses to create new products and specific value chains which are competitive in the international market.

The recent data from Croatian Bureau of Statistics show wood industry production stagnation in December 2019. Industrial production has decreased by 5.9%, but furniture industry (C31) increased by 3.4%. Also, final products storage has increased by 22.9% compared to the same period in 2018. According to the Lesprom source (www.lesprom.com), sawlog costs have fallen substantially in Central Europe in 2019 making the sawmilling sector in the region more competitive. The European Sawlog Price Index in the 3Q 2019 was 35% lower than its record high in 2011. The biggest price reduction came in Central Europe, where storm-damaged logs flooded the market. In Germany, sawlogs prices fell by 16% (not seen in 17 years), in Austria and the Czech Republic, log prices plummeted by 14% and 18% respectively over the past year to reach their lowest prices since 2003.

The current timber sales system in the state forests in Croatia has several shortcomings. The stumpage price agreement model is not economically efficient to solve the fluctuations in the roundwood market by institutional arrangements. There is an asymmetry in the market between one state company in a monopoly position, and a large number of privately owned wood processing and furniture industry. The proposed new Law on the Processing and Use of Wood and Wood Products, should establish a new trade model with wood trade bourse, which would provide wider access

to raw material and market-based pricing. The existing model of supply does not ensure the required and sufficient raw material for the production of wood processing and furniture manufacturing, neither does it allocate raw material efficiently. The low average price of raw material leads to inefficient wood use.

Long term contracts are good instruments of support to sawmill businesses, yet wood raw material prices need to follow international trends. The recently seen (almost 20%) increase in revenue growth in furniture manufacturing and wood processing sectors is certainly linked with affordable timber prices in the state company price lists. The share of revenue generated by the company needs to be increased with a higher share of public bids (currently accounting for merely 1%), at which higher prices are achieved, which subsequently increases the revenue generated by the company.

In a market driven system and through self-regulation of the market, only those producers who are investing into innovations and finalization of production will survive. This is also the publicly stated objective of all the proposed strategies and documentation in the sector of forestry and wood processing of the Republic of Croatia and the Republic of Slovenia. Further investment will be attracted only through the creation of a positive environment for innovations and new technologies. This will result in employment and an increase in exports in the forestry and wood processing sector.

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4. MANAGEMENT OF ECOLOGICAL INNOVATION – WOOD PRODUCTS AND PRODUCTS BASED ON WOOD VERSUS SUBSTITUTE PRODUCTS

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4.1. INTRODUCTION

Competition in the market causes a constant contest for customer favour, which accelerates technological progress and innovation in all areas to meet customer needs. From a microeconomic point of view, customer satisfaction can be understood as one of the factors in the products competitiveness evaluating. The transferred competitiveness of the products into financial indicators of businesses represents the competitiveness of their own. It means that the basic prerequisite for the success of businesses on the market is to create such competitive products that are able to meet the maximum volume of customer needs. This represents product portfolio management and its innovations do not exempt eco-innovations.

Eco-innovation - synonymous for "sustainability innovation" is a special category of innovation that generates the effects necessary for environmental protection (respectively sustainable development ensuring).

At present a strong emphasis is placed on sustainable development. Innovation management linking within the whole innovation process and corporate social responsibility when applying environmental protection creates an environmental management system which is based on three pillars - environmental performance of a product, innovation quality for customer and product added value supporting this development (James, 1997; Jeck, 2018; Kulhavý, 2012; Lešková, 2012, 2014; Loučanová et al., 2015; Loučanová, 2016; Loučanová, Trebuňa, 2014; Slovak Business Agency, 2018).

The product quality, which increases the customer's standards through innovation, is reflected mainly in the rising comfort of the customer, his safety and reliability of the innovated product. On the contrary, regarding the environmental impact there are monitored decreasing effects on climate changes, resource efficiency throughout the life cycle of an innovated product from research and development to its ecological disposal (Loučanová, 2016; Loučanová-Parobek, 2014; Straka, 2013; Štofková, 2013).

All these innovative activities are a prerequisite for the commercial success of a business for the sustainable development of its operating regarding market economy conditions, so they are connected to the commercial part of the innovation process (i.e. diffusion of eco-innovation in the market). Then ecological innovations represent an important dynamic factor of each company and at the same time, they form a significant bridge between the presence and future of each company (Loučanová, 2016).

Innovation product management focuses on the far-reaching business use of the product for the future direction of the business. It integrates it into the overall “green” marketing strategy of the business and participates in compatibility with organizational environmental protection policies presenting driving forces of environmental oriented strategy of a company based on the principle of sustainable development in cooperation with commercialization (Borguľa, 2012; Havierníková, 2012).

Loučanová (2016) and Šulgan et al. (2008) state that the understanding of innovation by customer within the discussed issue of innovative management in conjunction with marketing is based on globalization trends that focus not only on the traditional perception of the economy (characterized by a one-way linear process) but on a circular (closed) economy representing the concept of the sustainable development model of the economy.

This principle also works in different sectors of industry, including the wood processing industry that is in the centre of our interest in this article. Its main aim is to monitor the competitiveness of selected products through the Kano model with respect to the used material.

As Kadár and Kadárová (2010) state, the term competitiveness is based on the word competitive, which can be simply defined as rival. The main meaning of competitiveness means the ability of an entity to compete in the market.

Adam Smith (1975) defines it as a self-esteem society. He explains satisfying individual interests that ultimately lead to the satisfaction of the general interests. In general, we can talk about competitiveness as a market rivalry. Similarly, the competitiveness of products is understood as the ability to compete in the market regarding its quality within the competition. Based on the above mentioned information, customers prefer products with higher quality under equal (unchanged) market conditions to satisfy their needs presenting important factors determining the preferences of the product itself, i.e. its competitiveness (Luo, Xueming, 2010).

Identifying and meeting customers' needs and wishes is thus a fundamental mean through which businesses can prosper and be competitive. This concept determines them the task of trying to understand their customers. Consequently, businesses seek to develop and innovate products that meet the needs of customers at a higher level than competitors, to offer competitive products in the market (Tokarczyk, Hansen, 2006).

There are many tools for market-oriented businesses to identify customer needs and wishes for the subsequent realization of competitive product innovations. One of the possible tools for identifying customer needs is the Kano model. The Kano model was created by Noriaki Kano (1984) in Japan. It was immediately used by major automotive and electrical engineering businesses to develop new innovative products (Shahin, Zairi, 2009). In recent years, it has been used in many areas of business to increase competitiveness. Its application for qualification and integration into Quality Function Deployment (QFD) to optimize product design is described by Ji et al. (2014). In addition,

Jeyaraj et al. (2014) presented that also business capacity optimizations following logical priorities of customer needs are based on the Kano model. Jang et al. (2013) applied similar model in modified form when analyzing risk factors of the project.

N. Kano assumed that customers are not able to exactly specify their requirements regarding the product they are interested in. Based on the above assumption, the Kano model methodology was developed to identify all relevant customer requirements. N. Kano developed the theory of attractive product quality (product competitiveness), according to which there are 5 categories perceived by the customer: mandatory, one-dimensional, attractive, contradictory and not influencing customers (Krnáčová, Lesníková, 2012). Through these categories, the Kano model expresses the relationship between the degree of customer satisfaction and the attributes of perceived quality by the customer (Chen et al., 2010).

Individual categories of product requirements that influence customer satisfaction can be characterized by Chen et al. (2010) as follows:

Must-be requirements (M) are considered to be natural and automatically expected by customers. They can be marked as primary, respectively basic and therefore customers deal with them only if they are not met. Their identification is of fundamental importance mainly because their fulfilment is reflected in customer satisfaction, but their deficit and non-fulfilment is immediately reflected in dissatisfaction of customers. Finally, such a situation manifests in their maximum dissatisfaction and the product loses its competitiveness in the market.

One-dimensional requirements (O) are those attributes of the product, which fulfillment leads to satisfaction and in case of non-fulfillment to customer dissatisfaction, i.e. the higher the fulffilment rate is, the more satisfied customers are. However, customers do not automatically expect them compared to mandatory requirements. There is a direct linear relationship between meeting these requirements and customer satisfaction.

Attractive requirements (A) are those that have a clear effect on customer satisfaction because these are requirements that customers do not expect. If the attractive requirements are not met, customer dissatisfaction can develop.

Ducák et al. (2006) and Ullah et al. (2011) explains reverse requirements (R) - also called exactly the opposite ones, as those that represent those attributes of products where customers react oppositely.

Requirements that do not influence customers, also called irrelevant requirements (I), are attributes that are not decisive to customers and their fulfilment or non-fulfilment does not influence their satisfaction or dissatisfaction. They are also insignificant in terms of product competitiveness.

Besides the mentioned categories of product requirements, the Kano model identifies so-called questionable, respectively moot requirements. These express the questionable outcome, which relates either to incorrectly formulated questions or to misunderstanding of the question by customers.

As it is stated by Krnáčová, Lesníková (2012) in order to achieve customer satisfaction application of the Kano model should be applied and to maintain competitiveness. They present procedures how to maximize the fulfilment of must-be

requirements, create and expand an appropriate number of one-dimensional and attractive requirements to avoid implementation of innovations presenting reverse requirements.

4.2. METHODS

The competitiveness of products with respect to the used material (wood, wood-based material and substitution materials) is identified through customer satisfaction based on the attractive quality of used materials representing an elementary parameter of evaluating the competitiveness of selected products in this research.

On the base of pre-survey of elementary attributes there were selected typical wood-based products for exploration of determined parameters.

The competitiveness of selected products is built on the determination of specific product requirements through a model of non-linear and asymmetric dependence between importance and customer satisfaction with different characteristics of selected products.

The methodical process of identifying the specific customer requirements follows the elementary steps of the Kano model, monitoring the dependence between the importance of individual properties of selected products and customer satisfaction. As a first step, there were identified the basic customer attributes of selected wood-based products obtained through the pre-survey. This method identifies the criteria that customers consider when buying individual products and based on their responses we can generate requirements for selected products and typical wood-based products, which are the object of our research. The pre-survey will generate the basic attributes (future variables in the Kano model) of selected wood products, such as material, price, service (delivery, montage, etc.) and quality. It also generates basic types of wood-based products, specifically kitchens, furniture, floors, windows and doors.

Following detected customer requirements a positive and negative question is formulated to each single requirement and a finally a questionnaire is formulated. The respondents during the survey can response within the range of the Likert scale (strong approval, partial approval, neutral attitude, partial disapproval, strong disapproval).

The questioning was realized as the main method of identifying specific customer requirements for selected products to analyse their competitiveness in relation to the used material. It presents a multilateral method in order to obtain and collect primary data on customer activities and attitudes. By analysing attitudes, the above procedure determines the opinion of customers, their knowledge and experience, as well as ways of behaviour and motives of purchasing. The attitudes analysis allows determining customers' opinions, their knowledge and experiences and the purchase incentives.

The validity of the survey was determined by the methodology for respondents' sample calculation:

$$n = \frac{Z^2_{1\,\alpha/2} * S^2}{H^2} \qquad [1]$$

where:

z1-a / 2 - required confidence level

H - margin of error

s - standard deviation

The sample of respondents was determined at a confidence level of 99%, with a tolerance error of +/- 5% of the standard deviation of 0.5, which at the given data represents the value of 665.64, i.e., 666 respondents. There were 740 respondents and the results according to a confidence level, standard deviation, and margin of error are relevant.

For each variable, individual responses to the positively and negatively asked question (statement) by the Kano cross rule (Table 1) are individually evaluated to specify the requirements for the determined parameters as a survey object. This approach classifies individual measured variables into requirements: mandatory (M), one-dimensional (O), attractive (A), irrelevant (I) or questionable (Q).

Table 4.1. Kano Model to evaluate customer requirements

		Negatively formulated question				
		Strong agree	Partially agree	Neutral attitude	Partially disagree	Strong disagree
Positively formulated question	Strong agree	Q	A	A	A	O
	Partially agree	R	I	I	I	M
	Neutral attitude	R	I	I	I	M
	Partially disagree	R	I	I	I	M
	Strong disagree	R	R	R	R	Q

Source: Ducár et al., 2006.

Individual categories of product requirements that influence customer satisfaction can be characterized by Chen et al. (2010) :

Must-be requirements (M) are obligatory requirements that customers consider as normal and are automatically expected. These requirements can be identified as primary or basic. Customers deal with them only in the event of non-compliance. Identifying them is an elementary importance mainly because even though their fulfillment is reflected in customers' satisfaction, their deficit and failure is reflected in customers' dissatisfaction immediately as they realize it.

One-dimensional requirements (O) are represented by those product attributes that lead to fulfillment and satisfaction or in the event of non-compliance to customers dissatisfaction, i.e., the higher the degree of compliance with these requirements, the customers are more satisfied, but compared to the mandatory requirements customers automatically do not expect them.

Attractive requirements (A) have a clear impact on customers' satisfaction because they are requirements that customers did not expect. If attractive requirements are not met, it does not reflect customer dissatisfaction.

Reverse requirements (R), in some literature (Ducar et al., 2006, Ullah & Tamaki, 2011) also called contradictory or exactly opposite, represent product attributes where customers react oppositely.

Irrelevant requirements (I) do not have any influence on customers. This category involves the attributes that are not critical for customers and their presence or absence does not affect their satisfaction or dissatisfaction (Ducár et al. 2006).

In addition to the above mentioned categories of product requirements, the Kano model also identifies the inconclusive, respectively questionable requirements (Q). These represent a controversial outcome, which relates either to incorrectly formulated questions or it is caused by lack of understanding by customers.

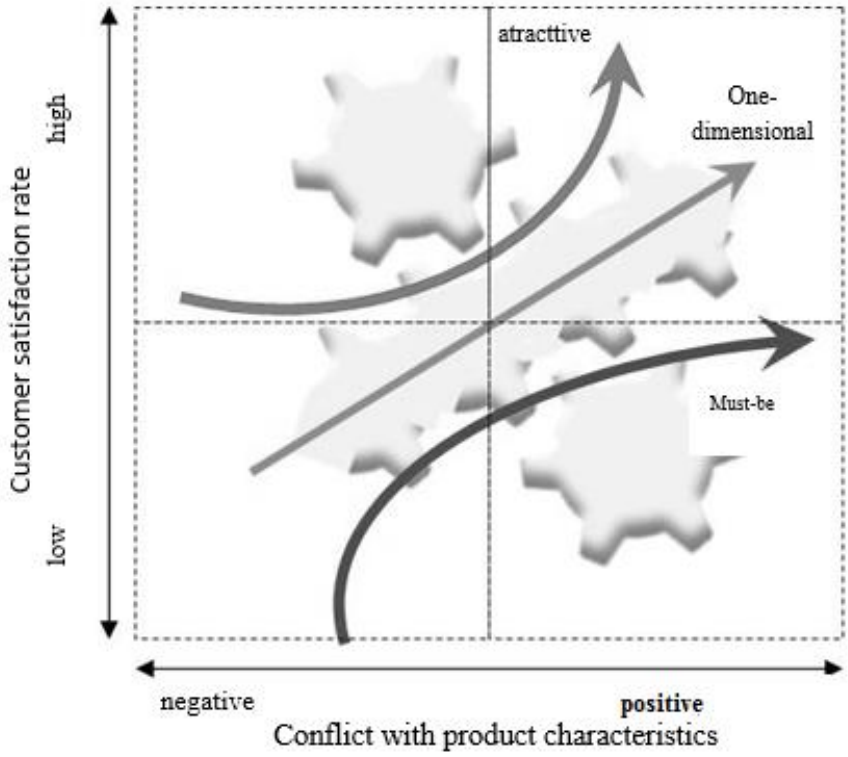

Figure 4.1. Kano model of attractive and must-be attributes
Source: Loučanová, 2016

Figure 1 presents the impact of given requirements on customer satisfaction rate. Categorized customer requirements for the surveyed subject are then expressed in percentage where the highest percentage category identifies the specific category of the studied attribute. Percentage expression of the identified specific category represents the share of identified requirements of the monitored attribute.

Reverse, irrelevant and questionable requirements are not recorded in the following steps regarding the fact that they are not elementary and they do not have significant influence on customers (Ducár et al., 2006). They are marked as "x" in the results.

In order to generalize and identify individual dependencies among identified product requirements and to better understand customer requirements, data from the database is processed into a table of specific customer requirements for selected products to identify their competitiveness with respect to the used material. The degree of dependence among individual variables (identified requirements for selected products) is determined by correlation analysis. Interpretation of the correlation coefficient is realized according to Chrásek (2000), who describes the dependence among individual variables as a weak dependence from 0 to 0.4, values from 0.4 to 0.7 means medium dependency, from 0.7 to 0.9 high dependence and considers the interval from 0.9 to 1 means a very high dependency. The positive value of the correlation coefficient indicates the positive dependence (where the growth of the given variable causes the growth of the dependent variable) and the negative value indicates the negative dependence.

4.3. RESULT AND DISCUSSION

Specifying the requirements for selected products to determine their competitiveness with respect to the used material is based on the methodology of cumulative satisfaction with the monitored products, as it is presented by Loučanová, Parobek, Paluš (2014). These are selected products intended for final consumers presenting various areas of the wood-processing industry, specifically kitchens, furniture, floors, windows and doors.

The total number of completed questionnaires is 720, so the elementary sample of respondents (196) is fulfilled. More than 140 questionnaires were completed for each selected product. Questioning was realized throughout the Slovak Republic.

Table 2 presents identified requirements (must-be, one-dimensional, attractive) as they have an elementary impact on customer satisfaction.

Table 4.2. Requirements for selected products given by Slovak consumers from the perspective of materials

Characteristic / products	Kitchens	Furniture	Floors	Windows	Doors
Wood	O	X	A	X	x
Wood-based materials	O	A	A	X	x
Substitution materials	X	X	O	O	O
Material combinations	X	O	x	X	x
Price	A	M	M	X	A
Quality	O	A	A	M	M

The above analysis shows that when buying selected products, customers consider price and quality to be the main specified requirements (must-be, i.e. these that must be met). Specifically, in furniture price is the must-be requirement in 58.1% share of identified requirements (58.1% of the requirements are have the must-be specifications of all identified requirements – must-be, one-dimensional, attractive,

reverse, indifferent and questionable requirements for the monitored variable of the given product). Price is the must-be requirement for floors (40.5 %). Quality is the must-be requirement for windows and doors.

These properties are considered attractive for some types of selected wood products, while price is considered attractive for kitchens (32.4 %) and doors (47.3%). Customers prefer when kitchens (58.1 %) are made of solid wood or wood-based materials (55%).

The combination of wood with other materials achieves one-dimensional satisfaction in furniture, where the share is 40.5% of the identified requirements. Wood or wood-based materials are equally attractive for floors (61.5%), but customers are also satisfied with buying floors from substitute materials (40.5%). These materials, which satisfy customers and are not based on wood, present one-dimensional requirement also in the case of windows and doors. They represent a specific category presenting more than half share to the other requirements, Customers similarly approach to product quality requirements. For most customers, the condition of quality parameters for individual products is essential. Specifically, for products of an investment nature, such as windows and doors, the condition of quality is essential. This feature is attractive for floors and furniture, and for kitchens and garden buildings it presents a specification of the linear dependence of requirements fulfillment and customer satisfaction.

Based on the procedures mentioned in the methods it is necessary to generally apply specific requirements for selected products features and to analyze the individual dependencies among monitored characteristics by correlation analysis. The correlation coefficient analysis symmetrically arranges the individual dependencies into a correlation matrix, see Table 3.

Correlation matrix confirms variability among monitored customer requirements. The red marked correlations are significant at $p < 0.05$. The matrix shows a statistically very significant relationship between wood and wood-based material (0.949899), where customers consider wood-based products to be very similar to those made of wood. From the point of view of requirements differentiation, quality must be met for all monitored products, however, in terms of the customer requirements generalization it can be stated that the highest dependency was recorded in quality when using wood as a material at a moderately significant level.

Customers classify products made of other materials than wood as a negative dependency (-0.4665), which can be understood as perceiving them as having higher price levels. This could be influenced by the fact that other materials are more preferred for windows and doors, and customers perceive their purchase as an investment. As they are intended for long-term use, customers are willing to invest a higher amount. On the other hand, combined materials show a positive dependency (0.632276), which may be caused by combination of cheaper and more expensive materials, making the price is more acceptable for customer than products made only of one type of material, as it is indicated by the monitored requirements differentiation.

Table 4.3. Correlation matrix

	Wood	Wood based materials	Substitution materials	Material combinations	Price	Quality
Wood	1					
Wood.based materials	0,949899	1				
Substitution materials	0,012372	0,003235	1			
Material combinations	-0,34555	-0,33103	-0,44357	1		
Price	-0,01263	-0,01409	-0,4665	0,632276	1	
Quality	0,334202	0,326622	0,129796	-0,28781	0,143005	1

From the customer's point of view, the analysis of the causal relationships of the individual attributes shows that in the wood and wood-based products market the products have a competitive advantage precisely because of the used material, which influences the product structure and properties. The main competitive advantage has been demonstrated in wood as a material characterized by its properties, manifesting in dependence of wood as a material and quality. Wood-based products are also attractive and interesting for customers.

As it follows from the specified requirements differentiation, customers perceive wood products and wood-based materials very positively, so we can state they are close to natural materials, which are an ecological alternative to their substitute materials. In this case, products made of wood, respectively wood-based products present practically retro-innovations that use original materials to produce innovative products that satisfy new customer requirements with respect to the environment, and thus they represent eco-innovations. It is in this case the wood and customers of high quality, which represents their competitive advantage, perceive wood-based products. For substitution materials, the quality requirement does not confirm the variability that customers demand.

Based on the above findings, we can present these results by an innovative force field for products and materials, which shows a significant prevalence of innovation forces of ecological innovation - wood materials over anti-innovation forces for ecological innovation - substitution materials.

Regarding the above analysis wood as material is also a source of competitiveness of various products in traditional industry.

It represents the resource available in Slovakia and at the same time, it represents a permanently renewable wealth following the tradition of the wood-processing industry, which in cooperation with forestry creates a characteristic complex of the traditional sector in Slovakia. Along with increasing competition on the market, more and more attention is being paid to industrial policy moves, with a focus on increasing support for domestic businesses and restoring traditional industries. As Nemcová (2006) states, the manufacturing sector of each economy is forced to continually increase its competitiveness in a globalized and increasingly competitive environment.

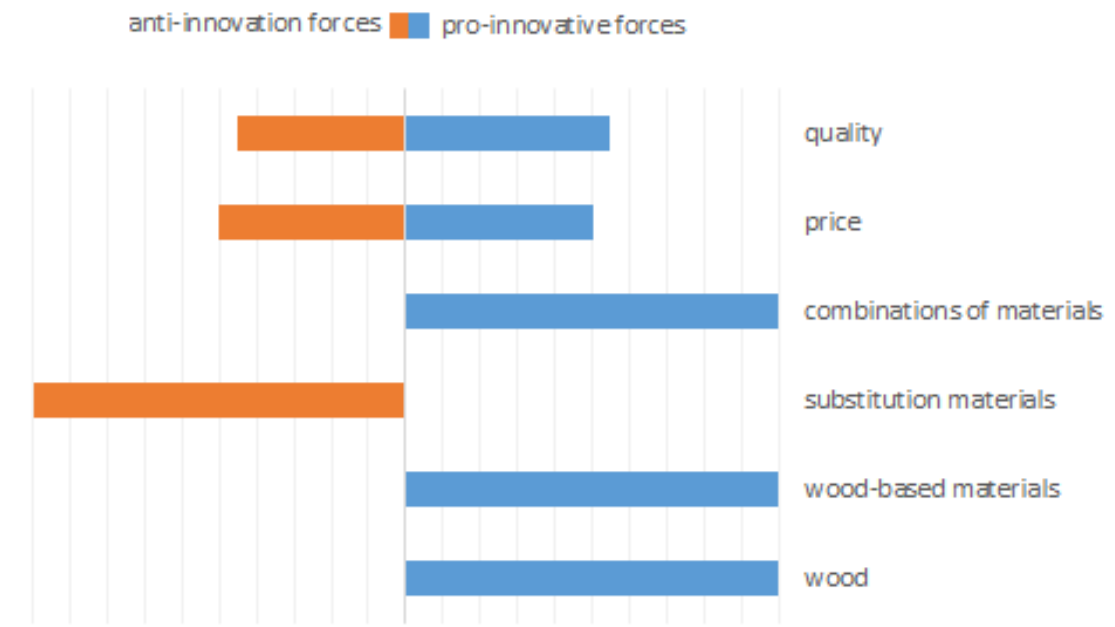

Figure 4.2. Force field of ecological materials

In the future, as Azua (2014) presents, the sense of competitiveness will rest in innovative business models structures for differentiated customer values. There are a number of prerequisites aimed to support creativity and to search the sources of this distinction, especially in traditional sectors. The potential using, such as the wood resources of the wood material of a given region (country), should be an integral part of the innovation policy in Slovakia.

Walburn (2014) presents a similar view in his commentary on the contribution of retro-innovation, which can be considered an important element of current innovation policy. He states that not all innovations must be high-tech, but many innovations should be realized by applying existing technologies and using traditional materials, which undoubtedly include wood.

Therefore, it is important to support business model strategies where wood as a material represents a competitive advantage, adapting to specific customer requirements.

4.4. CONCLUSION

The identification of product differential values, as well as customer groups, where wood as a material is an element of differentiation from substitute materials with their subsequent incorporation into production, presents a unique final solution for the customer representing an ecological variant of innovations using wood materials, respectively materials based on wood. From the point of view of product competitiveness and ecological products innovation management, it is important to prefer wood as a material (respectively wood-based materials) to substitution

materials, because they are their ecological variants and they present a competitive advantage for customers. From an economic point of view, these products represent an appreciation of the raw material base in an effort to increase added-value.

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5. INNOVATION MANAGEMENT OF BUILDING CONSTRUCTION IN TERMS OF SUSTAINABLE GROWTH

Miriam Olšiaková, Erika Loučanová

5.1. LITERATURE REVIEW

The idea of sustainable development is related to the economic growth taking into account the requirements of the society by creating the welfare conditions in short term, medium term as well as in long term period. Economic and demographic development naturally increases demand for natural resources. Sustainable development supports optimal resources using, information flows and communication in the chain, coordination and cooperation, as well as education of individual stakeholders in the sector. The persistently innovated approaches to the corporate social responsibility encourage the continual commitment to participate in the sustainable development. It allows the company to be more competitive on the global market through innovation of individual key components that are customized and trends in world markets during application of the sustainable development and environmental protection principles (Loučanová et al., 2015; Štěrbová et al., 2016, Parobek et al. 2015; Madudová et al., 2018).

The European Union has accepted the Strategy of sustainable development to enforce the sustainable development principles in various sectors. This strategy is established on the precondition how to meet current needs the way not to endanger the possibilities of continued growth for further generation. It is aimed at ensuring a high standard of environmental protection, economic prosperity and social equality. The strategy is also based on the request to change the society in individual spheres (e.g. more responsible consumption, intelligent natural resources usage, detection of new and sustainable forms, economic growth strengthening, new energy alternative sources, more effective transport and global society). This assumes involvement of all participants of social life. Each principle moves to national level and into all society subjects (Šupín, 2004; Šupín, 2013; Loučanová et al., 2014; Loučanová & Parobek, 2014, Maťová et al., 2017).

Sustainable construction is a chance how the building industry can contribute toward sustainable development. This idea rests in the demand change for sustainable development into an opportunity connected with creating and entering into new markets, and innovating requirements that satisfy traditional demands in the industry and the new social demands for sustainable development (Bourdeau, 1999). By data of the European Union (EU) the building sector contributes to 42 % of final energy consumption, 35 % of total greenhouse gas emissions, 50 % of the utilization of extracted materials, and 30 % of water consumption (European Commission, 2010). Taking into account above-mentioned figures we can state that construction and housing play an essential role in focusing on the enhancing social goals for sustainable

development. It is assumed that the total final energy consumption could be decreased by approximately 40 %, total greenhouse gas (GHG) emissions by 35 %, and the use of building materials by 50 % by the development of buildings construction and their utilization in the EU (Herczeg et al., 2014; Olšiaková et al., 2017).

There is a prediction of growing population around the world resulting in increasing demand for housing. As the global population is on the increase, a growing number of housing units is needed. Housing density, as well as green building, represents important factors in sustainable urban development (Dunse et al., 2013). This is the reason why high-rise buildings made of environmentally friendly, renewable materials will play an important role in a more sustainable built environment. Human dwellings have to meet many different and often conflicting expectations to fulfil the wide needs of consumers. In the case of a shelter, physical or technical quality is important. Regarding the practical point of view, also function is a very important condition. Dwelling perceived as a capital good should meet the expectation of economic quality (Thomsen, 2014). Meeting the consumer preferences regarding material that should be used in buildings is crucial. To support sustainable built environment for future, it is imperative for policy makers, planners, architects, and construction companies to understand consumer housing and material preferences (Vasanen, 2012). Various consumer preference studies specific to building materials have been applied. They have been realized in academic as well as in the professional field aiming at visual evaluations of wood or specific products made of wood or haptic perceptions of products such as flooring (e.g. Kaputa and Paluš, 2014; Høibø et al., 2015).

Since the nineties of the last century, wood buildings used to be characterized by attributes such as modern and highly eligible structures. This perception was gained based on a number of factors showing that modern wood buildings represent a good quality of housing supported by quick construction, excellent energy properties and a quality / cost ratio. Wood is a perfectly usable material with numerous notable features such as low weight, high strength and good thermal insulation properties. At present, wood begins to be understood as a strategic resource and the share of wood used in architecture keeps growing. Therefore, research and development centres in Europe as well as all over the world deal with essential and nano-characteristics of wood. They focus on areas such as flammability and fire protection, sound insulation, stability, structural systems and environmental requirements, but also issues of wood buildings designing which meet requirements and expectations on the market (Kaputa, Kalamárová, 2014).

The environmentally oriented management program (Kollár, Brokeš, 2005) realizes the environmental requests for innovative product management in relation to corporate social responsibility (CSR) regarding the principles of sustainable development. It is needful to apply activities that allow overcoming the conflicts among market, society and environment by environmentally oriented management of product portfolio. This is the reason why companies try to improve the environmental performance of their products. The company also takes into account social and economic aspects when it considers environmental behaviour in order to ensure safer product for customers in creating the benefit of the product. The connection of

innovation management and corporate social responsibility during application of environmental protection forms the system of environment management standing on three pillars - environmental product performance, innovation quality from the point of view of a customer and the product´s added value (Kalamárová et al., 2014; Olšiaková et al., 2016; Parobek et al., 2016; Paluš et al., 2018; Häkkinen, 2007). Pillars of corporate social responsibility based on the principle of sustainable development are displayed in Figure 1.

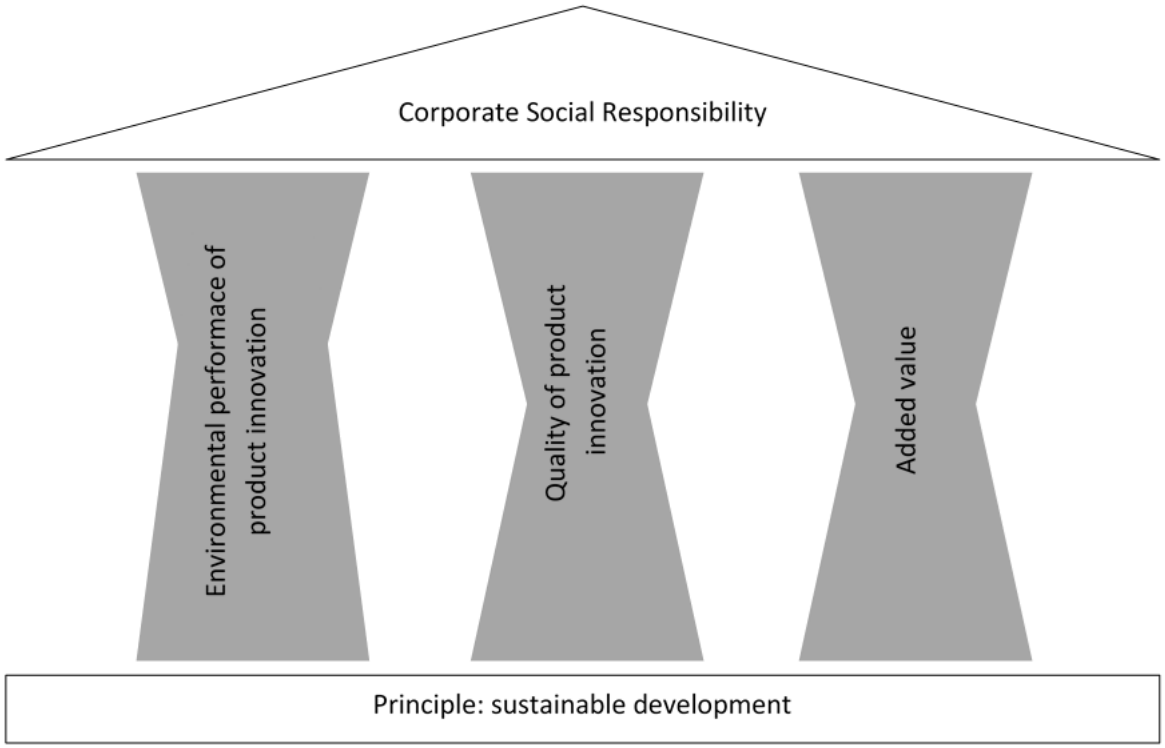

Figure 5.1. Pillars of corporate social responsibility based on the principle of sustainable development

Source: Loučanová, et al., 2017

Sustainable development is a strategy of development based on the using of sustainable sources within the growing significance of socio-economic approach. It is also related to environmental issues with respect to development of excellent social conditions and society. Innovation product management and CSR based on sustainable development represent the continuity of a product innovation with environment-oriented strategy of the company in order to ensure the long-term perspective on the market. These modern approaches to system management and innovation activities assessment lead to creation of a responsible product. It encourages creating the complex system which definitely ensures environmental sustainability as well as socio-economic development.

Changes in impacts that are caused by construction and utilization of buildings can be affected by choice and transport of raw materials and products in construction projects with the renewable energy using when the buildings are utilized in order to maintain the intended indoor climate and air quality (Häkkinen, 2007). The positive

expectations in wood usage increase in multistore constructions have to consider impacts on environment and the long carbon storage in wood, as it is proved by various studies of its life cycle focusing on carbon footprints (Cabeza et al., 2014; Gustavsson et al., 2010; Upton et al., 2008).

The most often considered sustainability criterion for building materials selection is that the material should meet the following areas: renewability, low energy, low CO_2 emissions, sourced locally, reusable and recyclable, minimum waste, non-polluting (Kaputa, Kalamárová, 2014).

Wood-framed houses are known for many positive properties. Wood is a renewable and universally applicable material. It does not produce non-organic waste. It is used for both load-bearing and filler constructions as well as in furniture and carpentry. It is also popular for its positive mechanical properties. The main advantage is the low weight / carrying capacity ratio, which makes wood a firmer material compared to others (Štefancová, 2011). Wood-based technologies are very promising. They can satisfy the customer's requirements in the area of aesthetics, healthy living, economy, interior design, or fire safety (Pajtinka, 2012). Each building allows creating two spaces - the interior one, which is directly defined by the architectural work and the outer one – an urban space. There are characteristic other requirements on the properties for both spaces. Residential wood-framed houses are primarily created for the needs of internal use that are influenced by the building requirements (Štefko a kol., 2013).

Although the consumer can perceive and understand the environmental advantages of wood products, the practical significance of environmental attributes of wood can be incomprehensible for most consumers (Toivonen, 2012).

The aim of the paper is to explain the role of innovation and to compare materials used in building construction in terms of sustainable growth. Considering these results, we are able to determine the force field of perception of construction innovation in the form of wood buildings now presenting ecological innovation of buildings.

5.2. METHODOLOGY

We used the analytical-synthetic method to evaluate the significance of building materials innovation for sustainable development focusing on wood buildings. The analysis was realized with regard to heat transfer coefficient (U) and thermal resistance (R) of analysed materials for building construction. The following step was the comparison of obtained data that allowed us to determine the innovation significance for sustainable growth consisting of three pillars that support the integration of environmental policy and economic policy (Loučanová et al., 2017).

The principal applied method of the research aimed at the identification of customers' stimuli supporting interest in wood building as an ecological innovation from the point of view of sustainable development of building construction in Slovakia is the Kano model. The data have been analysed according to the methodology of Chen et al., 2010, Ducár et al., 2006, Ullah & Tamaki, 2011 and Loučanová et al. 2015, 2017.

The sample of respondents was determined at a confidence level of 99 %, with a tolerance error of +/- 5 % of the standard deviation of 0.5, which at the given data represents the value of 665.64, i.e., 666 respondents. There were 990 respondents and the results according to a confidence level, standard deviation, and margin of error are relevant.

Individual categories of product requirements that influence customer satisfaction can be characterized by Chen et al. (2010) as follows:

Mandatory requirements (M) are obligatory requirements that customers consider to be normal and automatically expected. These requirements can be identified as primary or basic. Customers deal with them only in the case of non-compliance. Identifying them is a primary importance because their fulfilment is reflected in customers' satisfaction and their deficit and failure is reflected in customers' dissatisfaction immediately as they realize it.

One-dimensional requirements (O) are represented by those product attributes that lead to fulfilment and satisfaction or in the event of non-compliance to customers' dissatisfaction. It means, higher degree of compliance with these requirements is is reflected in higher satisfaction of customers. However, compared to the mandatory requirements customers do not expect them automatically.

Attractive requirements (A) have a clear impact on customers' satisfaction because they are requirements that customers do not expect. If attractive requirements are not met, customer´s dissatisfaction is not influenced.

In some literature resources (Ducár et al., 2006, Ullah & Tamaki, 2011) reverse requirements (R), also called contradictory or exactly opposite, represent product attributes where customers react oppositely.

Irrelevant requirements (I) do not have any influence on customers. This category involves the attributes that are not critical for customers and their presence or absence does not affect their satisfaction or dissatisfaction (Ducár et al. 2006).

In addition to the above-mentioned categories of product requirements, the Kano model also identifies the inconclusive, respectively questionable requirements (Q). They represent a controversial outcome, which relates either to incorrectly formulated questions or they can be caused by lack of customers´ understanding.

Based on the identified requirements for wood buildings, we have processed a force field of wood buildings, which shows the innovative and anti-innovative forces.

5.3. RESULTS AND DISCUSSION

The comparison of material characteristics was used to demonstrate the innovation significance for sustainable growth from the perspective of the buildings construction materials.

Table 5.1. Compared characteristics of building construction materials

Buildings	**Thermal Resistance - R m2K/W**	**Heat transfer coefficient - U W/(m2K)**
Masonry buildings - Ferro-concrete	0.31	3.23
Masonry buildings - Brick - full	0.35	2.86
Masonry buildings - Brick - perforated	0.47	2.14
Masonry buildings - Innovated material YTONG – insulated	7.42	0.14
Masonry buildings - Innovated material YTONG – non-insulated	3.45	0
Wooden buildings - Wood	2.67	0.37
Wooden buildings - Assembled building structure	7.45	0.14

Source: Loučanová et al., 2017

Based on the results shown in Table 1, the most appropriate construction materials are innovated construction material YTONG and assembled building structure, which have obtained better values in the monitored indicators compared to the traditionally used materials (e.g. ferro-concrete, full or perforated brick). Traditionally used materials have high heat transfer coefficient and therefore they are not as economical as innovated materials. There is also a difference between full brick and innovated material (difference -2.72 W/(m2K) or between perforated brick and innovated material - 2 W/(m2K) (see Figure 2).

Wood as a construction material achieves considerably better values compared to original materials routinely used in building constructions. Compared to the innovated material, YTONG is connected with minimal, but positive differences. Based on the comparison we can state that building materials innovations are of great importance for sustainable growth because they are economical, as it is proven by the savings of the heat coefficients of the innovated materials against the traditionally used materials. These innovations also fulfil the ecological function by saving energy for heating the buildings where innovated materials are used, thanks to lower heat transfer coefficient and thermal resistance.

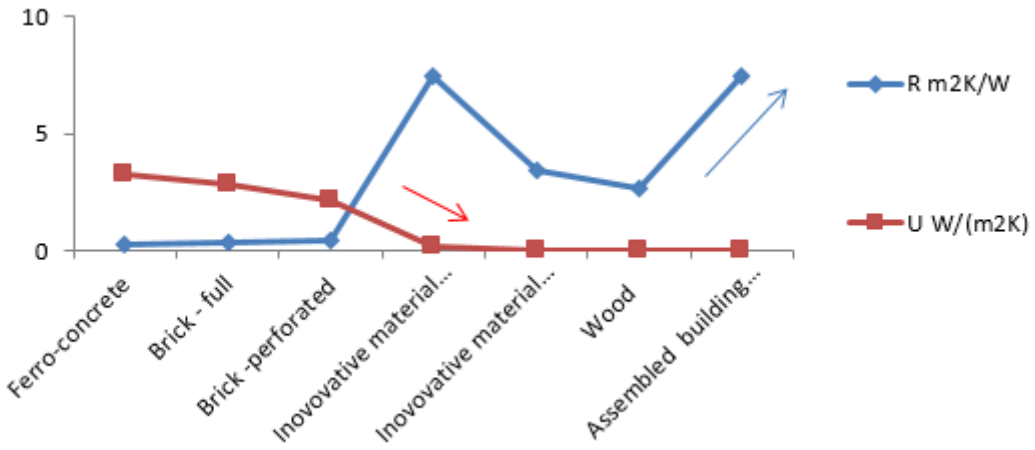

Figure 5.2. Heat transfer coefficient (U) and thermal resistance (R) comparison according to the type building

Source: Loučanová, et al., 2017

Additionally, wood assembled buildings, in contrary to innovated material YTONG, are constructed from a heterogeneous natural material, which is more consistent with nature. Moreover, less energy will be used to produce these innovated materials than to produce original materials used for building construction, what makes these innovated materials to be more environmentally friendly. Owners of buildings from innovated materials can use savings connected with the nature of these buildings for other purposes. Because of shorter construction time, the social aspect of sustainable growth is fulfilled. Innovations of building materials are of great importance for sustainable growth and wood assembled buildings that underline even more (Loučanová et al., 2016, 2017, 2018).

After the survey application by the Kano questionnaire, a database of acquired data was processed. Within the demographic data, we focused mainly on gender, age and education level of respondents.

From the database of obtained data related to our survey, we evaluated the individual answers for each question by cross rule of the Kano model using the Kano table which is presented in the paper methodology. The determined properties were subsequently specified as one-dimensional (O), attractive (A), mandatory (M), questionable (Q), reverse (R) and indifferent (I) requirements. Their detailed specification is also given in the paper methodology.

Regarding the values presented in Table 2 which are based on the KANO model, we found out that the perception of wood buildings has no influence on respondents; actually they understand this concept contradictory (44.44 %). It means that respondents have exactly opposite requirements representing the features of a competitive product of brick buildings.

Table 5.2. Results of surveys of customers' requirements for wood building versus brick building

Attributes	**Wood building Customers requirements**	**Brick building Customers requirements**
Fire safety	I	I
Lifetime	R	A
Construction	I	I
Thermal insulating properties	I	I
Sound insulation	I	I
Housing costs	I	I
Price	I	M
Quality	I	A

Respondents also perceive contradictory the requirements for the lifetime of these constructions, which were agreed by almost half of the respondents (49.49 %). Other requirements such as fire safety, wood building construction, thermal insulating properties, sound insulation, housing costs, price and wood building quality do not affect at all satisfaction, respectively customer dissatisfaction. It means that these are requirements that are not decisive for the customer and he is not interested in whether they are met or not. On the contrary, respondents in Slovakia perceive brick buildings much more positively. Especially the critical point of wood buildings - their lifetime - is perceived as an attractive requirement (40.4 %) in brick buildings. It means that this requirement has clear impact on customers' satisfaction. The quality of these buildings is equally attractive for Slovak respondents (40.41 %). The price presents a mandatory requirement of brick buildings and it is considered to be standard and automatically expected part of a product by customers (69,7 %). These requirements can be identified as primary or basic. Customers deal with them only in the event of non-compliance. Their identification is an elementary importance because their fulfilment is reflected in customers' satisfaction, their deficit and failure is reflected in customers' dissatisfaction immediately as they realize it. Fire safety, construction, thermal and acoustic properties and the cost of living in a brick house are requirements that do not affect customers and so they are considered to be insignificant.

Based on the above findings, we can present these results by an innovative force field for wood building, which shows a significant prevalence of anti-innovation forces over for innovation force for the wood building.

In order to support sustainable growth many improvements have become an essential part of the building industry where the consumers challenge the question, which type of the building, is more suitable for them – a wood building or a brick one. This idea is also the part of many studies focusing on attitudes towards determined attributes of individual types of buildings.

Figure 5.3. Innovative force field for wood building

Based on our findings, we can state that Slovak consumers are rather traditional what is reflected in their preferences in brick buildings. Only university educated consumers and respondents from the lowest age category present higher interest in wood houses, that is connected with their properties such as construction, fire safety, housing costs, quality, thermal insulating properties and lifetime. These are the requirements that must be taken into account in marketing strategies focusing on wood buildings.

Sustainable development is a key topic in achieving the acceptance of bio economy in society in general. Despite this, there is quite limited understanding of the interconnection between environmental sustainability and building regulations as driving forces for the future of wood use in the multistore construction business, which thanks to the long-standing role of building as carbon storage is a core for development sustainable forest bio economy. As environmental attitudes in society tend to develop through increased knowledge and even experienced discomfort and harm from environmental problems, it is also anticipated that in the future a greater proportion of consumers will be likely to seek more environmentally friendly alternatives to housing. Regarding all these aspects, wood material in modern urban construction has some definitive advantages, which has become visible especially among younger consumer segments (Høibo et al., 2015; Kaputa, Paluš, 2014, Štefko et al., 2014).

According to Toivonen (2011, 2012), both consumers and construction material companies consider the environmental quality of wood to be important. In a study by Toppinen et al. (2013), elements related to the environmental sustainability of wood products in housing, the social acceptability of products, and the aesthetic characteristics of wood can all be associated with a distinct consumer lifestyle, consisting of a complex interplay among consumer backgrounds, values, and behaviour. Toivonen and Hansen (2003) state that wood is additionally an attractive material compared to many other materials. However, environmental quality is typically

not the main quality attribute motivating consumers or organizational customers in their choice of construction materials. From the perspective of existing literature, only a few studies have directly linked the future of WMC (wooden multistore construction) to its key stimulus, i.e. changing societal values toward sustainable development, and the future perceptions of WMC value chain actors have scarcely been studied (Hurmekoski et al., 2015, 2016; Wang et al., 2014).

Innovation together with sustainable growth has a substantial place in a market economy. Sustainable growth is a persistently developing and essential factor in a globalized world, which is constructed on three pillars; economic, social and environmental (figure 4).

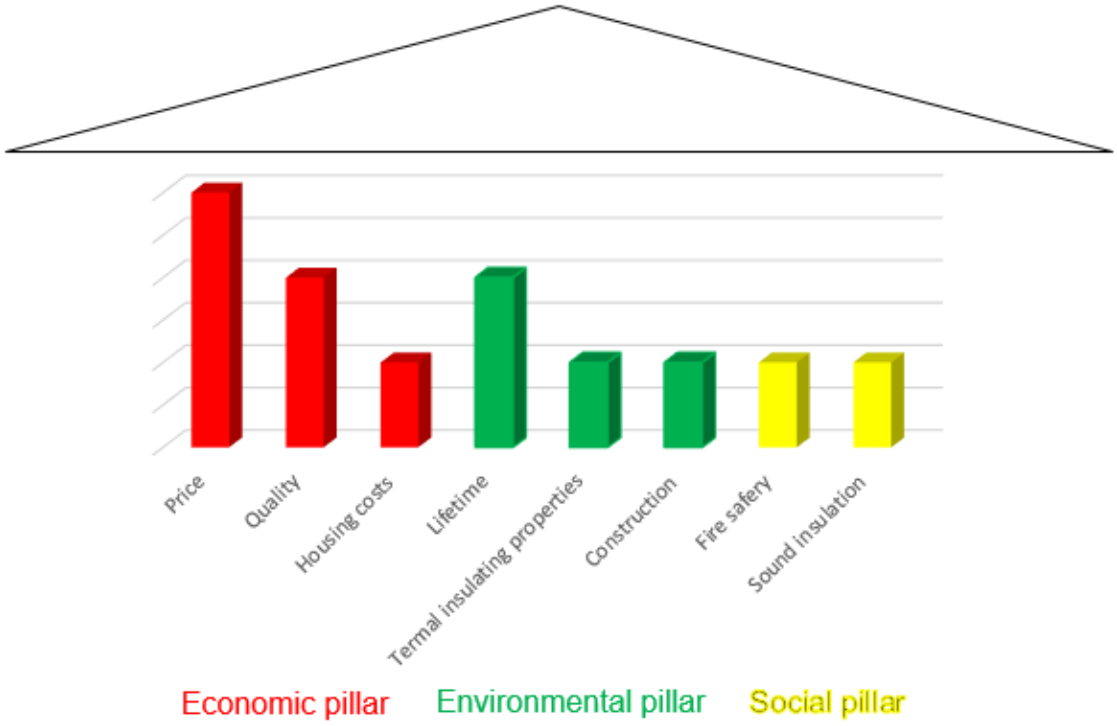

Figure 5.4. Perception of wood buildings from the perspective of sustainability by Slovak respondents

We assigned the searched attributes to the individual pillars of CSR. Economic pillar includes attributes that are reflected in consumer costs. They mainly relate to the acquisition and operation of this type of construction.

Environmental pillar involves lifetime, thermal insulating properties and construction of wood buildings. We assume that the longer and better given properties perform their function, the less negative impact on the environment is.

Fire safety and sound insulation are the part of the social pillar. They present value not only for the consumer itself, because they meet his social needs but these attributes also present positive externalities for wider surroundings.

The above results show that wooden buildings meet the economic requirements of customers the most of all. From the perspective of customer relationship management, it is necessary to apply innovations, especially in the areas of social responsibility that are lagging behind – the social pillar and partly environmental one. However, it does not mean that the searched attributes of wooden buildings do not meet these pillars, but the customer does not perceive them this way.

5.4. CONCLUSIONS

Innovations together with sustainable growth have a substantial place in a market economy. Sustainable growth is a persistently developing and essential factor in a globalized world that is constructed on three pillars, economic, social and environmental. Based on our findings, we can state that buildings from innovated materials are more affordable, so they meet the economic aspect of sustainable growth. In addition to the price, a number of positive aspects can be mentioned. It is a considerable time saving compared to the construction of buildings from the traditionally used materials, significant thermal resistance of the walls, almost half the thickness compared to the classical wall, which increases the useful area, the energy saving, so the social aspect is also met. As the innovated building materials are health and environmentally friendly, also environmental aspect of sustainable growth is fulfilled. Thus, we can conclude that innovations are of great importance for sustainable growth in terms of building materials.

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6. MANAGEMENT OF SELECTED REQUIREMENTS IN THE FURNITURE INDUSTRY OF THE CZECH REPUBLIC

Roman Dudík, Petra Palátová, Vilém Jarský, Marcel Riedl, Luboš Červený

The furniture industry in the Czech Republic has been facing several challenges in recent years. In addition to the Industry 4.0 concept, there are, for example, requirements regarding the use of non-controversial raw material in the chain of custody of forest-based products and, of course, the basic economic requirements that have an impact on the maintaining of the economic viability of wood-processing companies. In this respect, the bioeconomy phenomenon reaches also the wood-working companies. The next subchapters deal with the situation in Czech furniture companies and address the management of requirements in related areas. Furniture industry is statistically classified under CZ NACE 31.

6.1. INDUSTRY 4.0 IN THE CZ NACE SECTION

Successful furniture-making companies operate on the basis of targeted and variable customer orientation and focus on innovative thinking. We can talk about dynamic and positively developing market environment which could, however, change at any time. The economy of the Czech Republic is closely linked to the expanding global economy and it responds directly to it. These factors also strongly influence the furniture manufacturing industry. Likewise, here the so-called forth industrial revolution „Industry 4.0“, which is also applied into furniture production, is being discussed more and more often (Panorama, 2018).

Industry 4.0 implies a complete communication network that will exist between different companies, factories, suppliers, logistics, resources, customers etc. Individual organizational area optimizes its configuration in real-time depending on the demands and status of other associated sections in the network. At the same time, costs associated with logistics and volumes of materials are reduced, which results in a decrease in pollution and lowering CO2 emissions.

In other words, a system is created, that can be influenced by each cooperating section that is able to reach a self-organized status and transmit the responses with maximum effect in real-time.

The essence will lay in the generation of maximum profits for all the subjects involved in the cooperating supply chain (Carvaldo, 2016; Kagermann, 2013).

6.1.1. Industry revolution 4.0

Industry 4.0 will cause changes, where the entire areas of industrial production will be transformed thanks to merging of digital technology and the internet with conventional industry (Flynn, 2017). This era, in which we are now, builds its basis on a concept of cybernetic systems, which create a deep interaction between the real world and the virtual world. Thanks to the development of this industrial phase, the boundaries between products and services are gradually disappearing and became interconnected more and more within the whole process. This phenomenon is also called servitization (Huxtable, 2016).

These modern technologies will also strongly influence the development of the Czech economy (Marek, 2019). Středula, chairman of the Czech-Moravian Confederation of Trade Unions, points out, that the industrial revolution also has a social dimension. Apart from the industrialization 4.0, it is also necessary to discuss „work 4.0“ and „society 4.0“ (Tůma, 2016).

6.1.1.1. History of industrial revolution

So far, the world has witnessed three industrial revolutions, which took place in the period of last 200 years. We are now at the birth of the so-called Fourth Industrial Revolution 4.0, a top leading German strategy using the most contemporary technology (Seseni, 2018). Figure 1 represents the development of the industrial revolutions up to the present.

The first industrial revolution, dated to the 18th century, known as Industry 1.0, was associated with the introduction of steam-powered machinery, hydropower and mechanization, when part of the domestic production was moved to the factories. The continuation was the Industry 2.0 in the 19th century. This stage was marked by the drive of electric power and assembly lines enabling mass production, which was also founded by Henry Ford (Mansur, 2018).

In the 1970s, automation in manufacturing processes, development of computer technology, and the interconnection of the world via the Internet was developed. These discoveries contributed to the emergence of Industry 3.0, the third industrial revolution. The Fourth Industrial Revolution is considered an upgrade of the third revolution, also called Industry 4.0. This phenomenon was introduced in Germany at the "Hannover Fair" in 2011, as a proposal for Germany's new economic policy concept, signaling the beginning of the industrial revolution (Posada, 2015; Sivathanu, 2018).

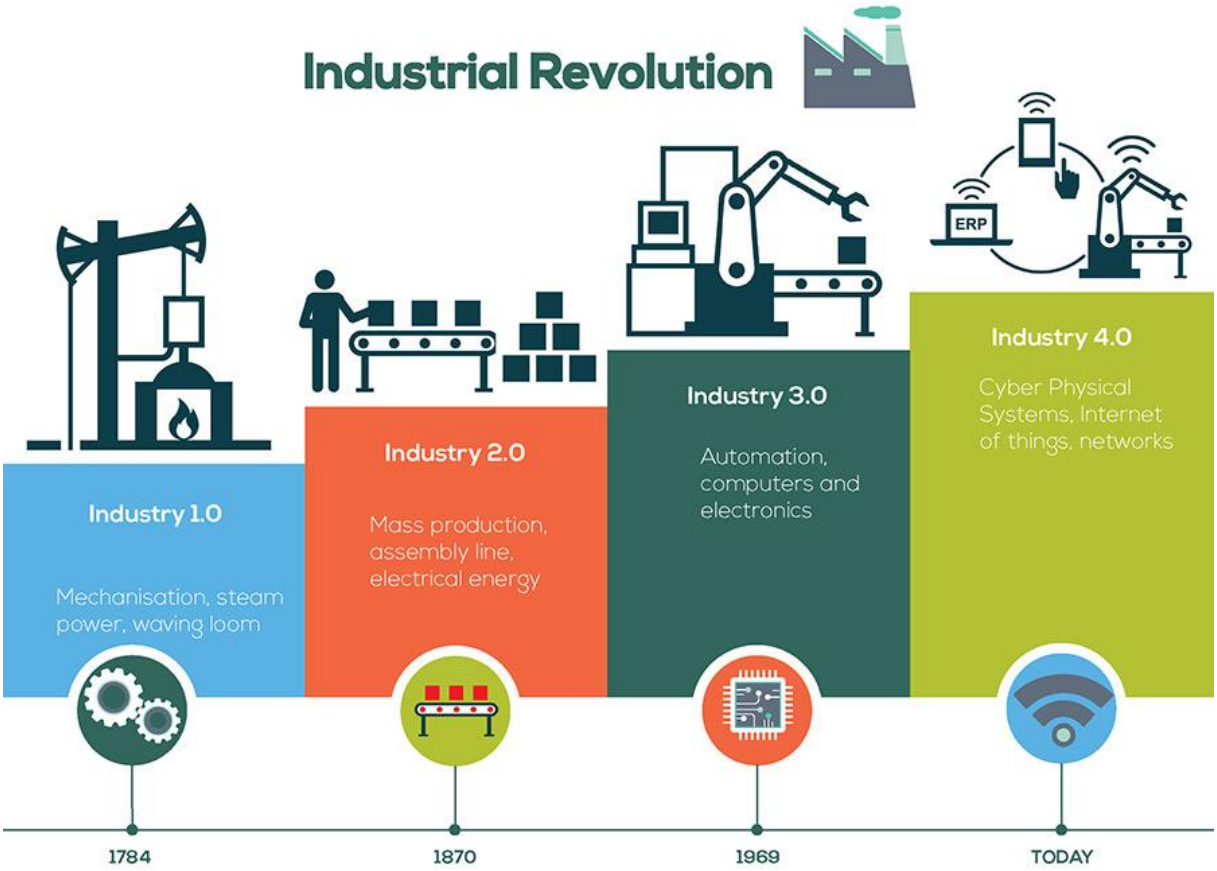

Figure 6.1 - Development of the industrial revolutions (Mansur, 2018)

6.1.1.2. The Intelligent Factory Concept in Industry 4.0

The Industrial Revolution 4.0 originated as a concept based on new technologies (Figure 2), creating intelligent value chains based on socioeconomic systems. We perceive these dynamic self-organizing and optimizing systems as smart factories (Ahmad, 2018). The main applied technologies include Internet of Things (IoT), Internet of Services (IoS), Cyberphysical Systems (CPS), Augmented Reality (AR), Artificial Intelligence (AI), Big Data and their analysis, Cloud Storage, Cyber Protection, Robotics, Automation and visualization (Mabkhot, 2018; Wrobel-Lachowska, 2018).

The concept of manufacturing plant 4.0 includes an area closely related to the IT development. Smart Factory Software is the heart of Industry 4.0, working with a comprehensive network of virtual objects that allows to collect, process and analyse a wide variety of data from the physical world. At the same time, they may request or provide this information. The exchange and analysis of information allow objects to communicate with each other and to carry out separate tasks (Mabkhot, 2018).

6.1.1.3. The foundation stones of Industry 4.0

In a modularly structured intelligent factory environment, Cyber Physical Sytems (CPS) monitor physical processes, arrange a virtual copy of the physical world and accept decentralized decisions. This data were conveyed through IoS, allowing CPS to communicate and collaborate with each other and people in real time. Internal and inter-organizational services are offered and used by all participants in the entire value chain through IoS at the same time (Mabkhot, 2018).

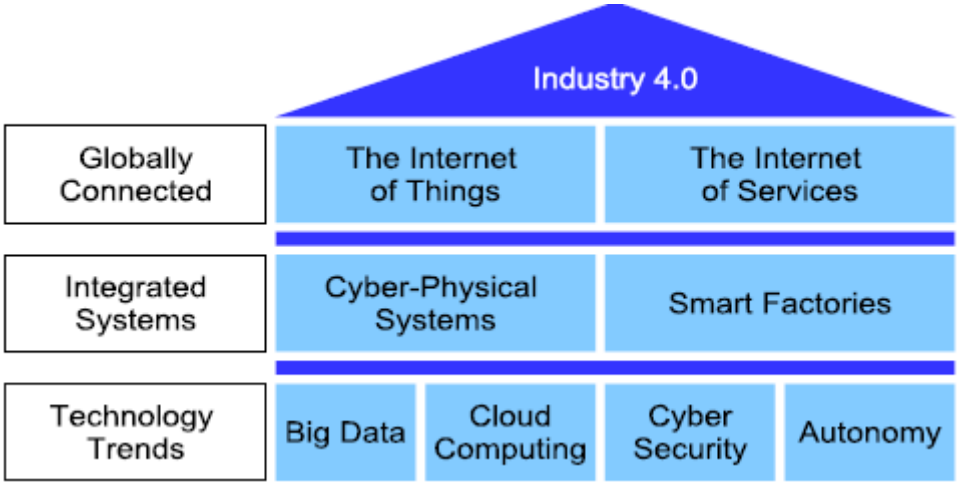

Figure 6.2 - The foundation stones of Industry 4.0 (Flynn, 2017)

1. IoT's Internet of Things was defined by Kevin Ashton in 1999. Sensors and actuators built into the physical objects are connected by wired and wireless networks, making IoT an infrastructure between them. The principle of the Internet of Things is the transmission of data through the Internet network using RFID radio waves to manage the value chain (Mabkhot, 2018).
2. Internet of Services (IoS) represents one of the main pillars of Industry 4.0. These systems work online on cloud storage, where they process the individual data they share (Huxtable, 2016).
3. Smart factories are a key feature of the 4.0 industry. The essence is a comprehensive factory management, which reduces the factors of error. In such an environment, production and communication between people, machines and resources are more efficient, according to social network principles (Wiśniewska-Sałek, 2018).
4. Cyber physical systems (CPS) This term appeared in 2006 in America. CPS that use a transdisciplinary approach are a mixture of the theory of cybernetics, mechatronics, construction and manufacturing science. The basis is the cooperation of independent control computing units in a real time. These units are able to make autonomous decisions, manage the entrusted technological

unit, transmit data that they analyse and, above all, they become an independent and full-fledged member of complex production units (IOT, 2016). This creates high intelligence structures in production processes (Zhou, et al., 2015; Huxtable, 2016).

5. Big Data are data that exceed the capacity of conventional databases in terms of processing capacity (Dumbill, 2013). They can be structured, unstructured or unprocessed and stored on the cloud in a several different formats. By analysing them, the necessary information is gathered and used. On the contrary, the traditional data are stored in the form of letters and numbers on the classical warehouse (Huxtable, 2016).
6. "Cloud manufacturing" (CM) is an industrial version of Cloud computing (CC). CM is a network-oriented production model that transforms production resources and capabilities into production services. CM is a form of the IoS in the manufacturing system (Mabkhot, 2018).
7. Cyber Security is a protection against theft or damage of hardware, software and data stored on the Internet. As industry 4.0 grows, so does the demand for these services (Gasser, 1988).
8. Autonomy or artificial intelligence (AL) was already part of the industry 3.0, but today we understand it a bit differently. Within the manufacturing sector, robots have long been used to increase the efficiency of production lines. However, with the increase in IoT and artificial intelligence, robots (autonomous machines) become even more flexible, cooperative, and more capable of interacting with each other and with humans at the same time (Huxtable, 2016).
9. Servitization, servification, or “production-service economy”
   Tim Baines defined servitization as "The process of generating streams of revenues from services of the manufacturer" (Figure 3). The strategy is to supply the customer with the product and possibly also with service connected to the product and because of that create the maximum added value of the whole product (Huxtable 2016).

6.1.1.4. Industry 4.1

Industry 4.1 is a vision where Industry 4.0 should aim. The idea is based on the creation of a system, that can work faultlessly, i.e. with zero errors in the whole production chain. The aim of the Industry 4.1 is to fulfil the determined values of 4.0, together with the cooperation of AVM (automatic virtual metrology system) achieve the maximum of efficiency and sustainability among the entire social spectrum. Automatic virtual metrology system "AVM" is an artificial intelligence algorithm with the possibility of self-learning and adaptation to the other product lines, ensuring the reliability index and index of quality and meets the purpose of precondition of online accuracy (Cheng, 2016).

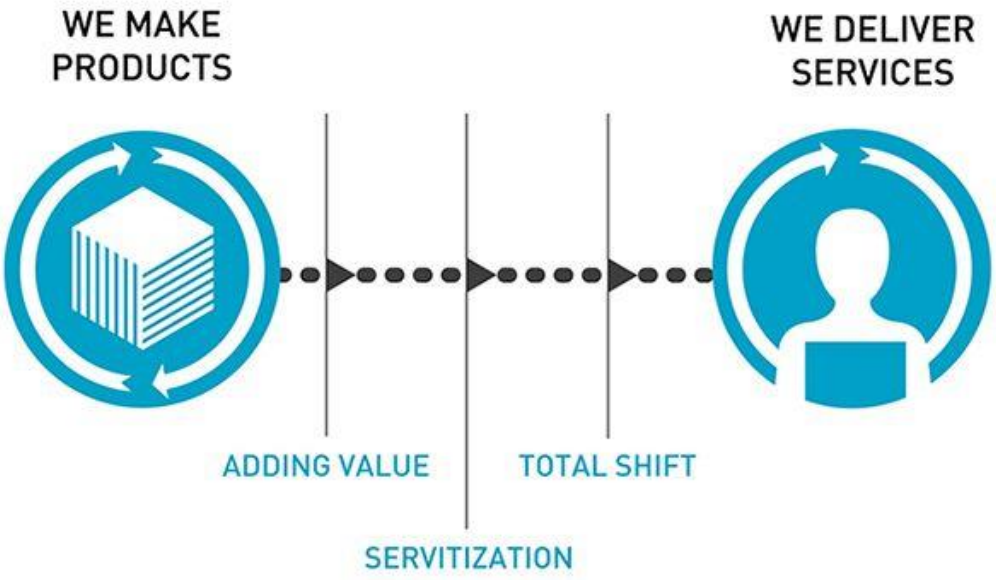

Figure 6.3 – Servitization (Huxtable, 2016)

6.1.2. Project management of Industry 4.0

In parallel with the changes in Industry 4.0, a working conditions in industry are changing as well. In the sphere of human resources, this concept means a transformation of human work, which is massively replaced by intelligent machine technology and autonomous robots (Mohelská, 2018).

Entities wishing to transform into a modern and efficient production process must carefully analyse their available resources, options and needs. From the human resources management point of view, an identification of needs of the subject in the current society specialization is an essential step. It is necessary to consider the skills and to determine the digital literacy status among current employees and to identify which are the aspects that the entity is missing (Hecklau at al., 2016). Although today's employees may not have all the capabilities needed for further development of the digitized operations, they have a great deal of experience with standards, procedures and workplace culture, and thus have the advantage. The transition to Industry 4.0 requires a complete revision of the company's operational and manufacturing processes. Employees should be retrained to an extent that corresponds to the needs of individual workplaces of the company, which of course depends on the structure and specialization of the production entity. Thus, each enterprise will have different specific labor requirements (Shamin et al., 2016).

6.1.2.1. Process management system – Industry 4.0

The principles of a smart modern factory are based on a production management system. Digitizing of a production control with Manufacturing Execution Systems (MES) connects all business sectors through the closed information loops starting from the implementation, production and quality management, to the data management and their real-time evaluation. Compared to the existing solutions, systems will no longer be based on a centralized management body, but will be capable of collective self-configuration. The future of industrial information system based on the principles of Industry 4.0, will become an organic structure within which automation is transformed into a higher level of "autonomy" (Almada-Lobo, 2015).

6.1.2.2. Personal structures´changes (Human Resources 4.0)

Indisputable industrial progress will also bring a change in workplaces. The traditional positions will be replaced by positions in the IT industry or machine service that will be directly linked to the future developments (Ahmad, 2019). It is anticipated that in the Czech Republic, automation will affect approximately 51 percent of people in the labour market. Their flexibility and willingness to develop and retrain will play a very important role. If the necessary steps leading to the education and training of the workforce are not taken in time, there is a risk of a significant increase in the shortage of employees in the sections necessary for the overall development of Industry 4.0 (Marek, 2018).

The world labour market solves the problem of unemployment in various ways. For example, 35-hour working hours are discussed, shift of the start of working hours to 9 am, or a change of the social system to basic unconditional income. The aim of these changes is to maintain the economic cycle of creating new jobs and to enable people to "spend their income". At present, it is rather the opposite in some companies, where employers try to force their workers to a “six-day” working week (Tůma, 2016).

6.2. THE POSSIBILITIES OF USING FOREST CERTIFICATION

The subchapter outlines possible application of FSC and PEFC forest certification systems in placing timber and timber products on the EU market (EUTR). Particularly, our attention is focused on the analysis of the EUTR legislation requirements, related to operators.

This topic was initiated by authors in the Czech Republic – for example by Dudík and Šišák (2014) or Ventrubová and Dudík (2014). This issue has a Europe-wide impact (Paluš et al.,2014).

6.2.1. The framework of the EUTR

First and foremost, we have to define whether the natural person or organization is an operator, trader or a subject unbound by the requirements of the Timber Regulation (Regulation (EU) No 995/2010). In case the natural person or organization identifies themselves as operators, they are liable for the following:

1. It is prohibited to place illegally harvested timber and products derived from such timber on the EU market for the first time.
2. It requires EU traders who place timber products on the EU market for the first time to exercise due diligence system (a set of processes and measurements stated in Article 6).
3. Keep and regularly evaluate their own due diligence system, unless the operator applies the due diligence system introduced by a monitoring organization (see Article 8 of the Timber Regulation).

The core of the due diligence notion is that operators undertake a risk management exercise so as to minimise the risk of placing illegally harvested timber, or timber products containing illegally harvested timber, on the EU market. The three key elements of the due diligence system are:

1. Information: The operator must have access to information describing the timber and timber products.
2. Risk assessment.
3. Risk mitigation.

6.2.2. Forestry certification systems

Requirements of forestry certification systems are analysed, in relation to the certified organizations and to the EUTR generally. The comparison of the surveyed requirements clarifies the role of forest certification systems in the EUTR.
Discussions on EUTR issues in the Czech Republic have been based on two myths lately. First, people often erroneously suppose an operator can keep current records (records of forestry output, among others) and that would sufficiently meet the requirements of the Timber Regulation and due diligence system. The first misconception was dispelled earlier in this paper. The other misconception is based on a presumption that an operator might believe that FSC or PEFC certification complies with the Timber Regulation.

First, it is worth highlighting that the Commission Implementing Regulation (EU) No 607/2012 sets basic terms of use of certification in risk assessment and mitigation. When a forest certification system meets the requirements, it can be used in the framework of EUTR. Besides, forest certification systems in the context of the Czech Republic constitute an independent and separate certification:

- Sustainable Forest Management (SFM) and
- Chain-of-Custody of Forest Based Product (C-o-C).

Forest certification systems applied in the Czech Republic:

- FCS – Forest Stewardship Council
- PEFC – Programme for the Endorsement of Forest Certification

In the framework of both systems, SFM and C-o-C are separately certified. On the face of it, it is misleading to presume: "When you have PEFC, you meet the demands of the Regulation", at the very least. The misleading conception was forged in the following context: In 2013, the PEFC International revised its international standard for C-o-C, and consequently, the Czech Republic revised its technical document setting the requirements for C-o-C. A revised C-o-C document TD CFCS 2002:2013 resulted. This technical document contains – apart of standard demands for C-o-C – also minimum requirements for the due diligence system. Actually, if operators apply C-o-C system together with the TD CFCS 2002:2013, they will also, in principle, meet the due diligence system requirements. Nevertheless, operators should take on the responsibility to create a due diligence system customized for their particular circumstances. TD CFCS 2002:2013 standard formulates concrete requirements in defined frameworks, i.e. not the particular circumstances of a particular operator; therefore, it is important to apply a due diligence system in accordance with EUTR European regulations. The above mentioned standard, however, presents a good concept of how the due diligence system might look like.

EUTR Implementation Rules complements the situation: *"Certification of the supply chain can be used as a proof that no non-certified or non-controlled timber enters the supply chain. Generally, it is desirable that only licensed timber enters the supply chain 'at critical check points' and that the timber is traceable to its previous owner (who must also be certified), not only to the forest it was harvested in. A supply-chain-certified product might contain a mix of certified and other licensed materials from various sources. If the certification of the supply chain is used as a proof of legitimate origin, the operator should ensure that all the material is licensed, certified, and its monitoring processes sufficient to eliminate other than the licensed material."*

The citation applies to C-o-C certification of any forest certification system. It is obvious – in relation to the explanation above – that it might be cost ineffective for some operators to create an appropriate due diligence system by TD CFCS 2002:2013 – especially in case of our smaller subjects who apply an easy and unambiguous identification of their timber sources. Major subjects with varied sources of timber entering the market might find the creation of a due diligence system (by TD CFCS 2002:2013 standards) a possible way to comply with the Timber Regulation. This conclusion basically corresponds with conclusions of Paluš et al. (2014).

For the sake of completeness, we have to mention the circumstances of SFM certification. The Commission Implementing Regulation (EU) No 607/2012 obliges *"a third party to carry out an appropriate monitoring regularly, at least once a year,*

including on-site checks"; therefore, the SFM certification does not meet the criterion, as every subject in the group certification usually fails to be checked upon annually. This also applies in the Czech Republic – to use SFM certification in the framework of EUTR, the operator must be audited annually by a third party (certifying body).

6.2.3. Marketing potential of forest certification

Major importing countries, Germany and the United Kingdom have had active groups of companies, led by retailers, demanding supply of certified forest products. This strong demand for certified products has probably driven Finnish companies to become chain-of-custody certified (Karna et al., 2003). Forest certification schemes have tended to presume implicitly that the ‘‘invisible hand’’ of the market will without intervention translate consumers’ values into supply of social and environmental services. Rather than encourage investment in difficult-to-control end consumer demand, forest certification has relied heavily on large retailer demand.

According to a large multi-country survey by McKinsey (Bonini and Oppenheim, 2008), 87% of consumers surveyed are concerned about the environmental and social impact of the products they buy, 33% say they are willing to pay a premium for sustainable products, and another 54% care about the environment, and want to help tackle climate change. Consumers want to act green, but they expect businesses to lead the way... businesses can do a lot more to help would-be green consumers turn their talk into walk. Following other industries, the wood processing industry should be increasingly focused on the end customer. So the tool that continues to grow in importance for the wood processing sector is branding (Tokarczyk, 2006). Branding is the marketing practice of creating a name, symbol or design that identifies and differentiates a product from other products.

As Yasushi (2014) noticed …it is difficult to direct consumer spending toward certified forest products. Only a small proportion of consumers understand the forest certification system (only 8% according to our results); thus, forest certification has a limited impact on the merchandise choice at present. According to Peck (2001) of all the commodities of importance in international trade, wood products are one of the most complex and diversified, ranging from basic raw materials straight from the forest to sophisticated manufactured products. Most of these wood products arrive to end consumers as complex combinations of natural and synthetic materials sourced from multiple locations worldwide.

Companies should proactively evaluate the potential for environmental marketing strategies and how forest certification might be used to develop competitive advantage (Hansen, 1997). A more sophisticated marketing differentiation strategy together with the application of Porters value chain for benefits of the whole industry column, can be developed by using the potential of forest certification and certification of chain of custody. As observes (Owari et al., 2006) charging a price premium was not possible for most certified companies. Although certified companies tended to gain improved

customer retention and satisfaction, in addition to a positive public reputation, certification did not generally help them to improve their financial performance.

In the Czech Republic there are about 300 companies certified in so called chain of custody certification. But the weaknesses of certification systems in the Czech Republic are similar as reported Cubbage (2010): lack of recognition (Table 1), no market structure to take advantage of certification, no country/government incentives for certification, poor funding for certification, no price benefits for certification.

Table 6.1 - Assisted Brand Awareness - Logo PEFC

	Yes, I have	**No, I have not**	**I do not know**
Have you ever seen this logo?	10%	82%	8%

	Yes, I do	**I do not know**
Do you know what this logo means?	7%	93%

Notice: Number of respondents 951. *Source: PEFC Czech Republic*

Although a Czech customer is not probably willing to pay more for certified products, branding products from certified wood and paper opens up new possibilities for differentiation strategy at the point of sale. Additionally branding can increase the impressive psychological value of the certified products and thus can increase their competitiveness in situations where pricing is comparable with uncertified products and can consequently increase demand for certified products. Examples of such marketing strategies aiming to increase the perceived value of the certified wooden products can be so called co-branding strategy (Helmig et al., 2008) or advertising alliance used by certification system PEFC and hobby market Bauhaus in the Czech Republic (Figure 4).

Figure 6.4 - Illustration of P.O.S. (point of sales) materials (source: www.bauhaus.cz)

6.3. CHAIN OF CUSTODY OF FOREST BASED PRODUCTS IN THE BIOECONOMY

6.3.1. Principles of the PEFC C-o-C and Bioeconomy

Before considering opportunities of use of the requirements of sustainable chain of custody of forest based products (C-o-C) within the bioeconomy principles, it is necessary to define the basic terms. First of them is „chain of custody of forest based products". If we come out of PEFC system approach (Programme for the Endorsement of Forest Certification), it deals with "*Process of handling of information on the material category of forest based products which allows the organisation to make accurate and verifiable claims on the content of certified material.*" (PEFC, 2013). Certified material is *„Raw material which is covered by the chain of custody claims"*. Specifically it means that certified material is (PEFC, 2013):

(a) forest based material delivered with the supplier's claim "x % PEFC certified" by the supplier with either:

i) PEFC recognised certificate or

ii) a document confirming that the supplier is covered by the PEFC recognised certificate.

(b) recycled material (other than products delivered with the "PEFC certified" claim).

The overall goal of the PEFC chain of custody is to provide customers of forest based products with accurate and verifiable information on the content of material originating in PEFC certified, sustainably managed forests, recycled material and controlled sources (PEFC, 2013).

Criteria for sustainable forest management evaluation in the Czech Republic are defined by an standard (within the PEFC system it is TD CFCS 1003:2016).

The second term is "bioeconomy". Many definitions are to be found. We use a definition by European Commission which is as follows: *„The bioeconomy comprises those parts of the economy that use renewable biological resources from land and sea – such as crops, forests, fish, animals and micro-organisms – to produce food, materials and energy"* (EC, 2012). Bioeconomy represents the European way to use our natural resources, as arises from the „Action plan 2018" (EC, 2018). According to this document, also the bioeconomy principles come out - *„The bioeconomy covers all sectors and systems that rely on biological resources – animals, plants, micro-organisms and derived biomass, including organic waste – as well as their functions and principles. It includes and interlinks: land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and service. To be successful, the European bioeconomy needs to have sustainability at its heart and be circular by definition. The purpose of the updated European Bioeconomy Strategy is therefore to*

further develop a bioeconomy that valorises and preserves ecosystems and biological resources, drives the renewal of our industries and the modernisation of our primary production systems through bio-based innovation, involves local stakeholders, protects the environment and enhances biodiversity".

Attention within the bioeconomy area is now aimed at sustainable future. Action Plan 2018 (EC, 2018) says that an update of the original Bioeconomy Strategy is necessary to accelerate the deployment of a sustainable European bioeconomy so as to maximise its contribution towards the 2030 Agenda and its Sustainable Development Goals (SDGs), as well as the Paris Agreement.

6.3.2. Bioeconomy approaches

Bioeconomy approaches can be divided into two groups as follows (Secco et al. 2016):

- the traditional, technological approach,
- the emerging, social approach.

Their main differences are shown in Table 2.

Technological approach represents an adaptive strategy with a conventional wisdom of innovation generation. Focus on forests, agriculture, fishery as raw materials providers with biotechnology being the engine of the growth. Social innovation approach represents bioeconomy as an opportunity to re-think to our consumers' patterns. It not only considers the protection of natural capital, but it stresses as well the importance of addressing equity and social inclusion challenges in moving toward a green economy (Secco et al. 2016). Technology-based and socio-ecological approaches are mentioned also in Priefer et al. (2017).

Chain of custody system requirements come out from an international PEFC C-o-C standard (PEFC ST 2002:2013) and can be divided into following areas:

- Identification of the material category of material/products
- Minimum Due Diligence System (DDS) requirements
- Chain of custody method
- Sale and communication on claimed products
- Minimum management system requirements
- Social, health and safety requirements in chain of custody
- Specification of the PEFC claims
- Implementation of the chain of custody standard by multisite organisations

Table 6.2 - Main fundamental differences between approaches

	Technological approach	**Social approach**
Focus on	- Technological innovations - Large scale investments - Value chain perspective - Sectoral development - Vertical integration	- Social innovations - Small scale - Networks - Cross-sectoral development - Horizontal integration (forests and agriculture as the green infrastructures for rural development)
Input/output diversification	- 1 or more inputs - Diversification in outputs	- Diversification in the use of inputs - High added value products & services
Market power	- Increasing role of business owning/controlling the (new) technologies	- Role of networks, groups, associations, public-private partnerships…
Model regions	- Northern EU (UK, Scandinavian countries)	- Southern EU (Mediterranean region)

Source: Secco et al., 2016

Detailed requirements in the above mentioned areas are stated by PEFC C-o-C standard, where they are presented. Based on the analysis of C-o-C system requirements in the above mentioned areas and two stated bioeconomy principles we can conclude that PEFC C-o-C standard is usable in a very good way for fulfilling the principles in the traditional and technological approach in bioeconomy. The reason for that is, that this principle considers the use of raw materials (wood, wood chips etc.), where C-o-C standard defines clear requirements.

Social approach is less tangible by PEFC C-o-C standard, the use of this standard is highly limited. Beside the tangible side of stream in chain of custody (like in technological approach), social approach needs to be considered also in terms of intangible aspects, that are sometimes hard to measure. PEFC C-o-C standard cannot properly evaluate e.g. the social acceptability, gender issues and discrimination, distribution of income etc. in detail.

6.4. BASIC INDICATORS OF FURNITURE MANUFACTURING IN THE CZECH REPUBLIC

This subchapter is aimed at furniture in conditions of the Czech Republic, namely Manufacturing of furniture, that belong under CZ NACE 31 according to the classification of economic activities. Primary source of the data for manufacturing industry in the Czech Republic are to be found in annually published reports by Ministry of Industry and Trade (so-called “Panoramas of the Manufacturing Industry”).

The furniture sector is described and evaluated according to the situation over the past 10 years.

6.4.1. Number of companies

The official data state that, in 2018, total number of 5659 companies was registered under CZ NACE 31. This is almost the same number as 10 years before (5538), but in 2011 the total number of companies reached as high as 8241 (difference between the highest and lowest value is 2582). For details see Fig. 5.

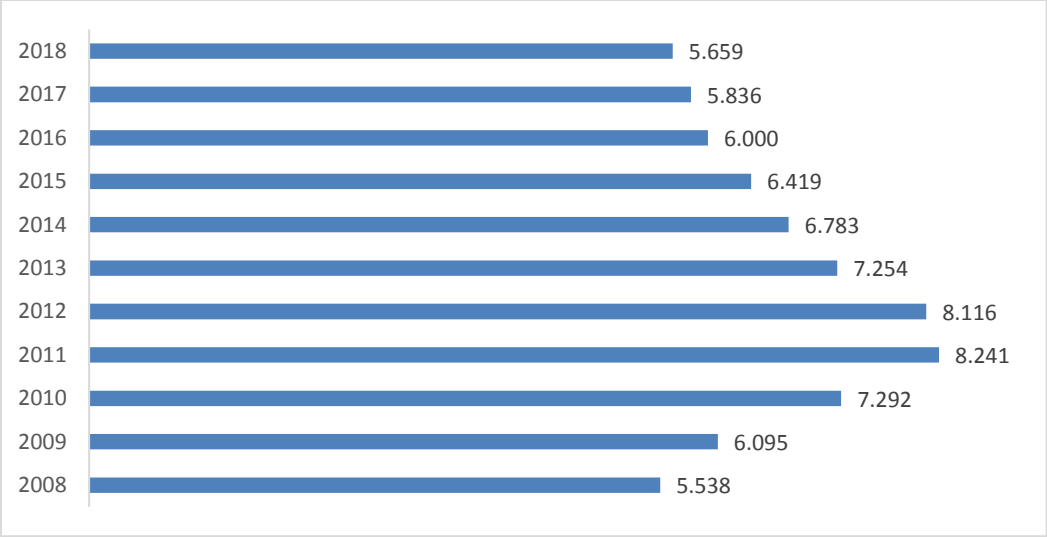

Figure 6.5 - Number of companies in years 2008-2018 in CZ NACE 31 (Source: Panorama of the Manufacturing Industry)

6.4.2. Number of employees

From 2008 to 2013, the total number of employees was decreasing. Since 2015 the number is almost steady (around 20.5 thousands of employees).

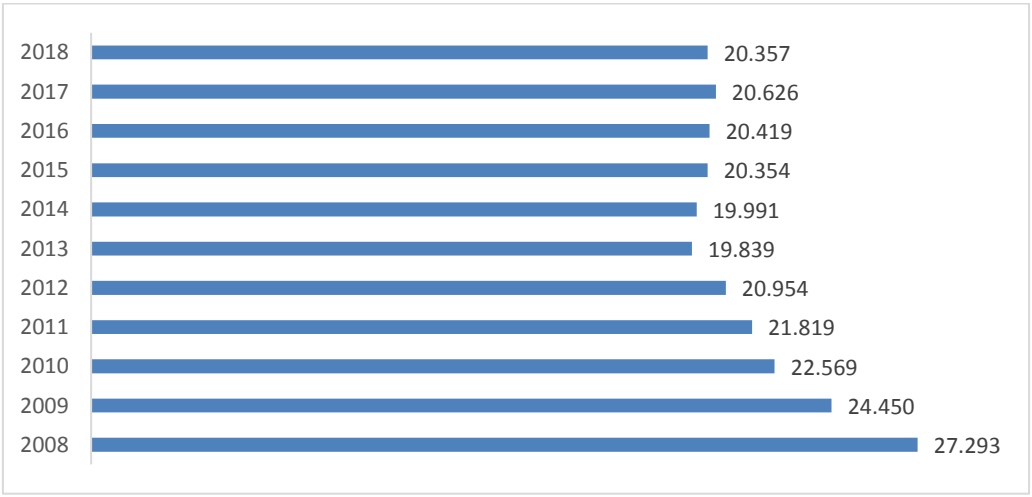

Figure 6.6 - Number of employees in years 2008-2018 in CZ NACE 31 (Source: Panorama of the Manufacturing Industry)

Considering number of companies and number of employees together, it means that average number of employees in one company varies from 3.38 (in 2012) and 5.74 (in 2008), which is quite low.

6.4.3. Average income

In 2018, the average income in the economy in the Czech Republic was 1354 EUR (Czech Statistical Office, 2019). The average income in manufacturing of furniture reached only 959 EUR, which represent only 71% of the average income. Nevertheless, the data show that there is an increase in the average income. This increase is rather slow, but since 2015 a bit more substantial.

Table 6.3 - Development of average income (CZ NACE 31)

Year	Average income (in EUR)[3]
2008	683
2009	686
2010	693
2011	703
2012	717
2013	737
2014	760
2015	782
2016	841
2017	902
2018	959

Source: Calculated based on the data from Panorama of the Manufacturing Industry

6.4.4. Trade balance

In recent years, the trade balance, financially expressed, is always positive, however the current trend is rather unfavorable. The decline started between years 2013 and 2014 and a big decline is visible between years 2015 and 2016.

6.4.5. Value added

It is useful to use the primary data for further calculations or to show proportions between the indicators. One of the suitable indicator is value added, which can be defined as a "*difference between the enterprise outputs and its consumption for the outputs. Outputs are revenues from the sales of own products and services, activation*

[3] Calculated with exchange rate 25CZK/EUR

and change in the inventory of own activities, consumption for the outputs consisting of the consumption of materials, energies and services (Pejzl & Slonek, 2006)".

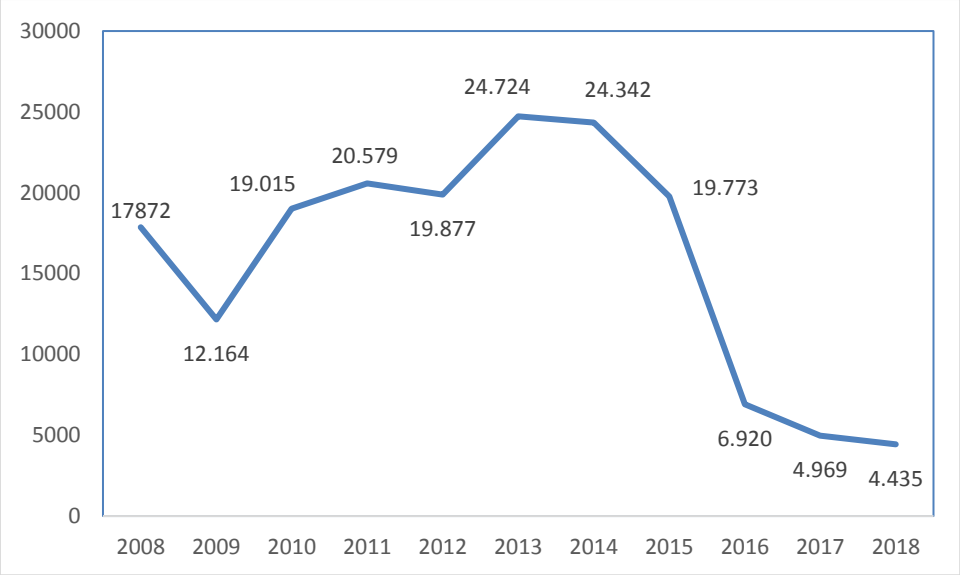

Figure 6.7- Trade balance (million EUR) in 2008-2018 in CZ NACE 31 (Source: Panorama of the Manufacturing Industry)

It is also an indicator that can be used not only for evaluation of a certain company, but also for competitiveness evaluation between several companies and it can be used for comparison of companies that do not belong under the same field of economic activities as well. To have this indicator more comparable, a relative version of the indicator (value added per 1 person or 1 employee) should be used.

The positive thing is that the relative version of the indicator is steadily growing. Other indicators based on the value added can be a mutual relation between value added and sales or investments – they show the measure of value added creation.

Table 6.4 - Value added per employee (CZ NACE 31)

Year	VA/employee (CZK)	VA/employee (EUR)
2008	397 290	15 892
2009	404 401	16 176
2010	425 139	17 006
2011	433 001	17 320
2012	465 991	18 640
2013	481 117	19 245
2014	518 016	20 721
2015	553 890	22 156
2016	577 598	23 104
2017	608 712	24 348
2018	637 188	25 488

Source: Panorama of the Manufacturing Industry

Table 6.5 - Selected indicators based on value added (CZ NACE 31)

Year	Value added/sales	Value added/investments
2008	0.0097	0.1104
2009	0.0118	0.2037
2010	0.0120	0.2076
2011	0.0125	0.3032
2012	0.0136	0.2341
2013	0.0142	0.2819
2014	0.0142	0.2556
2015	0.0141	0.2501
2016	0.0140	0.2818
2017	0.0139	0.2678
2018	0.0146	0.1940

Source: Own calculations based on the data from Panorama of Manufacturing Industry

Generally, the value added can be increased by shifting the prices of the final products up, by decreasing the input costs or by increasing the amount of sold quantities (FAO, 2014).

The competitiveness of the furniture market is high. Not only companies selling furniture made from wood should be considered as a competitor. Products used as a furniture, but made from other material, can interfere into the market, especially because of the lower price (than furniture made from wood). Thus, the increase in price might not be the way of increasing the value added for wood products (consumers will not be willing to buy more expensive products). Other ways – decrease of costs or increase of sold products can be the right way. Renewable resources are socially preferred by consumers nowadays, but, as mentioned before, the high price is often the limit. Ongoing research can increase the utilization of wood and products made from wood, which can lead to the decrease of costs in long-term and this will be projected into the final price – and attractiveness for consumer.

Another interesting indicator, the share between investments and sales, is shown in the table 6:

Table 6.6 - Indicator of investments/sales (CZ NACE 31)

Year	Investments/sales
2008	0.0879
2009	0.0577
2010	0.0580
2011	0.0412
2012	0.0579
2013	0.0503
2014	0.0557
2015	0.0564
2016	0.0498
2017	0.0519
2018	0.0752

Source: Own calculations based on the data from Panorama of Manufacturing Industry

6.5. CONCLUSIONS

Furniture manufacturing itself faces many challenges, such as low resource efficiency, high labor costs, increased environmental protection requirements, and many more. Studies on the aforementioned industrial and socio-economic factors show that Industry 4.0 with smart factories will be inevitable towards future viability not only of the CZ NACE 31 sector (Panorama of Manufacturing, 2018).

The difficulties that this new strategy faces are many, ranging from lack of professional staff to the securing finance (Seseni, 2018). What matters is whether the companies involved will remain active players or will be mere spectators of further developments in the industry. The question arises whether individual entities are prepared for future development. The digital transition and innovation of industry 4.0 require new strategic processes, organizational models, human resource management processes, manufacturing operations and technologies that companies need to prepare sufficiently and on time (Gilchrist, 2016).

Industrialization and automation in the Czech Republic will lead to an increase in factor productivity, GDP, wage increases and return on capital and other economic values. These changes will also have an impact on human resources, where we refer to so-called "Human Resources 4.0". Future developments assume that automation in the short term will not lead to an increase in unemployment, i.e. if the labor markets are sufficiently flexible and employees are willing to retrain and adapt to new innovations. In the longer term, job losses will be replaced by jobs corresponding to the needs of the future market (Ahmad, 2019, Marek, 2018).

In neighboring countries, these facts are fully aware and are not understimated. In Germany or Austria, for example, they are already taking concrete steps to address the predicted development. Unfortunately, similar discussions in the Czech Republic are at freezing point (Tůma, 2016).

When discussing the Single European Market, the EU Council highlights the shortcomings of the current model. It is clear that today's digital market model is not enough. The united digitized market needs to be achieved. This would make it possible to compete against the global market. The more the market shifts to digital information-based servicing and economics, the greater obstacle the current model will be (EU Council, 2018).

In conclusion, it is essential to say that since the inception of Industry 4.0, a great deal of effort has been devoted to overall research into what a modern and intelligent factory should look like. However, to date there is no explicit document to determine what objectives should be accomplished in order to achieve this concept in general (Mabkhot, 2018). The ever-accelerating technological evolution brings a number of visions that are gradually incorporated and changing the previously set values. The current trend of industry 4.0 is towards Industry 4.1, which carries the idea of flawless production with ASM accessories (Cheng, 2016).

If the Updated bioeconomy strategy 2018 deals with sustainable and circular bioeconomy (EC, 2018), than exactly criteria and indicators of sustainable forest management and subsequently the requirements of chain of custody of forest based products are of basic foundation of future bioeconomy in forestry and wood-processing industry.

Aiming the attention to determine the incentives of forest owners for sustainable forest management certification is appropriate. Paluš et al. (2018) deals with this issue in conditions of Slovakia. Besides, we can agree with the conclusions made by Šupín and Dzian (2018), where for consumers, the bio-economy means an opportunity to choose a more sustainable lifestyle.

Chain of custody of forest based products (in this text presented by PEFC C-o-C standard) is primarily based on the evaluation of requirements considering the tangible flow of forest based material. Also an intangible flow – information – is tied with that.

On one hand, social acceptability, gender issues and discrimination, distribution of income etc. is not a matter of evaluation by PEFC C-o-C standard. Exactly these and other impact categories could belong under the evaluation within the social approach in bioeconomy at the same time. This consideration follows on from papers dealing with social life cycle assessment (see e.g. Falcone, Imbert, 2018), where such an impact categories are taken into account within the bio-based economy.

On the other hand, PEFC C-o-C standard can be used within the technological approach in bioeconomy. It suitably follows on the criteria and indicators of sustainable forest management. PEFC C-o-C standard subsequently enables monitoring the share of certified material in chain of custody and minimize the risk, that a raw material from controversial sources would get into the chain of custody.

Manufacturing of furniture in the Czech Republic belong to the traditional fields, based on sufficient amount of raw wood to be processed. The number of compaies in the field is steady, but the number of employees decreases every year. The current situation on the wood and wood products market is complicated by impacts of bark beetle calamity on the possibilities of processing spruce wood and its prices. Furthermore, there is an apparent pressure from large retail chains for furniture products to come from FSC certified raw materials, in spite of that two thirds of the wood raw material in the Czech Republic is already certified by PEFC. The idea of using wood material from non-controversial sources is very positive. Nevertheless, the pressure to implement and maintain another system, in this case FSC C-o-C, will cause additional costs to furniture manufacturers. These additional costs of implementing and maintaining an additional system may also affect other businesses / parts in the processing chain as well as forest owners. All of these factors have a big impact on price development and willingness to pay for wooden furniture in the Czech Republic and abroad.

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7. PRODUCTION MANAGEMENT MODEL FOR SMALL AND MEDIUM FOREST BASED ENTERPRISES IN SOME SOUTHEAST EUROPEAN COUNTRIES

Denis Jelačić, Marko Dušak

7.1. INTRODUCTION

Today, micro, small and medium enterprises account for the majority of jobs. In addition, they provide a significant source of entrepreneurial spirit and innovation. Furthermore, there are approximately 23 million small and medium enterprises in the European Union. 75 million work posts account for 99.8% of all enterprises (Jelačić *et al*., 2015).

According to the *Small Business Development Promotion Act*, entrepreneurs are classified by size into three categories, i.e. micro, small and medium enterprises. Micro enterprises are those that employ less than 10 workers and generate less than EUR 2.000,000 in operating revenues per year. On average, small entrepreneurs employ less than 50 workers p.a. and generate less than EUR 10.000,000 in operating revenues per year. In contrast, medium enterprises are those that employ more than 50 and less than 250 workers and generate a total annual turnover of more than EUR 10.000,000 (Ukić and Kuran, 2015).

Using Croatia as the average representative of southeast European countries, over 100,800 small and medium enterprises existed in 2014, representing 99.6% of all industrial subjects in Croatia. In 2015, the number of SME's increased to over 104,100 enterprises (99.7%). Out of those 99.7% of all industrial subjects in Croatia, 98.5% were micro and small enterprises, and 1.2% were medium enterprises (SMEs and Enterpreneurship Policy Centre 2016).

In 2014, small and medium enterprises had over a 52% participation rate in the total Croatian Gross Domestic Product (GDP) and over a 53% participation in 2015 (35% small enterprises and 18% medium enterprises). In 2014, approximately 68% of Croatia's employees were employed by SMEs, and by 2015 that number was 50.9% in small enterprises and 17.5% in medium enterprises).

In total, 48% of Croatian exports in 2014 were by small and medium businesses, and in 2015 that share of participation increased to 48.5% (25.2% for small enterprises participation and 23.3% medium enterprises).

In Macedonia SMEs were 99.7% (or 70,453 enterprises) of the total number of enterprises in 2014. Additionally, there were 70,659 active business entities, out of which 64,187, or 90.8%, were micro enterprises employing up to 10 persons. Enterprises employing between 10 to 49 persons and from 50 to 249 persons generated a share of 7.0% and 1.8%, respectively. In 2014, the Macedonian SME sector had a share of 75.6% of total country employment, and the share has been

increasing on an average annual rate of 2.2% since 2010. In 2014, SMEs' contribution to total turnover and value added was 67.7% and 65.5%, respectively (European Investment Bank 2016).

In 2013, 99.8% of all Serbian enterprises (315,906) were SMEs, employing almost 65% of the labor force. Out of total number of SMEs, 99.8% were micro, 3.0% were small, while only 0.7% were medium enterprises. Additionally, SMEs accounted of 54.1% of total gross value added of non-financial sector and for 43.2% of total exports of non-financial sector in 2103. At the same time, only 4.4% of all Serbian SMEs recorded net income from export activities (OECD 2016).

In Slovenia, in 2014, out of total 59,856 enterprises 99.6% (59,620) were SMEs, out of which 98.1% were micro and small enterprises, and 1.9% were medium enterprises (OECD 2016). According to European Commission (2016) data, in Slovenia more than 62% of value added and over 72% of employment are generated by SMEs, and they provide over one third of all jobs. In 2015, SMEs employment was still 12% below what it had been in 2008. At 30%, the manufacturing sector contributes the largest share of SMEs value added, and a similarly high share of SMEs employment. In 2012-2015, as a result of increases in value added and employment of 11% and 3%, respectively, SMEs had almost attained their pre-crisis levels for both of these two indicators.

Managing such companies is a continuous process that drives and directs business activity and thereby achieves its goal. This type of business deals with issues such as financing, which is reflected in the inability to access the capital necessary for its establishment and development (OECD, 2016). The development of both the economy and the enterprise itself is valued through management systems that, along with a certain number of people, business plans and financial flows, must be aligned with other factors in the production process in order to survive. Difficulty in managing small and medium enterprises stems from the inability to conduct a comprehensive market research. A small business owner must personally perform all essential managerial functions, and must deal with administrative issues (obtain work permits, deal with taxes and insurance, abide by the Act on employment, dismissal, revision, etc.) (Bennett, 1994).

The management structure in the wood-processing sector (micro, small and medium enterprises) is reduced to a low level of knowledge and awareness of the benefits of the production management systems. The lack of standardized management systems that incorporate risk analysis tools, reduction of the business risk impacts and an array of other internationally-recognized management systems can have a significant negative impact on the business and life cycle of organizations, regardless of the size, structure or form of ownership in such organizations (Britvić, 2011).

The support provided to businesses and SME's development makes the structure of envisaged and coordinated activities and measures undertaken by different entities at different levels of decision making (Ren *et al.*, 2015). Such a system requires efficient institutions or experts who are well familiar with entrepreneurship, business and development specific for this type of enterprise. Today, successful business

operations and the development of small and medium enterprises require a quality solution to the problems related to their own technological and product development (Okolić, 2007).

The production itself needs to be well prepared and precisely planned, so that all jobs can be performed in a timely fashion, including the optimal consumption of all productive resources: materials, labor, money, information, instrumentation and energy (Grladinović *et al*., 2007).

Compared with large companies, small and medium enterprises have limited resources and little impact on the market (Kivijärvi and Tuominen, 1996). Their survival depends on the ability to get the most out of available resources and quickly find the market niche and adapt to it in an appropriate manner. Therefore, a rapid response to changes is considered the key to survival of SME's (Zhang, Li and Ziegelmayer, 2009).

Innovation can be seen as a solution to the company's survival. For example, market share of more innovative companies tends to increase in volume, in contrast with the underperforming companies whose failure forces them to search for innovation opportunities. Consequently, the companies that base their progress on innovativeness stand a better chance of having higher export values (Pirc-Barčić and Motik, 2013).

This research aimed to examine the current situation in production management systems in SMEs of wood-processing and furniture manufacturing companies in four southeast European countries. The study hoped to establish parameters for enterprise owners and managers in SMEs should consider to improve their business and production results in the future. The questionnaire aimed to establish the advantages and disadvantages associated with SME's production management systems. Also, to suggest a model to create better production and management systems within SME's in the wood industry sector, and for use in other industries.

7.2. MATERIAL

A survey was provided to the company managers of 130 micro/small and medium companies from four southeast European countries (Croatia, Macedonia, Serbia, and Slovenia). Sample of sent questionnaires to enterprises was defined by percentage of small and medium enterprises within each country. Total of 117 questionnaires was sent to micro/small enterprises and total of 13 questionnaires was sent to medium enterprises, according to number of enterprises in each county (Croatia 25%, Serbia 50%, Macedonia 15%, and Slovenia 10%). However, mostly because of the number of employees in management, medium enterprises almost all responded to survey, while small enterprises mostly did not respond at all or their responses were incomplete and were not considered.

In total, only 30 enterprises responded to the survey in full, and these responses were taken into further analysis. Of the responded questionnaires, 27% were from macro enterprises, while 33% were from small enterprises, and 30% were from medium enterprises.

An emailed survey, based on methods recommended by Dillman (2000), was the approach used in this study.

The questionnaire consisted of 40 questions with several statements concerning each question. The managers had to choose a statement related to different production management parameters that were either more or less important for the companies' production management system. Within the questionnaire, the conditions of key presumptions of different management parameters were checked.

The questionnaire was divided into two parts. The first part consisted of 11 questions and was dedicated to general information about the company. The second part consisted of 29 questions directly connected to production management system parameters. Those 29 questions gave several statements for each question marked 1 through 5 (1- not important at all, 5- most important).

The same questionnaire was given to 10 experts from the same four countries, who had to give answers to the second part of the questionnaire (questions 12 through 40). The goal of having both experts and managers answer the questions was to establish the differences between opinions of managers in the companies and experts not working in the companies.

In the second survey, different questionnaires for the purpose of an AHP analysis were used. The production management system parameters were grouped into seven categories and those categories were placed in relationships. The questionnaire was given to the same experts who had to grade the relationships among the categories, according to their own opinion.

7.3. METHODS

The differences in the frequency of answers given by the managers and experts were tested by a χ^2-test for each individual question (the hypothesis, H_0, was the distribution of answers to the same question that were equally given by both groups). The test showed that there was a statistically significant difference between the distribution of all answers given by company managers and those given by experts (for all tested values $p < 0.01$). Thus, this study aimed to establish which production management system category of parameters, according to the experts' opinions, should be considered. Therefore, the authors conducted the AHP method.

The AHP method is a multi-criterion decision making method that helps decide among suggested alternatives. Seven categories of parameters were established and placed to make $x \cdot (n-1)/2$ pairs. The questionnaire condition that should receive most consideration during the analysis was for the Consistency Ratio (CR) to be less than 10% ($CR \leq 0.10$), meaning that less than 10% of given answers (values) should be inconsistent. All statistical analysis and graphical presentations were conducted using Microsoft Excel software (Microsoft EMEA, Issy-les-Moulineaux, France)..

7.4. RESULTS AND DISCUSSION

The first 11 questions in the questionnaire were dedicated to general information about the companies. The micro companies surveyed in the research were manufacturing furniture or joinery (windows and doors), while small and medium companies were sawmills, furniture, or joinery manufacturers. Two thirds (67%) of the companies manufacture products exclusively through known customers, while 33% of the companies have their own shops, enabling them to combine their production for known customers and to that of the shop (unknown customers). Of enterprises responding to the questionnaire, 26.7% were small craft companies, usually family businesses that manufactured unique products ordered by a single customer who came to the company to order furniture or joinery by reputation (they gathered the information about the company from a friend or by chance). The other companies functioned through a type of legal entity. One fifth (20%) of surveyed companies used classic production technology and hand tools only, while 13% exclusively used computer aided technology, and two thirds (67%) used a combination of both.

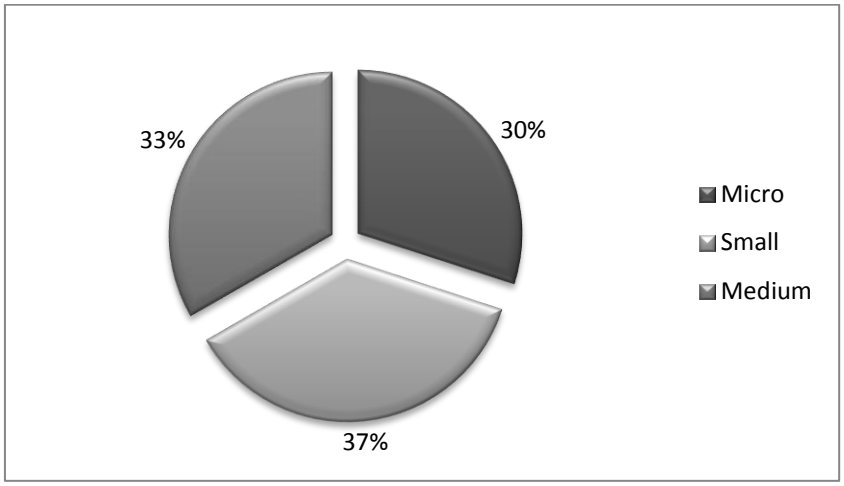

Figure 7.1. Type of business

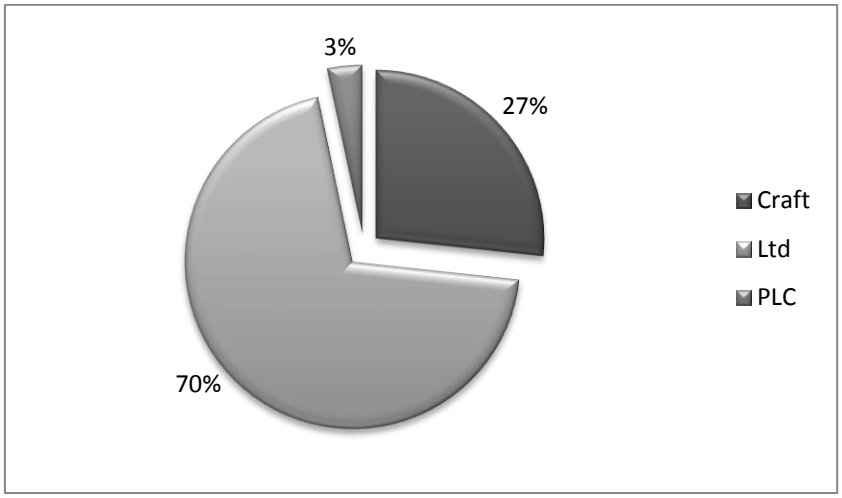

Figure 7.2. Legal form of companies

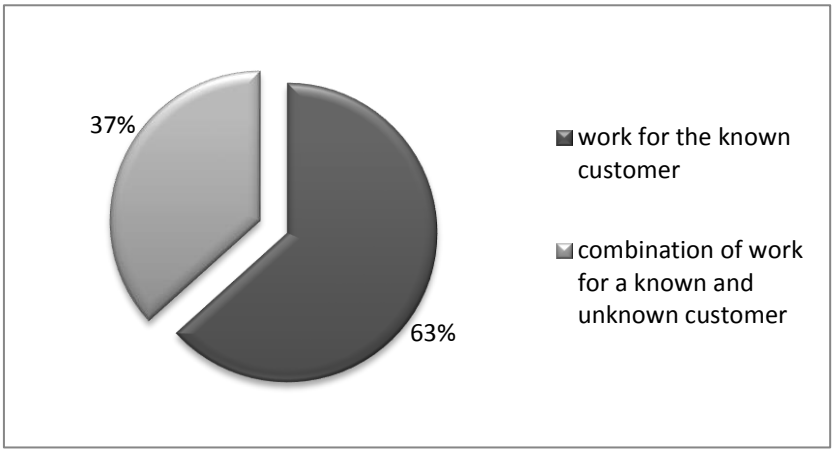

Figure 7.3. Customers

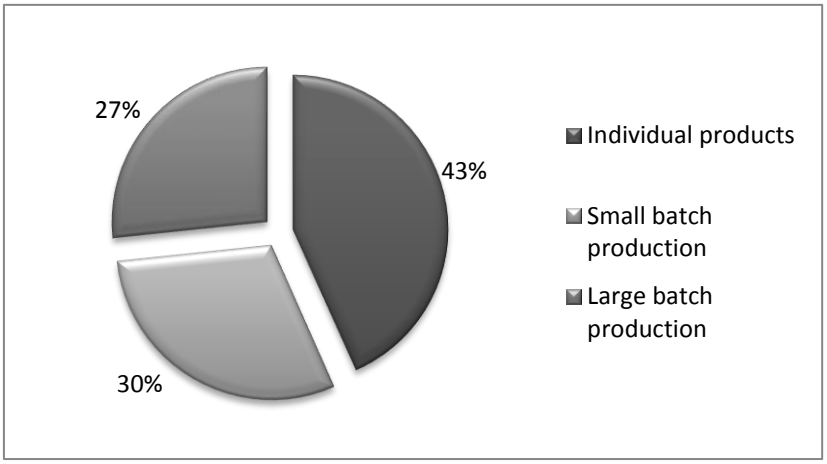

Figure 7.4. Production processes

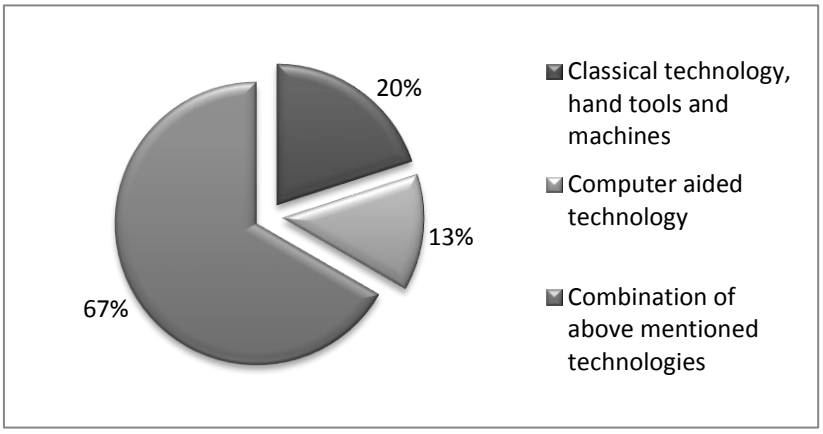

Figure 7.5. Equipment and technology

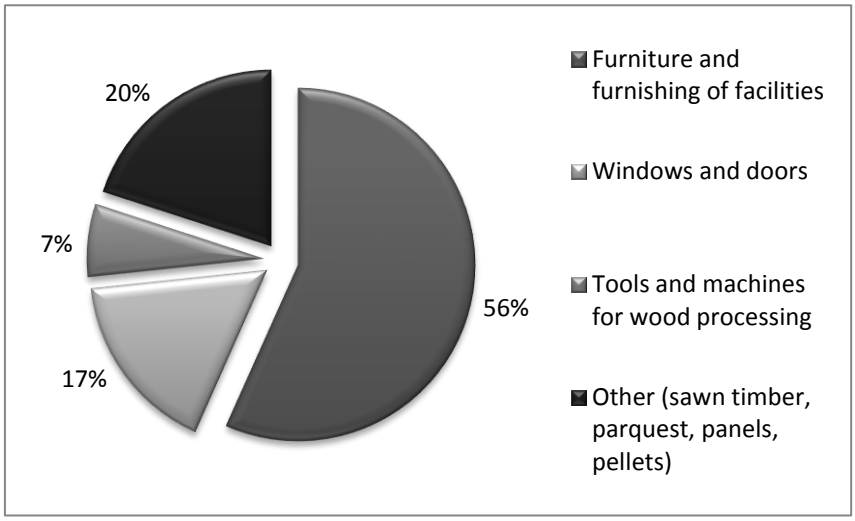

Figure 7.6. Production program of the company

The second part of the questionnaire consisted of questions related to production management system parameters (12-40). Those questions were devided into 7 major groups, which consequently were parameters for AHP analysis of the production and business management system. These 29 questions were answered by the owners (managers) of the companies as well as by external experts from the 4 countries in South East European region, who were not employed in the companies, but whose responses were needed for the χ^2 -test and the AHP method in order to compare the answers received by the company. These questions were posed in order to get the opinions of the company owners and external experts. The goal of such a survey response collection process was to determine the differences in responses between business managers and eternal experts. The results of the χ^2 –test were published separately previously (Dušak *et al.,* 2017), but as they were the basis for this research they will be explained here.

The questions from the questionnaire, 29 of them, with 135 statements in them all together, were divided into 7 groups: **LPOSC** - Leadership, Policy, and Organizational Structure of the Company; **PCMPPD** - Process Culture, Management Processes, and Production Deadlines; **RPQP** - Range of Products and Quality of Products; **MPM** - Marketing and Market Activities of the Company; **HR** - Human Resources; **ITMPT** - Information Technology and Modern Production Technology; **ECP** - Environmentally friendly production. Those groups were used for AHP analysis afterwards.

Tables from 1 to 7 present the χ^2- Pearson's chi-squared test and the p-values ($p <= 0.001$ – the differences are "very highly significant" (99.9%); $0.001 < p <= 0.01$ – the differences are "highly significant" (99.0%); $0.01 < p <= 0.05$ – the differences are "significant" (95.0%), $p > 0.05$ – the difference is "non-significant" in less than 95.0%) for questions 12 through 40 offered in the questionnaire. The questions and answers given in Tables 1 to 7 were grouped into seven main parameters and used in the AHP analysis.

Table 7.1. χ^2 - Pearson's Test and p-Values for Statements Regarding Leadership, Policy, and Organizational Structure of the Company (LPOSC)

Questions/Statements	X^2	p
Statements about leadership, goals, and objectives of SMEs		
Continuous business improvement with IT	13.7	0.0082
Complementary goals to implement strategy	14.7	0.0053
Employees familiarity with strategic goals	15.4	0,0040
Plans required for process improvement	13.9	0,0078
Innovation of the processes	14.1	0.0069
Statements about management and errors in production		
Complexity of production management	14.2	0.0068
Attention to information and material flows	14.2	0.0067
Control of errors and products	13.9	0.0077
Production losses dependent on technical preparation	14.5	0.0059
Adapting to customers' wishes	14.6	0.0056
Importance of SMEs' organization		
Smooth organizational structure	15.2	0.0043
Employees from different units from the same teams	14.3	0.0063
Organized workplaces for various tasks	20.9	0.0003
Owner role definition for implementation	13.9	0.0077
Criteria at the level of organization within the enterprises		
Providing necessary workplace materials	13.9	0.0075
Working conditions	20.8	0.0003
Motivation	14.6	0.0057
Labor productivity	15.8	0.0033
Importance of customers and relationships with suppliers		
Frequent market research	26.8	< 0.0001
Constant customer contact	16.9	0.0020
Managers monitor the competition	17.6	0.0015
Quick response to competition	16.3	0.0027
Partnership with customers and suppliers	13.8	0.0078
Company associated with customers	13.6	0.0086
Suppliers familiarity with company	14.8	0.0051
Importance of the following statements related to production		
Meet customers' demands	13.5	0.0091
Increase productivity for better results	15.8	0.0034
Customers successfully retained	14.8	0.0052
Production program attractive to customers	14.5	0.0058
Innovations introduced to market	17.4	0.0016
Strategies implemented into plans	14.5	0.0060
Importance of the following criteria		
Suitability	14.0	0.0074
Reputation	14.2	0.0066
Price	13.6	0.0087
Payment terms	13.9	0.0076
Availability of material	14.3	0.0063
Delivery deadlines	13.5	0.0092
High level of service	13.4	0.0097

Notes: For all answers in Tables from 1 to 7 the size of the sample for companies was $N_A = 30$, size of the sample for experts was $N_B = 10$, and the degree of freedom was df = 4

Table 7.2. χ^2 - Pearson's Test and p-Values for Statements Regarding Process Culture, Management Processes, and Production Deadlines (PCMPPD)

Questions/Statements	X^2	p
Importance of product distribution		
Intensive distribution system	15.2	0.0042
Selective distribution system	14.8	0.0051
Own shops	17.9	0.0013
Methods of selling the products		
Personal sale	19.5	0.0006
Phone or internet sale	14.6	0.0056
Sales through adverts	15.3	0.0041
Product promotion		
Fairs	14.9	0.0050
Verbal information	18.4	0.0010
Catalogues	20.2	0.0004
Newspaper ads	15.1	0.0044
Discounts and sales	15.4	0.0040
Internet- e-mails	14.9	0.0049
Company website	15.1	0.0044
Storage process		
Stocks needed for continuity of production	16.5	0.0025
Predetermined material flow	13.9	0.0076
Stocks should be at low cost stock	13.8	0.0080
No waste or failures	13.6	0.0087
Stocks should rationally accelerate material flow	13.7	0.0083
Increase competitively Increasing competitiveness of the company	16.3	0.0026
Statements about the market		
Produce by customers' requirements	15.6	0.0036
Sell what the company can produce	22.6	0.0002
Market research by customers' demands	22.8	0.0001
Packaging as a mean of protection	25.6	< 0.0001
Packaging impacts the products sale	13.5	0.0091
Stocks to meet customer requirements	14.2	0.0067
Stocks to meet production requirements	21.0	0.0003
Importance of innovation in SMEs		
Product innovations	13.9	0.0075
Process innovations	13.8	0.0079
Business innovations	13.3	0.0098

Table 7.3. χ^2 - Pearson's Test and p-Values for Statements Range of Products and Quality of Products (PRQP)

Questions/Statements	X^2	p
Importance of business processes in SMEs		
Documented processes	16.3	0.0027
Documentation defines responsibilities	14.2	0.0068
Business process is well understood	14.4	0.0060
Other methods of defining process	13.7	0.0082
Graphically described process	15.4	0.0039
Importance of production system processes		

Research and development	15.7	0.0034
Marketing	16.2	0.0028
Purchasing	13.7	0.0084
Production	13.7	0.0084
Quality assurance	13.3	0.0097
Accounting and finances	16.3	0.0026
Human Resource Management	14.4	0.0060
Importance of process culture in the company		
Business as a series of related processes	15.4	0.0040
Employees from different units work together	13.4	0.0096
Process owners are responsible for its success	13.8	0.0081
Quality and organization management system		
Quality defined by technology	15.7	0.0034
Quality is more important than deadlines	19.5	0.0006
Each process should be equally distributed	18.5	0.0010
Organized system for realistic deadlines	14.4	0.0060
Clear division of a process is a key to success	17.6	0.0014

Table 7.4. χ^2 - Pearson's Test and p-Values for Statements Regarding Marketing and Market Activities of the Company (MPM)

Questions/Statements	X^2	p
Impact of the market on production program		
Market impacts on production program	14.4	0.0060
Single product is a quality program	16.6	0.0023
Narrow product range is easier for business	16.2	0.0028
High quality means longer products life cycle	36.2	< 0.0001
Statements about the importance of the inputs		
Quality	13.5	0.0093
Price and deadlines	13.8	0.0078
Material on time	13.8	0.0081
Production requirements on time	13.5	0.0093
Statements about the importance of the outputs		
Quality	13.5	0.0089
Meeting customers' demands	14.0	0.0074
Output evaluation	14.1	0.0071
Deadlines	13.4	0.0097
Importance of production efficiency		
Effectiveness measurement system	14.1	0.0071
Adopted standards for effectiveness	14.9	0.0049
Results are basis for objectives	15.0	0.0047
Employees are informed	14.4	0.0061
Employees are familiar with changes	13.7	0.0082
Importance of quality assurance in SMEs		
Product quality assurance	13.6	0.0088
Process quality assurance	13.9	0.0078
System quality assurance	13.5	0.0091
Quality management system according to ISO 9001		
There are benefits from ISO 9001 (yes/no)	13.8	0.0002
Importance of quality control in the company		
ISO 9001	17.3	0.0017

Total quality management	17.0	0.0019
Lean production	19.6	0.0006
20 keys system	17.1	0.0019
6 Σ Six Sigma System	17.0	0.0020

Table 7.5. χ^2 - Pearson's Test and p-Values for Statements Regarding Human Resources (HR)

Questions/Statements	X^2	p
Evaluation of human resources in the company		
Management support to employees	14.8	0.0052
Employees trained for improvements	13.3	0.0097
Managers to motivate employees	13.4	0.0094
Knowledge and experience through work	15.5	0.0038
Awards for employees competences	14.7	0.0054
Salaries based on skills	14.0	0.0072

Table 7.6. χ^2 - Pearson's Test and p-Values for Statements Regarding Information Technology and Modern Production Technology (ITMPT)

Questions/Statements	X^2	p
Company information system		
IT as a support to managers	14.0	0.0073
IT for process modification	13.9	0.0078
IT as a connection to partners	14.9	0.0049
Importance of conducting computer training		
IT as support to strategic management	14.7	0.0053
IT literacy for various programs	13.6	0.0087
Company needs to invest to IT training	14.0	0.0073
Importance of the following criteria		
Involvement of all employees in new product development	15.4	0.0039
Research as a basis for new product development	14.2	0.0067
Cost as crucial part of new product development	19.3	0.0007
Company should have research and development department	14.0	0.0073
Necessary market research for product development	20.3	0.0004

Table 7.7. χ^2 - Pearson's Test and p-Values for Statements Regarding Environmentally friendly production (ECP)

Questions/Statements	X^2	p
Statements about environmentally friendly production		
Attention to energy consumption	13.8	0.0080
Attention to waste disposal	13.7	0.0084
Provide environmental information on product	14.9	0.0049
Environmental protection as priority	14.4	0.0061
Saving money over environmental impact	16.3	0.0026

Answers provided by managers and external experts on each question and each statement were placed into relationship according to χ^2 –test requirements to establish the differences in opinions between managers who are dealing with those problems within the companies and external experts who are dealing with those issues as external consultants for the companies.

The χ^2 -test was conducted as the Pearson's Chi Square with obtained P values: p <= 0.001 – the differences are *statistically very highly significant* (99.9%), 0.001 < p <= 0.01 – the differences are *highly significant* (99.0%), 0.01 < p <= 0.05 – the differences are *significant* (95.0%), p > 0.05 – the difference is *not statistically significant* (90.0%).

According to the results obtained in the research, every single p-value was less than 0.01 (H_0: p>0.05 was rejected), all of the P values showed that there was a *highly* or *very highly significant* difference between answers given by managers and by external experts to each individual statement in each individual question in the questionnaire. A *very highly significant* difference was found in several statements of the questions, such as organized work posts, work conditions, personal sales, higher product quality, quality management system and lean production system.

To be able to help managers to make a quality decision about problems which occur in their production and business management systems, it was necessary to establish which process of the production and business management system should be taken care of the most, and which management parameter to pay the most attention to. Therefore, the AHP analysis was performed.

As mentioned earlier, for the purposes of AHP method, the second questionnaire was created. It consisted of 7 groups of parameters given earlier placed in pairs of direct relationships one to another. The same 10 experts from the four southeast European countries answered the AHP questionnaire to compare the importance of each group of production management parameters in grading each particular pair of the seven groups of parameters. Each expert's questionnaire was analyzed to calculate if the Consistency Ratio (CR) was less than 10%. Those questionnaires in which the CR was higher than 10% were considered non-consistent and were removed from the analysis. Therefore, 6 out of the 10 questionnaires were taken into consideration, thus why the overall analysis depicted the number of participants as N = 6.

The AHP analysis showed that CR = 1.2%, which designated that the analysis was valid. By the results of the analysis and by the ranking given according to the weight of each of the seven groups of parameters, the managers in SMEs in wood-processing and furniture manufacturing should pay the most attention to the conditions of the market activities and marketing (weight = 24.91%), followed by range of products, quality of products (weight= 19.59%), and information technology *versus* modern production technology (weight = 14.78%).

AHP Analytic Hierarchy Process (EVM multiple inputs)
K. D. Goepel Version 04.05.2016 Free web based AHP software on: http://bpmsg.com
Only input data in the light green fields and worksheets!

n=	7	Number of Criteria (2 to 10)	Scale:	1	AHP 1-9
N=	6	Number of Participants (1 to 20)	α:	0.1	Consensus: 67.1%
p=	0	Selected Participant (0=consol.)	2	7	Consolidated

Author: Marko Dušak
Date: 10-Nov-16 Thresh: 1E-07 Iterations: 4 EVM check: 7.9E-09

Table	Criterion	Comment	Weights	Rk
1	LPOSC		11.1%	6
2	PCMPPD		11.6%	4
3	PRQP		19.6%	2
4	MPM		24.9%	1
5	HR		11.3%	5
6	ITMPT		14.8%	3
7	ECP		6.7%	7
			0.0%	
			0.0%	
			0.0%	

Result: Eigenvalue Lambda: 7.097
Consistency Ratio 0.37 GCI: 0.05 CR: 1.2%

Figure 7.7. AHP Analysis on the Seven Groups of Production Management Parameters

Matrix

	1 LPOSC	2 PCMPPD	3 PRQP	4 MPM	5 HR	6 ITMPT	7 ECP	8 0	9 0	10 0	NPE
1 LPOSC	-	1 2/7	1/2	2/5	1	4/7	2	-	-	-	11.11%
2 PCMPPD	7/9	-	2/3	3/7	1	1	2	-	-	-	11.62%
3 PRQP	2	1 4/7	-	8/9	1 6/7	1 1/3	2 3/8	-	-	-	19.59%
4 MPM	2 1/2	2 2/7	1 1/8	-	3	1 2/5	3	-	-	-	24.91%
5 HR	1	1	1/2	1/3	-	1	1 2/3	-	-	-	11.29%
6 ITMPT	1 3/4	1	3/4	5/7	1	-	2 4/9	-	-	-	14.78%
7 ECP	1/2	1/2	3/7	1/3	3/5	2/5	-	-	-	-	6.71%
0	-	-	-	-	-	-	-	-	-	-	0.00%
0	-	-	-	-	-	-	-	-	-	-	0.00%
0	-	-	-	-	-	-	-	-	-	-	0.00%

Note: Normalized Principle Eigenvector (NPE)

Figure 7.8. AHP Analysis – Matrix of Answers by the Seven Groups of Production Management Parameters

Figure 7 shows that the parameters, ranked according to the AHP method starting from the most important parameter or factors to those that are considered least important, indicate that the market, promotion and marketing have the most significant

impact on the production management system in small and medium businesses (24.9%), followed by the production program and product quality (19.6%), information technology and modern production technology (14.8%), the process culture, management processes and production deadlines (11.6%), human resources (11.3%), leadership, policy and organizational structure of the company (11.1%), and environmentally friendly production as the least important (6.7%).

7.5. PRODUCTION MANAGEMENT MODEL FOR SME's

According to given results the block diagram and production management model for small and medium enterprises in forest based industries was established.

The block diagram shows the order of decision making activities when entering the market (Figure 9). The model uses the stated goal (the new product) with the seven parameters of effectiveness to demonstrate the profitability of innovation in the new product development. If all the answers were *positive*, then the innovation, production program, production technology, management system, human resources, organizational structure and production ecology would give the innovative product the boost to enter the market. In opposite, if all the answers were *negative*, the product would remain as is. Some innovations do not require positive answer to all statements, innovations in a product which does not require the change in production technology or in human resources, is still an innovation in a smaller scale, not the radical one, and it can still bring some good results and benefits on the market. The same statement stands for each innovation in smaller scale which can result with better position on the market and bring benefits to the company.

According to established block diagram it was necessary to establish the organization model for small and medium enterprises (Figure 10) which can help make decision process in a company easier, faster and which could meet the requirements of the turbulent and ever-changing market for wood products and furniture.

The newly established model was created based on the AHP analysis and block diagram and it meets the requirements of the market placed in 7 groups of production and business management parameters. Each group consists of parameters the company should think of when entering the market and it was a part of the the first questionnaire which was the basis for this research (Dušak *et al.*, 2017). Usually, the organization models place different functions or group of parameters of the same of similar importance on the same level. The groups of parameters in this model are almost at the same level and they are almost equally important in decision making process, but some of the parameters or groups of parameters, according to AHP analysis, have slightly higher priority. Therefore, they are not at exactly the same level, but slightly moved up or down according to priority they achieved in the analysis.

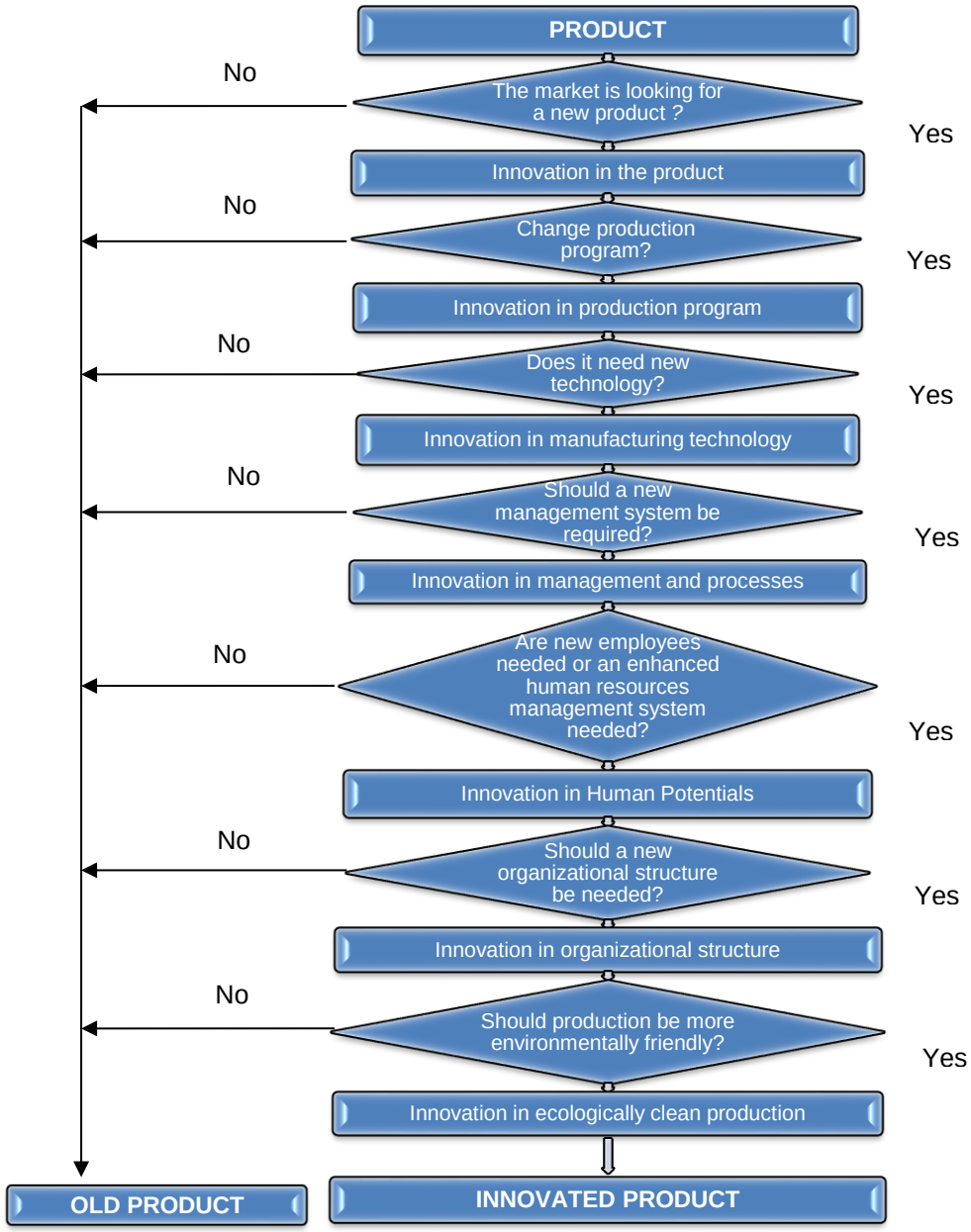

Figure 7.9. Block diagram of the order of activities in decision making process in small and medium businesses

The model is flexible and if the company management makes a decision to go into the innovations in information technology or in human resources, it could bring particular group of parameters up front in the model and make the decision making process easier, faster and more effective.

Also, small and medium companies usually do not have enough staff to deal with all those issues at the same time and discuss them during a weekly meetings or otherwise. That is especially relevant to small and micro companies, where one or two persons have to make decisions on all issues. Therefore, they need some kind of model which will give priorities to some issues over the other and make the whole decision making process easier and faster.

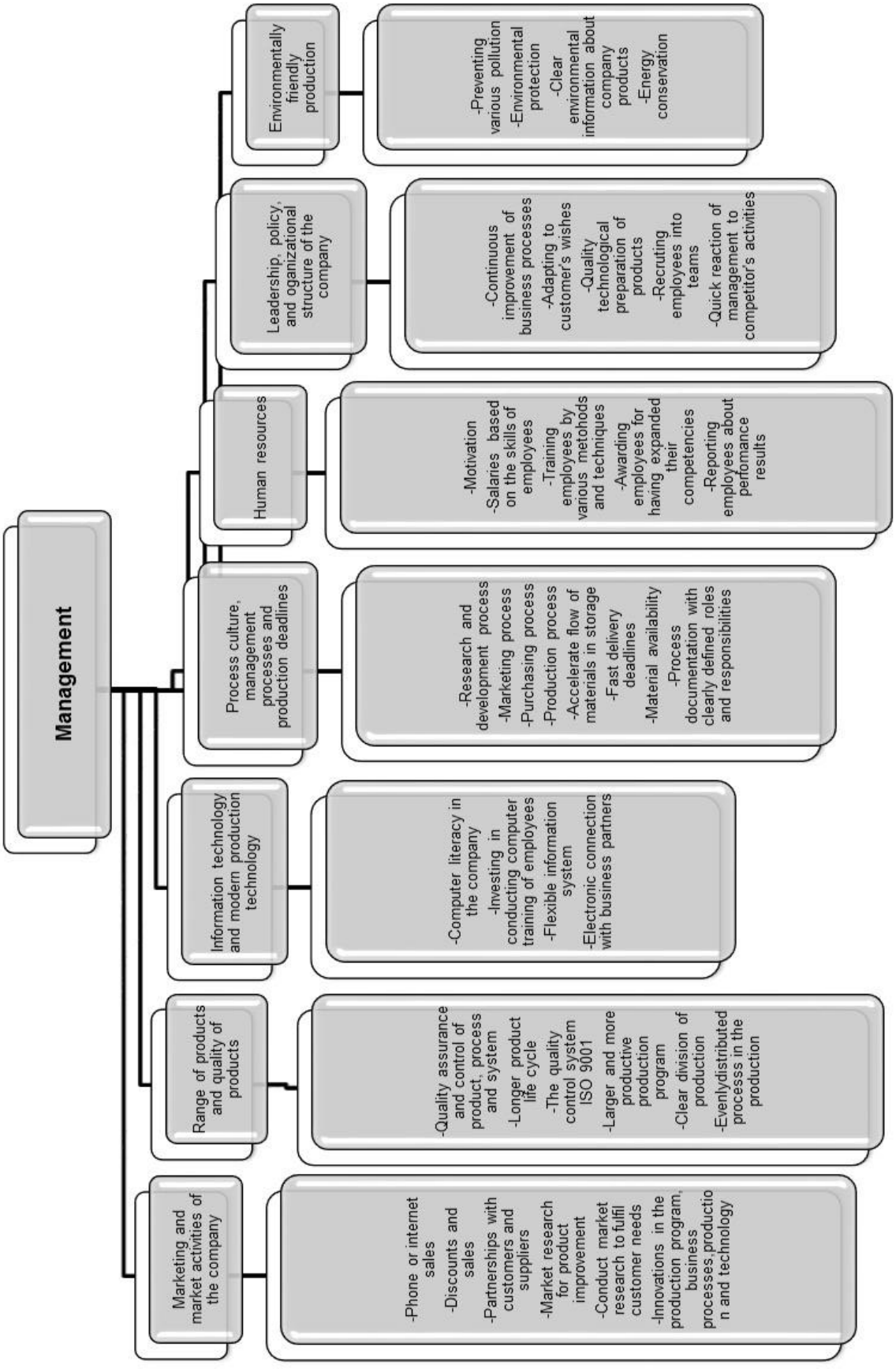

Figure 7.10. Production management model for small and medium enterprises

7.6. FINAL REMARKS

The presented data indicate that the small and medium enterprises provide an above-average contribution to the business economy in Croatia.

The aim of this research was to establish the differences in opinions on different production management system parameters between managers in different small and medium wood-processing and furniture manufacturing companies in four southeast European countries and experts dealing with production management issues within the same countries. By using a χ^2-test, the research indicated that the differences between all given questions and statements were significantly different. This stipulated that the AHP analysis was conducted to establish the ranking among the production management system parameters as a tool in the decision making process. Also, the aim of this research was to present the current situation of small and medium companies in the wood industry in Croatia, and show possible solutions to various problems in the production management systems.

The AHP method demonstrated the order of parameters of effectiveness of the production management system, and revealed, based on the opinion of the experts, which factor in production process should be dealt with more attention and which with less. The model itself showed the cost-effectiveness of innovation related to certain factors with the purpose of obtaining a new product. The company cannot be characterized as being creative and innovative by itself. This requires internal organization and external environment as the foundation for innovative action, and the above-mentioned responses within the model show exactly that. It was discovered by the AHP method that managers in wood-processing and furniture manufacturing SMEs in Southeast European countries should pay the most attention to conditions on the market activities and marketing Knowing the needs and demands of the customers could help in improving production and business results of SMEs in this particular branch. A second group of production management system parameters that SMEs' company managers should pay attention to are the range of products available and quality of products. Customers welcome quality products, and even prefer quality over price.

For all of the stated reasons, this research is important because it represents the structure of an improved production management in small and medium businesses. The results of the surveyed companies and experts indicate the current situation in the surveyed companies in Croatia. Apart from the lack of staff, information and modern production technology, the companies have also not been receiving enough investments from the state, government or various agencies. Therefore, the presented models can help small and medium enterprises to make a decision making process easier, faster and more efficient. These models are the tools for small and medium enterprises to get more innovative and to make quicker responses to market requirements.

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8. APPLICATION OF THE ANALYTIC HIERARCHY PROCESS (AHP) ALGORITHM TO OPTIMISE BUSINESS MODELS FOR THE KITCHEN FURNITURE MARKET

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8.1. INTRODUCTION

Home is a place where you want to return. It should be emphasized that the home is created primarily by people, our loved ones, dear to our hearts. At the same time, the home is a living space, which we probably spend most of our time in, trying to give personal life the highest quality possible. The individual components of the home have specific functions. It is amazing how important kitchen is for household organization (Supski, 2017). A kitchen room with its equipment usually satisfies two groups of needs: basic and higher ones. Basic needs include: preparation and consumption of meals, cleaning and food storage. In turn, meeting the needs of a higher order, the kitchen fulfills very important social functions: it is a place of meetings, building relationships, self-realization, and also has aesthetic functions (Nixon, 2017; Cowan, 2018; Kunce, 2018).

The contemporary image of the kitchen was shaped in the 1920s, the 20th century. At that time, Margarete Schütte-Lihotzky, referring to the modernist concept of 'socially engaged architecture', proposed a model of so-called 'Frankfurt kitchen. Referring to Frederick Winslow Taylor's scientific work and own research, Schütte-Lihotzky designed the ‘industrial kitchen laboratory’. A characteristic feature of this specific research workshop was the high level of task organization (functionality) carried out with the minimum number of moves (Schütte-Lihotzky, 2004). In a small room (dimensions 3.4m by 1.9 m), the necessary kitchen equipment and storage spaces were placed, available to the user sitting on a rotary stool. The project was created in response to the social needs of the inhabitants of Frankfurt. Based on the experience gained, 10,000 new, prefabricated kitchen modules designed in this original process were installed in the flats of the newly built housing estates. The developed model not only set a long-term standard of ergonomic kitchen. It also became a symbol of women's emancipation. This happened mainly due to the first Austrian woman - architectural engineer, who was the author of the solution Margarete Schütte-Lihotzky herself (Henderson, 1996). Women, who more and more often undertook 'male' paid work needed a functional kitchen. They couldn't spend too much time on traditional housework.

Isn't that a bit like of the modern world dominated by digital technologies? Each of those prefabricated ‘*Frankfurt kitchens*’ had the same functional parameters (dimensions). This greatly limited the adaptation of furniture to the needs of customers

with special preferences. Contemporary designed kitchen furniture, although to some extent refer to their ancestors, have lost their industrial character. Today, customers can benefit from the so-called mass customization of the final product (Doiro et al., 2017; Wiechoczek, 2018). It results in multi-variant products, manufactured using efficient, modern technologies, offering simultaneously a typical productivity for mass production.

Although this does not always relate directly into functionality, ergonomics or even the environmental friendliness of products, but in return you get the ability to almost free customization of the designed furniture in the kitchen. It is possible to effectively involve the end user in the design process. Therefore, we are invited to participate in participatory design or co-design. In this respect, the world of digital technologies is already fully present and accessible to almost everyone. Designing individual furniture development using an application launched in a web browser usually involves the selection of modular cabinets and accessories from a certain limited collection. It is usually the source (resources) of the current commercial offer of a certain manufacturer or commercial retail chains. Each of the selected elements can be changed for its specific parameters. Therefore, the dimensions within the series (set of dedicated dimensions), surface finish, internal layout and other parameters change. These applications are usually part of more integrated industrial computer systems for enterprise resource planning (ERP).

As a result of the design process, the customer can see the effect of their decisions in the form of a visualization of the furnished kitchen room (Sjøbakk et al., 2018; Stone and Levine, 2019). After 2012, more design innovations appeared. Modern systems are no longer bound to closed sets of technological and dimensional solutions. It is possible to design furniture to any dimension, taking into account the technological rules implemented in the software. In addition, preliminary ‘virtual’ verification of the appearance of designed furniture in a specific kitchen room is available. This is another step in the process of customization of design, without increasing the cost of furniture production (Lihra et al., 2008; Sydor and Ligocki, 2017).

Does the end-use of kitchen design by such far advanced adjustability and the highly individualized commercial decision making by end users of furniture still make sense in examining their preferences? Is there any need to optimize such decisions?

8.2. MARKET IDENTIFICATION OF USERS OF KITCHEN FURNITURE

From the perspective of furniture manufacturers and building business models in this profile, the process of design customization is a challenge that is not always conducive to production optimization and effective management. Indeed, everyone seems to understand this, trying to adapt, but they are not always ready for multispecialization (Motik et al., 2004; Chudobiecki and Wanat, 2015; Kaputa et al., 2018; Mikołajczak et al., 2019). Can it be said that such exists at all? It has been noticed that wherever, as a kitchen user, a human focuses not only on functionality but on quality of life, he also allows his aesthetic needs to be heard. These, however, do

not always fit the most adjustable collection of furniture modules or the catalog of available technologies. It may be assumed that the market will keep space for slightly narrower, which does not mean completely narrow specializations in the field of furniture design and production, not only kitchen related (Wanat, 2009). In this context, it seems reasonable to study the conditions and preferences of kitchen furniture users. It is worth of the conduct, if only to identify the main trends in this area, dare to create and design new ones (Liker et al., 2016; Bonenberg et al., 2019). Is it worth it?

Indeed, if we do not want the house to remain only a place of vegetation, but be a creative space, conducive to creativity, fulfillment and joy of life. To verify, if there are even small reasons for this, a pilot consumer opinion survey was first carried out on what functional types of kitchen they use in their flats. The study was conducted using a survey technique on a purposely selected sample of 200 users of newly built apartment flats and single-family houses in the Poznań Agglomeration, i.e. in Poznań, one of the largest cities in Poland and its immediate vicinity.

The respondents themselves had to describe and attempt to identify the kitchen they were using, while not being employees of the furniture industry. The respondents were also asked to indicate three additional, alternative types that they know and which they could take into account when furnishing the kitchen in their home.

In the study designed in this manner, 124 responses considered valuable were obtained. The four most frequently indicated types of a kitchen room were identified:

1. CLASSIC - a typical residential kitchen, adapted to the usually limited space available, construction conditions, with the necessary minimum of functionality.
2. MODERN - open, sometimes integrated with a self-designed residential space, using the latest technologies, including digital technologies, multifunctional, usually part of an intelligent building, the so-called smart kitchen.
3. RETRO - stylish, referring to the '*kitchen of our grandmothers*' and local cultural traditions, made of natural materials, environmentally friendly, meeting the most important functions and needs of users.
4. MIXED (*mix-kitchen*) - combining functionality with aesthetics and tradition, a variety of materials and elements of new technologies; taking into account users' fantasy, coexistence of styles and utility functions.

Based on such specific results, a study was designed in the next step to identify the preferences of future kitchen users, potential individual designers, and customers who dream of their own home in a definable perspective. Academic youth of full-time students of the city of Poznań, studying economics and IT, were invited to the study (Popek and Wanat, 2016).

It used the diagnostic survey method, using the survey and in-depth interview technique. A proprietary survey questionnaire was developed, also referring to selected methods of decision optimization (Orszulak-Dudkowska, 2012; Popek and Wanat, 2014; Zalega, 2016; Kościelniak and Tyszka, 2019). In particular, the algorithm

referring to the analytical method for hierarchical decision problem AHP (the Analytic Hierarchy Process) was verified. It consists in decomposing the task (research problem) into simple components and then applying a comparative analysis carried out as part of an in-depth interview by the respondents (Saaty, 1988; Berrah et al., 2019; Liu et al., 2019). Why was this method chosen?

8.3. SELECTION OF A MULTI-CRITERIA METHOD OF DECISION MAKING

Among the multi-criteria decision-making methods, the most popular are: Analytical Hierarchical Process (AHP) and Analytical Network Process (ANP). The popularity of the AHP method is due not only to its effectiveness in solving problems, but also to its relative transparency and ease of use. The Analytic Hierarchy Process (AHP) method was designed and applied by Thomas L. Saaty of the University of Pittsburgh in the 1970s (Saaty, 1988, 2008). It was used to create the '*Super Decisions*' software, which Saaty is the co-author of. The method uses a general, hierarchical approach in the process of making multi-criteria decisions. It allows combining quantified and non-quantified criteria as well as objectively measurable and subjective factors (Asadabadi et al., 2019; Dos Santos et al., 2019).

8.3.1. Assumptions and application of the AHP method

The implementation of the assumptions of the AHP method consists in decomposing the research problem into simpler components, assessing these components by experts, and then processing aggregate assessments based on pairwise comparison. There are many applications of this method in supporting economic, technical or social decisions, which confirms their usefulness (Berrah et al., 2019; Cooke, 2019; Liu et al., 2019). Modeling using AHP hierarchical problem analysis is especially useful when:

- the functional relationship between the elements of the decision problem described in the form of a hierarchy of factors is unknown,
- at the same time, it is possible to estimate the effect of occurrence of given properties of the problem (product) under study and the practical effect of these properties (Tułecki and Król, 2007; Lima-Junior, 2019; Wang et al., 2020).

In this work, the Analytic Hierarchy Process (AHP) approach was chosen to verify the problem. This is an example of an algorithm for making complex decisions based on a large number of criteria. The starting point is the hierarchical decomposition of assessment criteria. The priority hierarchy in the AHP method has a predefined structure. First, the goal of the decision process is set, then the assessment criteria and solution options are set. In this approach, the decision maker has an impact on the entire process. He can choose the best solution among many variants. The decision maker assesses possible variants of selection in terms of specific criteria, as

well as the weight of these criteria in terms of purpose, based on his knowledge and experience.

8.3.2. Programming the stages of research under the AHP method

There are basically five stages in the Analytic Hierarchy Process (AHP) convention:

* STEP 1: Hierarchy of the problem - the goal of this stage is a detailed description of the problem, identification of participants, determination of the goal of the main goal and expected results.

** STEP 2: Problem decomposition - isolation of the primary goal, main factors and partial factors as well as variants considered. The verified variants reflect a certain degree of implementation of the objective function, identified appropriately for each level of the hierarchical model.

*** STEP 3: Evaluation of the tested criteria by pairwise comparison - the assessment is made by an expert (decision maker) invited to the study. He compares the sub-goals (selected functions) with each other in pairs in relation to the criteria, and the criteria in relation to the superior goal. The comparison consists in a subjective determination of which of the criteria and to what extent is more important than the other in the expert's opinion. The relations between individual elements are usually determined by a 9-point scale (Saaty, 2008; Prusak et al., 2016; Abastante et al., 2019): 1 - equal significance; 3 - slight advantage; 5 - strong advantage; 7 - very strong advantage; 9 - absolute advantage; 2, 4, 6, 8 - intermediate values. Ratings with opposite relations are marked as the inverse of whole numbers. This stage ends with the creation of a result matrix.

**** STEP 4: Determining mutual preferences (weights) in relation to criteria and decision variants - after building the matrix, we calculate the weights of the criterion. The normalized rows of the matrix are added together and the matrix's vector is calculated. Ratings from experts are not always completely objective. Therefore, the inconsistency factor is taken into account (in parallel, the consequence factor and random index).

***** STEP 5: Analysis of selected results - the research scenario finalizes the selection of the best variant that would correspond to the achievement of the overarching goal. Dedicated software, such as '*Super Decisions*' or '*Expert Choice*', is also used to perform this stage.

Obviously, when designing the author's research scenario, it is possible to distinguish main stages or specify them, according to the specific conditions of the study.

8.4. SCENARIO AND RESEARCH RESULTS

In the designed study, an attempt was made to identify the preferences of future kitchen users, designed for the surveyed own flats. In order to achieve this, the analytic Hierarchy Process was used. The main research problem was divided into simple components determining its essence, and then respondents compared them in pairs.

8.4.1. Determining the scale of relative preference for the AHP model

In the process of comparing elements, a 9-degree scale of relative preference of Saaty was used. In accordance with this, separate elements of the scale were distinguished: 5 basic and 4 intermediate levels (Saaty, 2008; Abastante et al., 2019; Berrah et al., 2019; Cooke, 2019; Liu et al., 2019).

In particular, respondents' attention was paid to basic levels, distinguishing:

1) EQUIVALENCE: no preference for compared objects.

2) WEAK PREFERENCE: the first element is weakly preferred over the second, or vice versa.

3) IMPORTANT PREFERENCE: the first element is significantly preferred to the second, or vice versa.

4) CLEAR PREFERENCE: the first element is clearly preferred over the second, or vice versa;

5) ABSOLUTE PREFERENCE: the first element is absolutely preferred to the second, or vice versa.

The respondents' opinion was compared with an expert opinion, which was considered due to future actual users of kitchen furniture. The survey combined with individual in-depth interviews was conducted on a group of 120 full-time students. Unfortunately, the results of some surveys turned out to be contradictory (respondents making pairwise comparisons provided mutually exclusive answers). These surveys were excluded from the final analysis. Finally, the results from 40 positively verified questionnaires were included.

8.4.2. Selection of evaluation criteria for the AHP model

As mentioned in point 2 of this chapter, four functional kitchen types have been previously identified for the purposes of the study: classic (type 1), modern (type 2), retro-stylish (type 3) and mixed / mix-kitchen (type 4) .

The respondents chose the kitchen based on four criteria. Also, these criteria, defined as the main determinants of kitchen furniture preferences, were previously determined in a pilot study.

The following criteria for choosing kitchen furniture were taken into account: price (criterion 1), quality (criterion 2), environmental performance (criterion 3) and functionality (criterion 4).

The criteria thus defined are described in detail, listing:

1) PRICE - understood as a relation of quality to price, with an indication of the preference for the lowest possible costs of both equipment and use;

2) QUALITY - understood as durability, elegance, comfort and a high standard;

3) ECOLOGICAL (environmental performance) - understood as the preference for natural materials, including wood, environmentally friendly construction and technologies, conducive to a healthy lifestyle and natural nutrition, facilitating segregation, minimizing waste and recycling.

4) FUNCTIONALITY - understood as practicality and high usability of the kitchen, having all functions adequate to the needs of the user, reflecting a kind of universality for the user.

The study was optimized, extracting in this case three levels of research. They are illustrated in Figure 1.

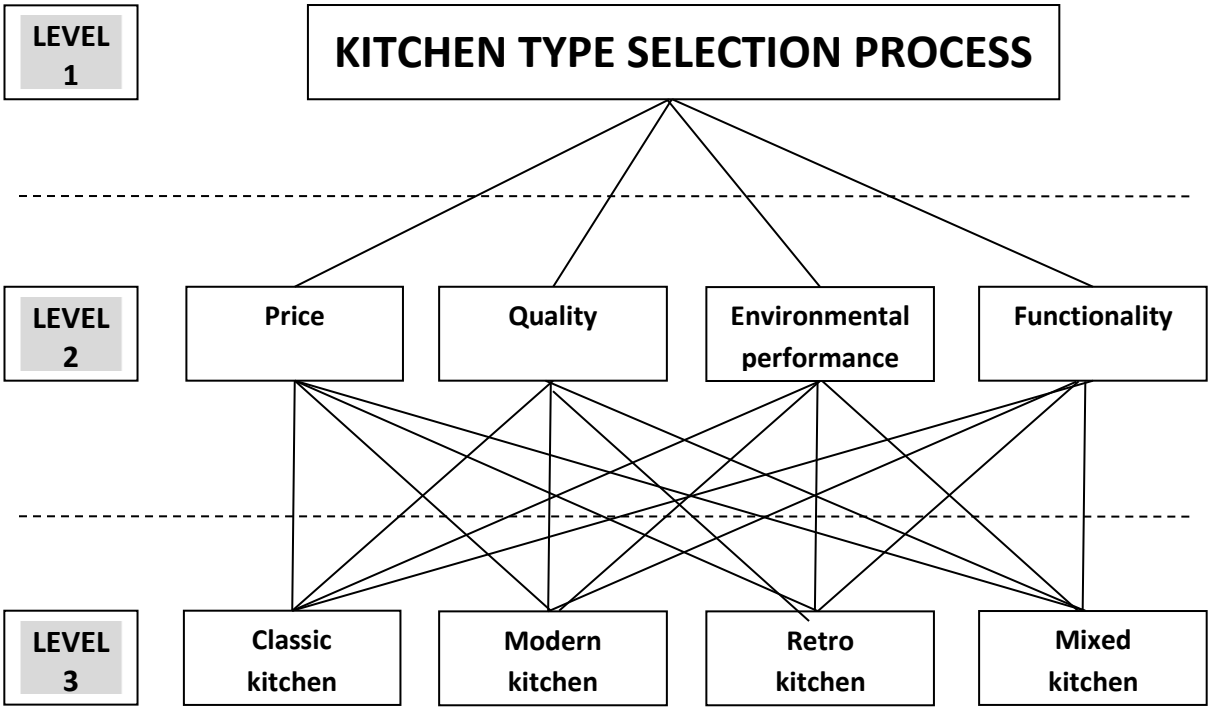

Figure 8.1. Visualization of the author's scenario according to the AHP method - research levels
Source: Own study

8.4.3. Results

Using the Analytical Hierarchical Process (AHP), results were obtained that made it possible to identify the most popular functional / utilitarian types of kitchen and key criteria for their selection, which might be made by young, future users (Table 1).

In particular, when analyzing aggregated data in the study of the popularity of various types of a kitchen, it was noted that:

- young students in the first place chose classic kitchen (85% of respondents indicated the preference for this type of a kitchen in the first place).

- at the same time, just behind the classic, modern kitchen was ranked (80% of respondents indicated the preference for this type of a kitchen in second place).

- retro and mixed kitchen were selected in turn (95% and 99.75% respectively indicated the first preference for these types of a kitchen in third and fourth places respectively). It is worth noting that the preference line in the AHP method is determined by the diagonal of the results matrix (Table 1).

Table 8.1. Preferences for choosing kitchen furniture / kitchen type after taking all criteria into account (aggregate results matrix table)

Hierarchy of kitchen furniture selection preferences / type of kitchen (places)	**Classic kitchen (%)**	**Modern kitchen (%)**	**Retro kitchen (%)**	**Mixed kitchen (%)**
Place 1	**85,0**	15,0	0,0	0,0
Place 2	15,0	**80,0**	5,0	0,0
Place 3	0,0	5,0	**95,0**	2,5
Place 4	0,0	0,0	0,0	**97,5**
Checksum	*100,0*	*100,0*	*100,0*	*100,0*

Source: Own elaboration based on aggregated results in the questionnaire and in-depth interview

The diversity of respondents' preferences and the direction of the conventional trend, a simplified model of the kitchen user market, is also illustrated in Figure 2.

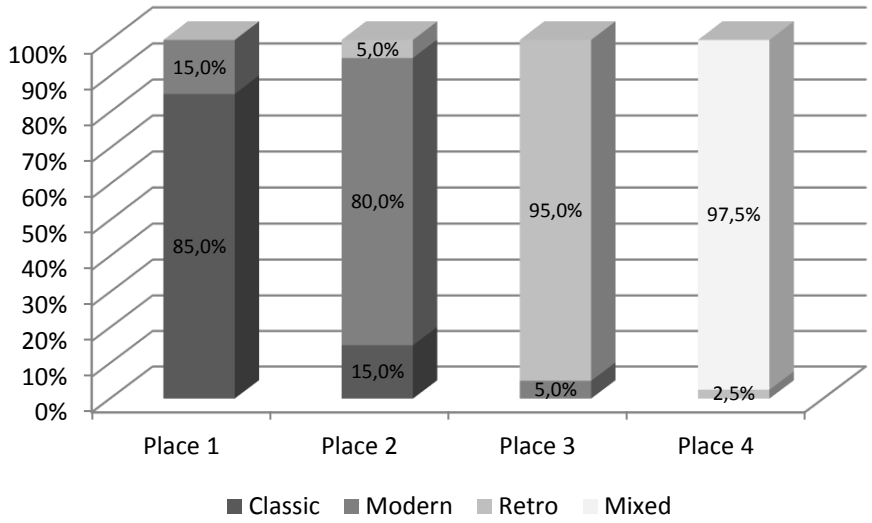

Figure 8.2. Visualization of the main preferences for choosing kitchen furniture / type of kitchen taking all criteria together into account
Source: Own study

In addition, by selecting the kitchen selection criteria, it was found that:

- for young students planning to buy their own apartment, the most important factor in choosing their home kitchen is the price (90% of indications);

- it does not prejudge the fact that the other factors previously described as important, namely quality, environmental performance and functionality, have no meaning; however, clearly informs that at this stage of life, young adults cannot mostly afford high expenses for furnishing the apartment, including the kitchen;
- at the same time, it is worth noting that, although a relatively small group of respondents (8%) gave priority to the quality criterion over price.
- only 2% ordered the analyzed criteria in a different order.

Eventually, taking into account the importance of only one of the selection criteria, the following trends were established on the basis of a pair-wise comparison:
1) PRICE: considering only the price criterion - 72.5% of respondents chose classic kitchen, 22.5% modern, while only 5% selected other types of kitchen;
2) QUALITY: considering only the quality criterion - classic kitchen was chosen by 65.0% of respondents, modern 30.0%, and other types of kitchen by analogy 5% of respondents;
3) ECO-FRIENDLINESS (environmental performance): considering the ecological criterion only - classic kitchen was chosen by 67.5% of respondents, modern kitchen by 15.0%, and other types of kitchen by 17.5%;
4) FUNCTIONALITY: considering only the functional criterion - classic kitchen was chosen by 72.5% of respondents, modern 25.0%, while other types of kitchen, which is worth emphasizing, only 2.5% of the surveyed students.

Detailed results are presented in Table 2.

Table 8.2. Preferences for choosing kitchen furniture / type of kitchen after considering only one criterion

Preference for ONE criterion (horizontal) for a specific functional type of kitchen (vertical)	**Price (%)**	**Quality (%)**	**Environmental performance (%)**	**Functionality (%)**
Classic kitchen	72,5	65,0	67,5	72,5
Modern kitchen	22,5	30,0	15,0	25,0
Other kitchens	5,0	5,0	17,5	2,5
Checksum	*100,0*	*100,0*	*100,0*	*100,0*

Source: Own elaboration based on aggregated results in the questionnaire and in-depth interview

In addition, the trends identified in the study, indicating a clear preference for classic kitchen, even in view of the tempting versatility of the functional model, is illustrated in Figure 3.

The results of the study, although seemingly difficult to discuss, seem to allow for prediction of dominant market trends. Therefore, the main segment of the kitchen furniture market in terms of design and production was indicated, which in the era of almost customization of the design process and flexible decision making seemed impossible.

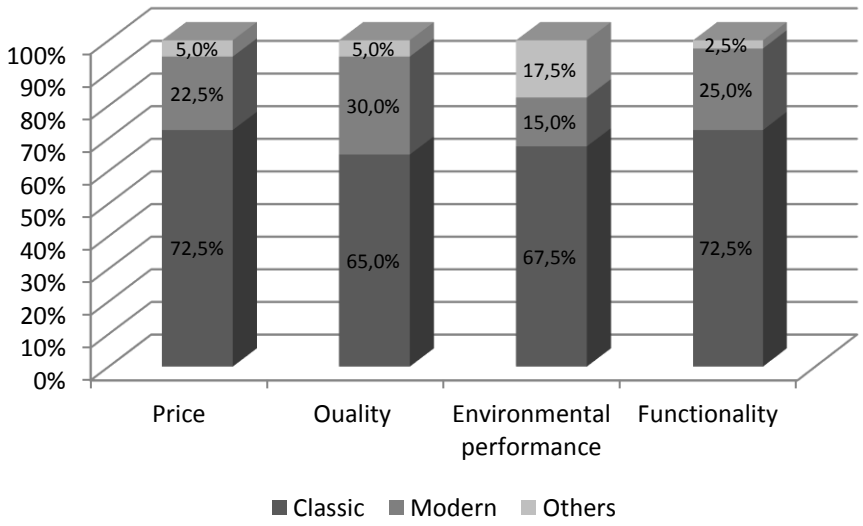

Figure 8.3. Visualization of the main preferences for kitchen furniture / kitchen type, taking into account only one criterion into account
Source: Own study

8.5. CONCLUSION

Optimization of business models in the production of kitchen furniture, although must assume flexibility of choice and almost unlimited customization of the kitchen design process, is needed. Rational management of inventories and the foundation chain will remain one of the key factors determining business efficiency. Even the temptation to completely customize the production process will not change this.

Even this perspective will have to face the length of the production cycle. It seems that this time, as well as the final price of the furniture, will decide on a certain compromise between customization and unification.

These conclusions and recommendations are prompted by an in-depth analysis of the results obtained under a relatively simple test scenario using the AHP algorithm. It can be assumed that this method will be used more and more widely. It may even be used as a tool to select the best tenders, as well as the best management practice (Wanat and Lis, 2009; Mikołajczak et al., 2020). The advantages of this method are: flexibility, ease of use, objectivity of variant selection, comparison of both qualitative and quantitative factors (Wanat et al. 2018a, 2018b). Many decision-making processes in forestry and the wood-based sector meet the assumptions of the Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) methods (Chudobiecki et al., 2016; Wanat et al., 2019). For subsystems: benefits, costs, opportunities and risks, it is possible to formulate organizational, production, technological and economic criteria, for which, in turn, the values of priorities (weights) may be calculated. Thus, it becomes relatively simple and feasible to determine the optimal development variant of the examined project, indicating significant benefits and threats.

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9. THE PROSPECTS FOR APPLYING THE BEST PRACTICES MODEL AS ONE OF THE PILLARS OF BUSINESS MANAGEMENT IN THE WOOD MARKET

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9.1. INTRODUCTION

The pillars of business management, including those referring to the natural economy, are defined quite precisely by economic sciences. Thus, although the canons formulated by the discipline of management are subject to processes of change, the essential criteria remain constant. They define the purpose of the management process, its subjective, objective and spatial scope. At the same time, models, methods and techniques of management are still open to: evaluation, improvement and innovation. In this context, it is worth noting the tension between classical management, represented by H. Fayol (2013 [1949]) and successors (see: Lucas, 2003; Hatchuel and Segrestin, 2019), behavioural management, represented by E. Mayo (2014 [1946]), A. H. Maslow (2000) and successors (see: Maslow and Hoffman, 1996; Bernstein, 2017; Trahair and Zaleznik, 2017; Lussier, 2019), and management based on operational research (von Bertalanffy, 1972; Wiener, 1961 [1948]). The quantitative tendency in the discipline of management has proposed a systemic, operational, strategic and finally process-based approach. These issues were addressed in the literature: C. Armistead (1999), R.S. Kaplan and D. Norton (2008), H. Breuer and F. Lüdeke-Freund (2019), P. Harmon (2019), A.B.L. de Sousa Jabbour et al. (2019), P. Centobelli et al. (2020) and others.

It turns out, however, that the variability, unpredictability and the need for flexible, quick decision making in the management process leads to search for other, effective support tools. This is seen, among other things, in the behavioural trend in management sciences (Drucker, 2018). Above all, however, the challenge for the application of new management models and methods is to change the key view of the enterprise's objectives. Where financial profit remains the absolute measure of effectiveness, a set of classic methods may be sufficient. However, in order to take as a starting point the anthropocentric perspective, in which a person is the subject of the management process and his or her quality of life becomes a priority, the quantitative approach is no longer sufficient (Drucker, 2013). Moreover, taking into account aspects of corporate social responsibility, including responsibility towards future generations for the state and future of the environment, research in this area towards an integral economy are profiled (Gerber and Steppacher, 2014). This also applies to management processes in the wood-based economy (Wanat, 2009).

Searching for methods to support management in the natural economy draw, understandably, on the achievements of economic sciences, including mezo economics and industry economics. They take into account the key importance of forests, wood as a renewable and ecological raw material, perfectly fitting the concept of circular economy (Stahel, 2016; Geissdoerfer et al., 2017). They refer to aspects - derived directly from forest sciences - of sustainable economy, then sozology, but go beyond these concepts to the idea of integral development, including integral ecology. Against this background, the concept of the so-called best practices management model is particularly important (Purcell, 1999; Barrett and Baldry, 2009). The popularity of such an approach, resulting more from the practice of life than from formal codifications, gained in importance at the end of the 20th century in the USA and Western Europe, due to its usefulness and effectiveness. It is worth stressing that a kind of 'routine': and 'management habits' have always been present and applied to some extent at all times. They concerned every form of human activity and human communities, organisations, including production, services, consumption, etc. The best of these techniques were described as innovations in management (Schumpeter, 2000), although, sometimes they did not change anything significant, but they always made sense of certain activities, improved their operation, in short, turned out to be simple and effective, somewhat obvious.

9.2. WHAT IS AND IS NOT BEST PRACTICE ?

It should be stressed that, in a positive perspective, best practices are used mainly to improve the standards of the business. They are a good tool for improving quality in various aspects of the management process. They teach how to enrich one's knowledge, improve methods and techniques of operation, reduce risk and determine effectiveness, using the experience of others.

The concept of 'best practice', or at least 'good practice', has recently made a remarkable career in management theory and practice. Almost every country in different areas of social, economic or political life considers it a point of honour to have dedicated or multidisciplinary catalogues of good practice. They are collected by large corporations, international organisations, including above all the European Union, as well as the World Bank, OECD or public administration institutions, banks, insurance companies, finance companies, NGOs, universities (OECD, 2004). What has happened is that, just as we have given up our traditional activities in modern organisations, in favour of exclusive implementation of projects, in almost all areas of public life nothing can happen without examples (imitating student crib sheets) of best practice. Is this some kind of madness or really a useful method?

9.2.1. Definition dilemmas

Although in some circles best practices have simply become fashionable, a clear definition of this concept does not seem to be clear. Scientists understand it differently from business people. The same problem concerns government agencies, local government units, and finally the proverbial 'Kowalski' or ‘Smith’. All these circles understand the idea of best practice in a slightly different way. Yes, they agree that it is a tool to support knowledge management. It is well known that the creation, use and dissemination of knowledge is of great importance for the economic growth, development and welfare of communities. This, of course, applies to the concept of the knowledge economy. Despite the relative freshness of this idea, it is not so completely new. What was the economy based on before, if not on knowledge?

In different countries and environments, the definitions of best practice may be formulated differently, depending on the legal system, the specific economic and political situation or cultural and historical differences (Bergek and Norrman, 2008). Nevertheless, it seems necessary to propose a universal concept.

In general, best practices are - ex post - implemented actions (today everyone would say: projects) that have been successfully implemented in a specific place and time. They provide practical solutions to particular problems and have proven results. To be considered as best practice, an action should meet at least a few key criteria as the following:

- comply with the legal system (local, national and international) effective at the place of implementation (the measure will be legality);
- specify the methods and means necessary for the implementation of the project, respectively: design, production, service, commercial or organizational (the measure will be a clear, relatively simple implementation scenario);
- should be feasible and 'economically realistic', which means that, by implementing a given 'good practice', a particular company or organisation should be able to achieve its objectives (project) without the need for extraordinary financial, time or organisational constraints (the measure will be feasibility and efficiency as well as economic viability);
- should be beneficial to the environment, i.e. be characterised by energy efficiency, do not harm ecosystems, both in the natural environment and in human society, protect their integrity; take into account recycling as far as possible, minimise waste (the measure will be a positive impact on the whole environment);
- should consequently be implementable in other places, companies, organizations (the measure will be the ability to replicate).

The real value of best practices, as a management model, depends on the possibility of transferring already applied and proven solutions to other places, companies, organisations, regions or countries, despite existing limitations (Epstein, 2018). Indeed, organisations that promote the best practice model in their management strategies pay attention to their impact on social and territorial cohesion, energy efficiency, sustainable resource management, better use of funds, including

structural institutional support funds, capacity to build networks, and the preservation of gender equality principles.

In this context, it should be pointed out that the willingly published, numerous collections of so-called 'institutionally correct rules', preserving only their own specific intentions of their authors and not taking into account the rational management of common resources (Ostrom, 2005, 2008; Słodowa-Hełpa, 2015), are sometimes called the best, or even only good practices, excessively. Then they become a marketing simulation tool rather than a management support technique.

Furthermore, best practices, in addition to proposing simple methods of solving management problems, especially those that are not solvable at first glance, should above all maintain reality, sense, common sense and transparency. Only then will they encourage imitation (replication) and build cooperation networks. The fact that a given action becomes best practice is primarily determined by numerous imitators of the proposed actions. It is them who decide on the life cycle of best practices, constantly improving them. In the future, as it is already more and more boldly observed in modern economic concepts, other than stereotypical, classic criteria will determine competitive ability (Chudobiecki et al., 2016). Resource-based competitiveness is no longer sufficient, and the measure of competitive advantage is increasingly becoming the strength of cooperation (Wanat et al., 2018).

9.2.2. Innovation and best practice

It is believed that innovation can be managed, even in a systematic way. One can argue whether the source of innovation is an idea, inspiration or hard work and experience. Is discipline essential in the approach to innovation? In the face of questions formulated this way, the American professor of management, Peter F. Drucker, decided that the answer lies in the middle. He proved that there was no innovation without hard work. He pointed out that it can and should be managed, similarly to any other business space (Drucker, 2013). On the other hand, he noted that there is no innovation without courage. It is, of course, about the courage to exceed generally accepted standards of operation. It is said that 'after all, it has always been like that', exposing the reluctance to change in the background. The history of economic thought proves that 'laziness is the leading light in economic development'.

How is that for management? In a particularly environmentally sensitive forest and wood-based sector, managers should look for simple, clear solutions. The best reward for innovation may be a statement: 'It's so obvious!' At first, the valuable innovation seems inconspicuous. Very ambitious ideas to revolutionize the industry are willing to be taken up. These, paradoxically, usually do not work. Meanwhile, innovation generates activity, multiplies talent, inventiveness and knowledge. Yes, the process of creating innovations can sometimes take a lot of time. However, innovation always has a real impact on the market. In this context, a business in which nothing is denied and nothing is changed predicts the upcoming failure. Drucker noted that the question of courage in creating innovations and personal involvement of employees has become

a more important factor than the company's finances today (Drucker, 2013). Joseph Schumpeter, on the other hand, pointed out that innovation does not mean simply copying others' solutions, but rather the ability to adapt various solutions to real needs. He proved that sometimes small changes, even those that did not require a significant investment, were most beneficial (Schumpeter, 2017). Moreover, and this may come as a shock, these simple actions have been decisive in increasing the usable value of products and services, convincing numerous consumers.

Innovation, according to Schumpeter, can mean:

- the introduction of a new product that has not yet been known to consumers;
- introducing a new quality of already existing goods or services;
- implementation of a new production method, previously unknown in the industry;
- opening a new market;
- the use of a new source of materials' supply or intermediate products, whether the source already existed or was created for the first time;
- creating a new industry organisation (for example by building a new monopoly or breaking it).

The 'New' was recognized by Schumpeter as the driving force of the process of change (Schumpeter, 2017). The expected innovation is somewhere between Drucker's proposal and Schumpeter's concept. The attempt at synthesis is to define an innovation as 'the implementation / commercialisation of a product with improved performance or the provision of objectively new or improved services to consumers'. At the same time, 'a technological process innovation is the implementation / adoption of new or significantly improved production methods or supply chain organization'. 'This may include changes in equipment, human resources, working methods or any combination of these' (Hospers, 2005). Moreover, what is crucial, is not so much and not only the measurement of innovative activity of companies, but first of all their relations with partners and business environment, i.e. the ability to create cooperation networks. In this context, best practices become an important tool in the management process, stimulating the creation and implementation of innovations.

9.3. INITIATING BEST MANAGEMENT PRACTICES IN THE WOOD MARKET

The techniques of promotion and replication of best practices in the new institutional economics have already been analysed quite thoroughly in literature (O'Flynn, 2007; Bergek and Norrman, 2008; Walker et al., 2019). At the same time, this does not mean a similar abundance of research on mesoeconomics, especially on forestry and wood-based economics. It may seem that implementation of analogous measures stimulating innovation on the Polish wood market is possible through adaptive management (Salafsky et al., 2001; Wanat et al., 2018). It is a right idea, but providing only a partial solution. It may rather be a starting point for searching for best management practices in the wood-based industry, through similarity. However, it should be remembered that forestry and the wood industry are a specific sector of the

natural economy. Technological and economic aspects intertwine within it with the problems of environmental protection, sustainable and integral development, and compatible coexistence in a circular economy.

9.3.1. Sources of information on best practice

The source of information on possible directions of management actions should be an integrated database of existing examples of best, or at least good, management practices in the wood-based sector. So far, such examples have been promoted incidentally, separately for forestry, separately for some selected sub-sectors of the wood industry. The catalogue (database) collected should provide both B2B (business to business) and B2C (business to consumer) and B2A (business to administration) information about effective management techniques, i.e. solving various, usually uncodified, business problems. The application of best practices brings the most desirable results with the simultaneous support and active involvement of all market participants (Epstein, 2018). This applies to business, local decision makers and administration, NGOs, education and, of course, direct recipients, 'consumers' of best practices. A good presentation and accurate evaluation of past activities and innovative attempts (good practices) can be a useful tool to promote, adapt and replicate future best practices in the wood-based sector (Jelaĉić, 2011; Kaputa et al., 2016; Chudobiecki and Wanat, 2015; Szulecka, 2019; Wanat et al., 2019).

Looking for adequate sources of information on innovative activities and best practices of the participants of the wood market, a pilot opinion poll was conducted in an environment of experts, covering the management of the wood-based industry selected enterprises, including foresters Państwowe Gospodarstwo Leśne 'Lasy Państwowe [State Forest Holding 'State Forests'], forest service companies, elemental wood processing plants (sawmills), wood plastics production plants, furniture factories and micro- and small entrepreneurs. They were asked about the need to apply the best management practices (which was considered equivalent to understanding the idea of 'best practices'), then about their intuitive (routine) or purposeful application (as needed), about using the experience of other business participants and adapting their practices, as well as readiness to share their own achievements (innovations), i.e. participation in an industry network of cooperation or exchange of experience.

9.3.2. Best practice case study

The pilot opinion poll, using a survey and in-depth interview technique among experts, business participants in the wood-based sector, also used a proprietary 'best management practices case study' questionnaire. It was noted that it is important to take into account the following elements when developing a scenario for each of the analysed practices as the following:

- problem definition in the context under consideration,
- the existing ways of solving the problem;
- the precise purpose of the business venture and its assumptions,
- the justification for the choice of the proposed solution,
- description of the business venture and its scope (subjective, objective, temporary, spatial);
- the method chosen;
- implementation scenario;
- results and their evaluation (qualitative, quantitative perspective, including measures of effectiveness, benefits and costs, other indicators as available);
- recommendations for replication.

It is worth noting that the best practice description analysed should contain all the information that the author of the innovative project himself/herself would like to use if he/she had to solve a similar problem (Wanat and Lis, 2009).

9.3.3. Usefulness of the best management practices in the opinion of experts

Table 1 summarises the results of the pilot study to assess the usefulness of applying the best management practices method to selected sections of the wood-based sector. The survey was conducted in 2019 in purposely selected groups of 100 management experts, business practitioners, working in five selected sections of the wood-based sector. An in-depth interview was conducted with 20 experts from each department respectively. A total of 89 full answers were obtained. By means of a comparative analysis, differences and similarities were sought, but first of all the conditions determining the preference or lack of preference for the 'best management practices model' approach were examined. Only selected, but in the opinion of the authors the most interesting results of the study were presented.

In the compilation (Table 1), only the most important determinants of preferences for applying or not applying best management practices are indicated, using a numerical scale from 1 to 10, where 10 is the highest value, referring to the importance of the feature in question. It was noted that although the best practice method is of interest, only some representatives of management leaders in the wood-based sector actually use it. This applies in particular to foresters, furniture factory managers and private business, small and medium enterprises. These groups appreciate and apply the method to the greatest extent and recognise its practical usefulness. On the other hand, sawmill managers and companies providing forest services relatively rarely use the best management practices . Interestingly, all the management representatives, when asked directly (though outside the protocol), consider the application of best practices and business, production, service or management solutions as natural, obvious, necessary and beneficial.

Table 9.1. Usefulness of best practices (BP) in the opinion of experts in the wood-based sector

Division of the underlying sector on wood	**Number of expert responses**	**The need for BP** (weight 1-10)	**Actual application of BP** (weight 1-10)	**Owning a catalogue BP** (weight 1-10)	**Participation in the exchange of experience in the BPs area** (weight 1-10)	**Overall utility assessment BP in business** (weight 1-10)
Foresters	16	**7**	5	5	**7**	5
Forestry services	15	2	1	1	1	2
Sawmills	19	5	2	3	3	3
Furniture factories	20	**10**	**7**	5	5	**8**
Entrepreneurs	20	**10**	5	1	**7**	**8**
Average	*17,8*	*6,8*	*4,0*	*2,8*	*4,6*	*5,2*

Source: Own elaboration based on aggregated results in the questionnaire and in-depth interview

9.4. CONCLUSION

While it seems obvious that the promotion of best practices that link the business of the wood-based sector to its environment, promotes economic recovery and stimulates the wood market, they are not a common management tool. A traditional approach is still preferable, not always keeping an open attitude towards proposals for networking and exchange of experience. The research shows that entrepreneurs are still more afraid of competition than they appreciate the benefits of combining resources (e.g. into clusters) and building a competitive advantage based on cooperation (co-opetition). However, this does not mean giving up looking for innovations and new, effective management methods. Often, even without explicitly calling their activities 'new methods', teams (including production employees) create and implement effective management solutions. This is nothing else but best management practices. Some protect them jealously as special intellectual property. However, more and more often, especially where in conquering new markets business is somehow bound to cooperate, the need to learn from each other increases. Therefore, it seems that detailed research in this area should be continued.

In the digital age, which is progressing with automation and robotization, competitiveness and development can still be decided by humans. To what extent? Perhaps to an extent that is appropriate to the ability to cooperate, exchange experiences and create added value through an adaptive management model. One of the effective tools seem to be simple, sensible, real best management practices. These

are the activities that can be overcome by a human being, still dominating over artificial intelligence with his/her ability to adapt in conditions of uncertainty, diverse, changing risk. The best business practices motivate creative, unconventional but still human activities, that is, those in which a person remains a living subject, not just an object or a dead end in the management process. So what is the role of the examined tool in the natural economy based on wood? In this context, it is possible to risk including best practices to those management tools that are well suited to the model of a green economy, which gives priority not so much to sustainable as to integral development.

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10. HUMAN RESOURCE MANAGEMENT (HRM) IN THE FOREST-BASED INDUSTRY

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10.1. INTRODUCTION

The end of 20th and the beginning of the 21st century brought some strong challenges to economy in general. The fast development of information technology (IT), and science and technology in general, changed the characteristics of business environment, which is much more complexed than some 30-40 years ago.

Many centuries had to pass bay for human itself, his abilities, knowledge, creativity and motivation to become recognized as a main and most important factor of economic successfulness.

The research conducted in 2004 in USA showed the interaction of a chain: attractive work spot means pleasant place for shoping and thus suitable place for investment.

Human factor is more and more important in economic development, so scientists and researchers are trying to bring this problem to practicionists – human resource managers in compenies to achieve better business results. Human factor research involves scientists from different ares of science: psychologists, sociologists, economists, lawyers and others.

Motivation factors, conflicts, human relationships, stress, hierarchy, competitiveness, creativity, inteligence – all these terms should be carefully investigated to get a result which will be the goal of the whole research in the field of humar resource management, and thus to achieve improvement of economic policy in general.

So, human resource management becomes not only the most important business function, but a specific philosophy and approach to management which considers human potential as most important as key strategy and competitiveness adventage. Nowadays, the term human resource management has 4 different meanings: 1. scientific discipline; 2. managerial function; 3. separate business funcition in a company; and 4. specific management philosophy.

The human resource management concept, as interdisciplinary theory, developed from several scientific disciplines:

- Psychology
- Management theory
- Ergonomics
- Economy
- Sociology
- Anthropology
- Andragogy
- Work medicine
- Law.

McCourt and Eldridge define human resource management as the way organizations manage their personell and influence on their defelopment and improvement. The goals of human resource management are extracted from organization goals and they should be compatibile. In human resource management, organizations in business sector should take care of:

- satisfying employees needs,
- improvement of their social and economic status,
- ensuring acceptable work environment and good human relations,
- employees healt care.

Human resource management is influenced by certain factors, internal and external. External factors are:

- Economic system
- Institutional factors
- Work force market
- Society culture,

while internal factors are:

- Management
- Size of the organization
- Type of activity and technological equipment
- Phase in the development of the organization
- Organization culture.

Motivating theories may be devided in two groups: (1) motivation of contents and (2) motivation of process. First group of theories is researching factors that motivate to certain behaviour, and the other group of theories is studying the reasons for certain behaviour.

Among the contents theories most recognized are Maslow theory of needs and Glasser theory of choice. It is to be assumed that all human behaviour is pointed to satisfying basic needs (Glasser, 1999; Glasser, 1994, Kropivšek et all, 2011; Jelačić et al, 2008). Knowing the profile of persons needs may form the basis for making the right approach for efficient and successful leadership (Kropivšek, 2007, Jelačića et al., 2007). One of those theories are given by Herzberg who gives two main factors – factors/motivators and hygienic factors (factors which keep the normal level of satisfaction).

Among the process theories there is a theory of a problem, which is based on a statement that people are willing to solve problems. Problem automatically initiate the reaction of an employee. Hackman-Oldhamer model of enrichment is based on three key psychological circumstances (importance of work, responsibility and knowing of results) which influence the motivation on working place. Fromm gives a theory which says that people work because they either want to have something or because they want to be somebody/something (Fromm, 1996).

Some newer research within companies for wood processing and furniture manufacturing (Kropivšek 2003; Kropivšek and Rozman 2007) has revealed the presence of organizational cultures within a workplace, where the main goal is to motivate employees. Such cultures can lead to additional problems under certain

circumstances. It can be stated that almost all motivational factors lie in the hands of management. The main question remains: does management know how to use them (Možina 1998)? Motivation means that somebody does something because he or she wants to do so, and what management has to do is to motivate and stimulate him or her in such a way as to encourage such an outlook (George and Jones 1999; Herzberg 2008). Motivation is the process of awakening a person's drive to pursue activities, with attention to certain details and regulation to achieve a certain goal while overcoming obstacles along the way (Jelačić *at al.* 2010). It can be said that motivation contains factors such as enthusiasm, wishes, intentions, persistence, *etc.*, which motivate and point ones behaviour in a certain direction (Daft and Marcic 2000). Previous research has shown that human activities are motivated by one or many known and sometimes unknown complicated factors (Možina 2002). There are individual factors that influence human activities, and they are very often part of the human social life. Therefore, some routine motivating approaches may prove to be ineffective, because they are not adapted to each individual person within a company (Lipičnik 1998). The main goal of these activities aims to satisfy the wishes and expectations of one individual person, which are formed, based on his or her own material and social needs, desire for respect, independence, personal growth, and development.

During a period of economic down-turn and in the time of a company restructuring, there are many demotivating factors that occur; and those that already existed regarding unsatisfying business results grow even stronger. Employees are facing uncertainty, amongst other fears such as the potential of losing jobs or lower salaries. On one side there is a need to implement a production and business system for more efficient work. On the other side, the act of restructuring and performing a cost reduction process must be introduced along with the possibility of promoting the selling of products. In that vicious circle it is important to establish that motivating factors will help employees to work with more enthusiasm and a bigger strive for success (Kropivšek *et al.* 2011).

Some of the authors in this field of study have wanted to establish what kind of changes in motivation area occur during the different business environment period such as economic crisis. Kropivšek *et al.* 2011) established the differences between employees' motivation in wood industry companies in two Central European countries, Slovenia and Croatia during the economic down-turn. Hitka *et al.* (2014) and Hitka and Sirotiakova (2011) researched the impact of economic crisis on motivation of employees in the woodworking industry in Slovakia, while Zavadsky *et al.* (2015) tried to establish what were the changes in employee motivation in different Slovakian companies due to global economic crisis.

To achieve high-quality results in forest based industry as well as in every other industrial branche, apart from the influence of technical and technological factors, one of the most important factors to consider is employees' motivation for work (Úradníček and Zimková 2009). Motivated employees come to work with enthusiasm and wish to fulfill their daily obligations in the most satisfying way, because it guarantees that their business results would be on the level required, satisfaction with their results would be higher, and their salaries would be bigger. Unmotivated employees very seldom fulfill

their obligations, so their production and business results are on a much lower level than required by the company or by the market (Jelačić *et al.* 2010).

10.2. MATERIAL

The ideas outlined above have led to empirical research in a wood processing company. The aim was to establish what motivating factors are most important to employees and their level of importance, before the restructuring in a period of full economic down-turn, and after the restructuring and implementation of a new stimulation motivation system.

The research method for collecting the data was a survey conducted by a questionnaire for employees consisting of 6 questions. The conditions of key presumptions of different motivational theories were checked within the questionnaire. The questions were closed-ended, and respondents were using a four-level scale of importance for each statement: the number 1 meaning never, 2 meaning sometimes, 3 meaning often, and 4 meaning always. A total of 180 employees (*n*) were surveyed in one wood processing company. The survey was conducted twice, in the year of a full recession and economic down-turn, 2010, before the restructuring, and again several years later, in 2014, the year of the economic recovery, after the restructuring and after the new motivation/stimulation system was introduced. Along with the new motivation/stimulation system, the new model for work evaluation was introduced after the restructuring of a company.

10.3. METHODS

The differences in the frequency of answers given by employees between the year 2010 and the year 2014 were tested by the χ^2-test for each individual question. The hypothesis H_0 was that the distribution of answers to the same question given in both years were equal. That test showed that there was a statistically significant difference between distribution of all answers given in the year 2010, and those given in the year 2014 (for all tested values $p<0.01$). The study wanted to establish which answers to given questions were closer to each other than others. Therefore a cluster analysis was conducted.

Cluster analysis is one of the possibilities to exploit the information contained in multi-dimensional comparisons using the differentiation of sets into several relatively unified sets of clusters (Parobek *et al.* 2016). The application of such a cluster analysis can lead to favorable results. If the prospective employee motivational systems are based on differing criteria according to variable characteristics, then it is appropriate to use cluster analysis for the evaluation of motivational factors (Zamečnik 2013). Cluster analysis can be used to create a certain type of motivational program. Cluster analysis can also be used for more detailed verification of the structure and ranking of importance of motivational criteria.

The clustering method was used to find distances between the questions. For computing the distances between the questions, the percent disagreement measure distance equation, (x,y) = (number of $x_i \neq y_i)/i$ was used due to the categorical nature of the answers. For the clustering algorithm the hierarchical single linkage known as the nearest neighbor method was used. In this method the distance between two clusters is determined by the distance of the two closest objects within the different clusters $d(C_i U C_j, C_k)$=min. ($d(C_i,C_k)$, $d(C_j,C_k)$). All statistical analyses and graphical presentations were conducted using the STATISTICA 10.0 statistical software.

10.4. RESULTS AND DISCUSSION

The work evaluation system in a company before the restructuring was very complicated, hardly informative to the employees, not transparent and absolutely not created to motivate the employees. Work places and coefficients for work evaluation of each work place were placed in 5 groups with 36 different categories, with the range from 1.0 to 3.0. The problem that was highly de-motivational was the fact that the same work place behind the same machine was placed in 3-4 different categories with different coefficient, so two workers behind the same machine had different salary coefficient, regardless the work they did or the results they achieved. That created a lot of problems in human relationships and workers were not motivated to work as a team. Also, the salary calculation was so complicated that workers never knew what kind of salary will the get at the end of the month, and it was different from month to month not because of the work results, but because of the working day in particular month.

After the restructuring of the company, the new work place systematization was introduced to the company, new profit centres were established. As a consequence, the new work evaluation system had to be introduced.

The work evaluation system was transferred from fixed evaluation system which basis for evaluation was the individual coefficient and number of hours at the work place, regardless the work results and competences, to work evaluation system where the basis for evaluation was the coefficient according to level of competences required for each group of work places, and work results of the individual employee and the group of employees needed for particular work to be done.

So, the number of coefficient groups was changed from 5 to 7, but instead of 36 coefficient categories within those 5 groups, it was reduced to only 1 coefficient per group according to competences required for the work. So, instead of 36 individual coefficients, the system was reduced to 7 group coefficients.

Those 7 coefficients were the basis for the calculation of the fixed part of the salary, and that fixed part of the salary was slightly reduced. But, at the same time, the variable part of the salary was raised and it was directly connected to work results of the team working on a particular job. The same system was introduced to all levels of production and lower and middle management of the company, according to systematization of the work places and according to job required to be done at each particular working

place. That way the work evaluation system and calculation of an individual salary was much more transparent, so each employee could calculate his/her own salary according to his/her work results and the work results of the group he/she is a part of.

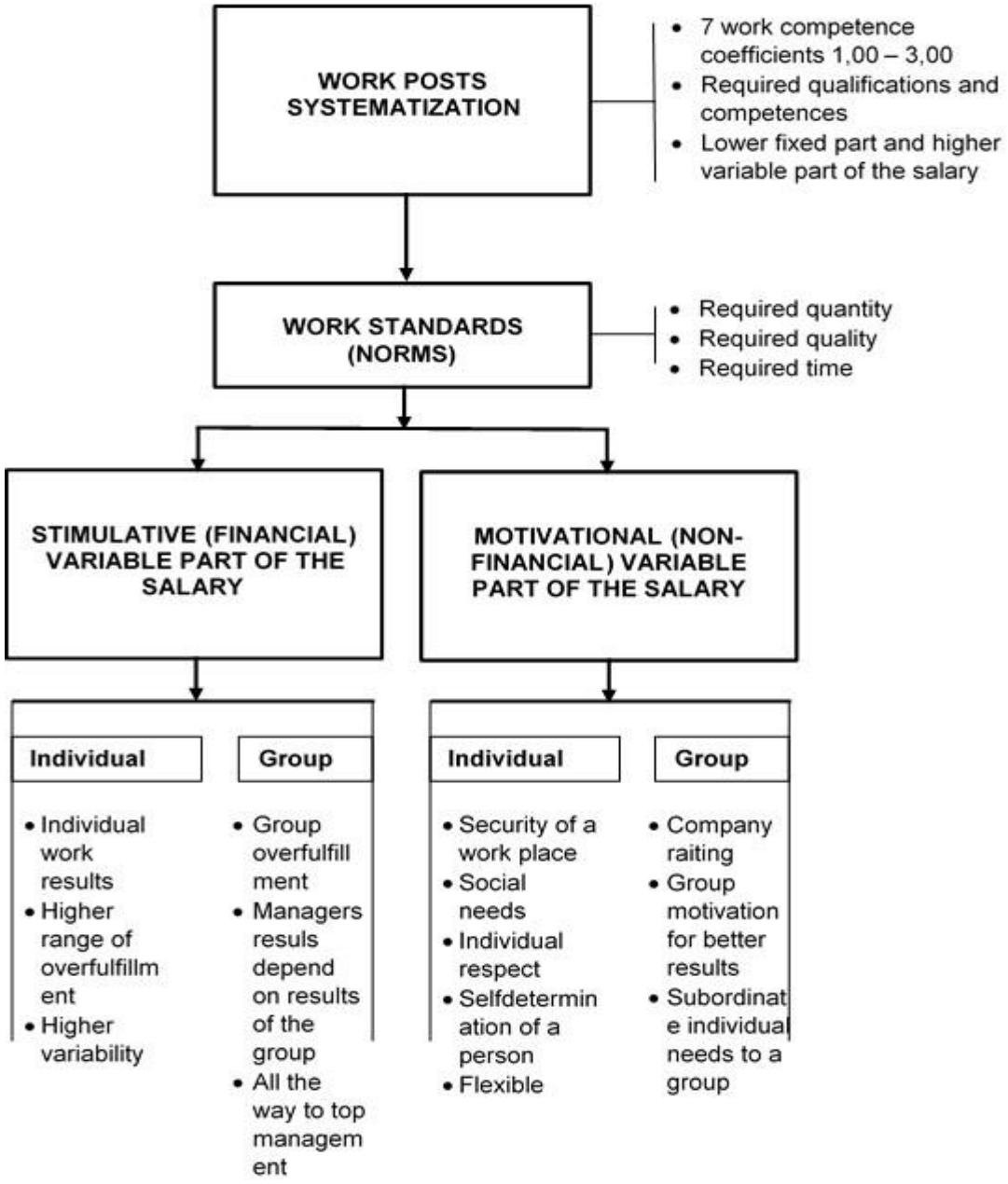

Figure 10.1. Newly established model for motivation and stimulation

10.5. MOTIVATION FACTORS

Tables 1 to 6 present the frequencies of answers to questions offered in the questionnaire from the years 2010 and 2014. *N* stands for the size of the sample, df is the degree of freedom, χ^2 - represents the Pearson's chi-squared test and p-values[4].

Table 10.1. Which Employee-related Factors do Managers Give Most Attention while Managing?

GRADE	**1**		**2**		**3**		**4**		**N**	**df**	**χ^2**	**p**
NEED / YEAR	**2010**	**2014**	**2010**	**2014**	**2010**	**2014**	**2010**	**2014**				
Physiological needs	26	37	77	57	25	41	52	45	180	3	21	<0.0001
Security needs	13	23	13	58	26	57	128	42	180	3	258	<0.0001
Social needs	1	53	63	64	103	36	13	27	180	3	2.763	<0.0001
Self-approving needs	12	43	90	71	77	44	1	22	180	3	539	<0.0001
Need for success	13	53	39	65	116	33	12	29	180	3	224	<0.0001
Survival needs	12	59	51	65	77	31	40	25	180	3	221	<0.0001
Need for love and belonging	39	92	102	47	38	20	1	21	180	3	510	<0.0001
Need for power	115	62	51	55	13	25	1	38	180	3	1.405	<0.0001
Need for freedom	26	64	90	57	51	27	13	32	180	3	107	<0.0001
Need to learn and to have fun	25	79	64	48	64	29	27	24	180	3	140	<0.0001

(1 – never, 2 – sometimes, 3 – often, 4 – always)

Table 10.2. Why do People Work?

GRADE	**1**		**2**		**3**		**4**		**N**	**df**	**χ^2**	**p**
NEED / YEAR	**2010**	**2014**	**2010**	**2014**	**2010**	**2014**	**2010**	**2014**				
To have something	1	8	1	10	103	39	75	123	180	3	200	<0.0001
Be something or somebody	13	24	90	45	64	45	13	66	180	3	254	<0.0001

(1 – not important, 2 – less important, 3 – more important, 4 – very important)

[4] p <= 0.001 – the differences are "very highly significant" (99.9%), 0.001 < p <= 0.01 – the differences are "highly significant" (99.0%), 0.01 < p <= 0.05 – the differences are "significant" (95.0%), p > 0.05 – the difference is "non-significant" (90.0%)

Table 10.3. Which of these Factors are Important in Motivation?

GRADE	1		2		3		4		N	df	χ^2	p
NEED / YEAR	2010	2014	2010	2014	2010	2014	2010	2014				
Interesting job	1	22	64	26	63	68	52	64	180	3	467	<0.0001
Salary	1	17	1	10	77	28	101	125	180	3	374	<0.0001
Work success	26	13	13	22	90	62	51	83	180	3	42	<0.0001
Work independence	13	13	39	22	91	71	37	74	180	3	49	<0.0001
Work responsibility	13	10	51	25	64	54	52	91	180	3	45	<0.0001
Possibility of promotion	1	20	26	22	90	44	63	94	180	3	400	<0.0001
Possibility of self-development	26	22	39	34	103	48	12	76	180	3	372	<0.0001
Possibility of professional education	25	28	51	23	90	52	14	77	180	3	315	<0.0001
Company reputation	26	23	13	27	90	64	51	66	180	3	27	<0.0001
Company politics and strategy	26	28	51	36	65	61	38	55	180	3	12	0.0061
Outside auditing	51	44	77	57	40	37	12	42	180	3	81	<0.0001
Way of management	1	29	39	32	91	55	49	64	180	3	804	<0.0001
Relationships with superiors	2	15	51	35	90	66	37	64	180	3	116	<0.0001
Relationships with subordinates	13	22	39	28	90	62	38	68	180	3	42	<0.0001
Employees inter-relationships	1	15	26	19	102	52	51	94	180	3	259	<0.0001
Satisfaction with personal life	2	17	26	24	92	43	60	96	180	3	160	<0.0001
Work environment	1	22	39	23	91	44	49	91	180	3	508	<0.0001
Quality work schedule	13	15	64	20	64	54	39	91	180	3	101	<0.0001
Status	13	26	64	42	77	58	26	54	180	3	55	<0.0001
Safety	1	19	26	15	65	44	88	102	180	3	338	<0.0001
Information on company status	13	29	51	28	115	65	1	58	180	3	3.301	<0.0001
Financial awards	12	14	40	20	39	41	89	105	180	3	13	0.0040
Recognition	14	19	39	35	90	45	37	81	180	3	77	<0.0001

(1 – not important, 2 – less important, 3 – more important, 4 – very important)

Table 10.4. Can a Problem Increase Your Activity (Motivate You)?

GRADE	1		2		3		4		N	df	χ^2	p
NEED / YEAR	2010	2014	2010	2014	2010	2014	2010	2014				
For solving a problem special conditions are required	1	21	127	78	39	57	13	24	180	3	437	<0.0001
A problem is an additional motivator	1	36	26	68	114	52	39	24	180	3	1.332	<0.0001
Unmotivated employees do not see problems	13	35	26	55	90	61	51	29	180	3	88	<0.0001

(1 – never, 2 – sometimes, 3 – often, 4 – always)

Table 10.5. How Psychological Circumstances Influence Work?

GRADE	1		2		3		4		N	df	χ^2	p
NEED / YEAR	2010	2014	2010	2014	2010	2014	2010	2014				
Sense of work importance	13	10	39	24	116	73	12	73	180	3	332	<0.0001
Sense of responsibility	12	7	38	27	77	70	53	76	180	3	16	0.0012
Knowing the results	13	9	37	29	103	64	27	78	180	3	114	<0.0001

(1 – not important, 2 – less important, 3 – more important, 4 – very important)

Table 10.6. At What Level Do You Notice Demotivating Factors in Your Company?

GRADE	1		2		3		4		N	df	χ^2	p
NEED / YEAR	2010	2014	2010	2014	2010	2014	2010	2014				
Being discharged	26	15	51	29	90	53	13	83	180	3	406	<0.0001
Salary decrease	51	14	39	45	65	52	25	69	180	3	108	<0.0001
Use of punishment in managing	13	18	116	30	50	57	1	75	180	3	5.543	<0.0001
Creation of tensions between employees	39	17	64	32	51	52	26	79	180	3	136	<0.0001
Work hours shortening	141	100	13	28	12	32	14	20	180	3	65	<0.0001
Reprehending employees	39	16	77	48	63	60	1	56	180	3	3.050	<0.0001
No possibility of further education	47	28	65	67	66	46	2	39	180	3	698	<0.0001
Less freedom at work	51	24	89	50	39	46	1	60	180	3	3.514	<0.0001
Less work to do	26	84	64	45	78	29	12	22	180	3	174	<0.0001

(1 – not existing, 2 – existing a little, 3 – existing, 4 – very existing)

The results of the cluster analysis are given in Figs. 2 to 7, showing the tree diagrams for answers to each question for the years 2010 and 2014.

Figures 2 and 3 show that there was a strong relationship between social needs and the need for success in the year 2010, while there is a strong connection between the need for freedom and the need to learn and to have fun in the year 2014. Those two strongest connections practically switched places in given years, while other answers exhibited significantly different connections during those years.

Figures 4 and 5 show that among motivation factors in the year 2010, the strongest relationship was between the work environment and a quality work schedule, followed by employees inter-relationships and their satisfaction with personal life. In the year 2014, the situation changed and the strongest connection was between status and safety, followed by a quality work schedule. This data means that in the year 2010, when the economic situation was not as satisfying and when people were afraid to lose their jobs, physiological needs were most important. On the other hand, in the year 2014, after restructuring the company, and when the economic situation became better, employees became more motivated with social needs, especially within the company.

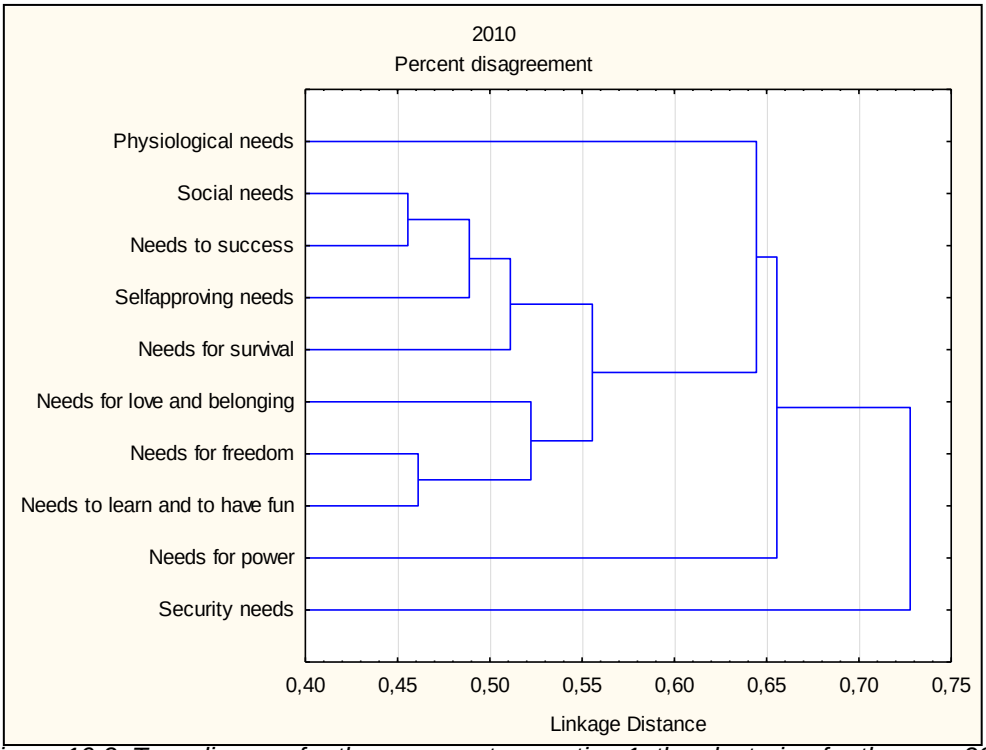

Figure 10.2. Tree diagram for the answers to question 1, the clustering for the year 2010

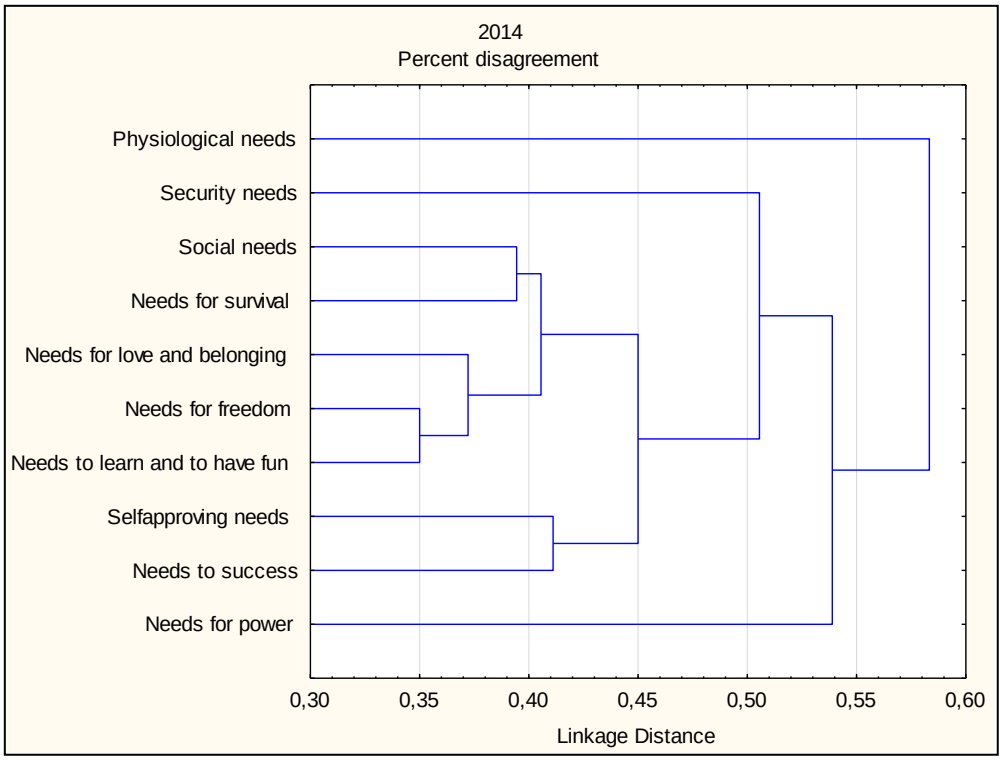

Figure 10.3. Tree diagram for the answers to question 1, the clustering for the year 2014

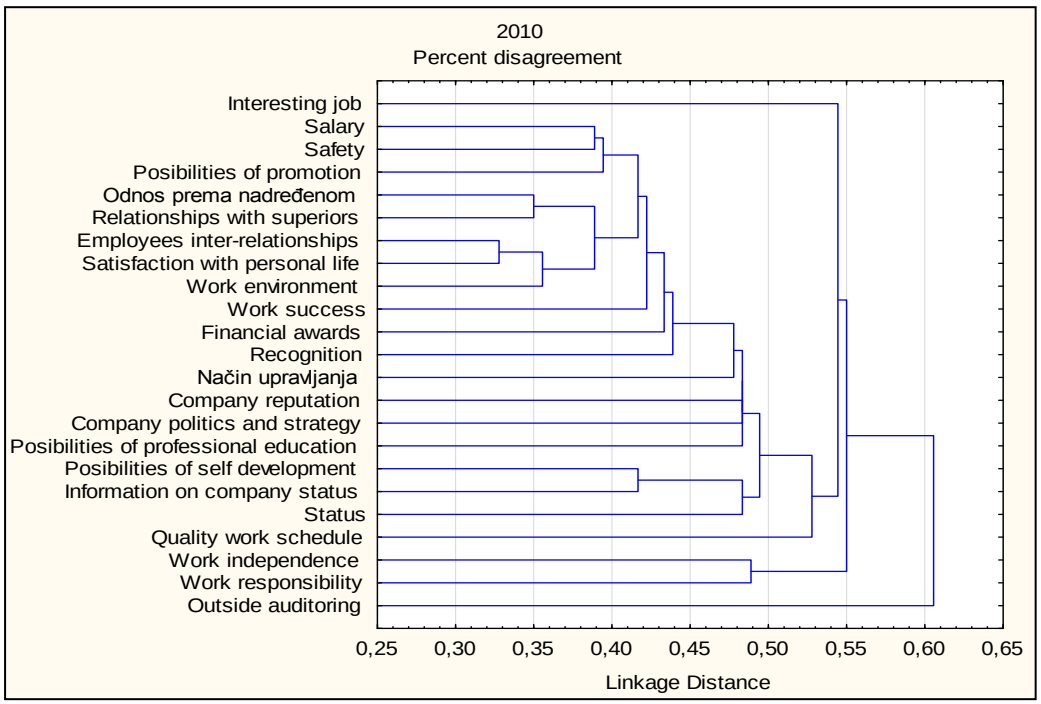

Figure 10.4. Tree diagram for the answers to question 2, the clustering for the year 2010

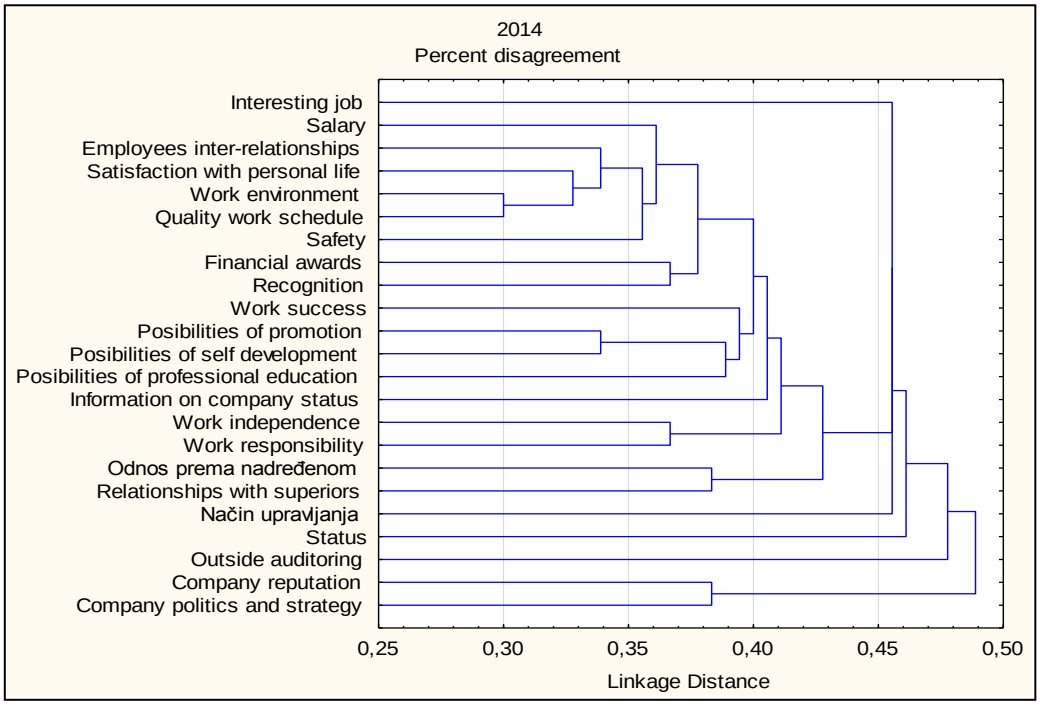

Figure 10.5. Tree diagram for the answers to question 2, the clustering for the year 2014

Cluster analysis for the answers to question 3 show the way that employees think about a problem as a motivator, and in the year 2010 employees have seen a lot of problems within the company, so they strongly connected a problem as a motivator and the inability to see the problem for unmotivated employees. In the year 2014 the situation changed and employees put an accent to seeing a problem as a motivator and the special conditions required to solve the problem.

Results of the cluster analysis for the answers to question 4 showed that the linkage distance between two answers to the question, "Why do people work?," was significantly different between the years 2010 and 2014. While employees thought that “having something” was a motive to work in the year 2010, in the year 2014 employees considered “recognition” as a bigger motive to work.

Results of the cluster analysis for the question, “how psychological circumstances influence work” show that employees were more concerned about the results, especially financial results, and the meaning of work in the year 2010, while in the year 2014 they think more of responsibility at work connected with a sense of work importance.

The last question can be summarized by the following results in Figures 6 and 7. Regarding demotivating factors and their presence in the company, employees considered different factors as more present in the year 2010 than those in the year 2014. The strongest correlation is between the reprehending of employees and less freedom at work, followed by a connection between less work to do and no possibility for further education in the year 2010. In the year 2014 the strongest connection was

between the use of punishment in managing and the creation of tensions amongst employees.

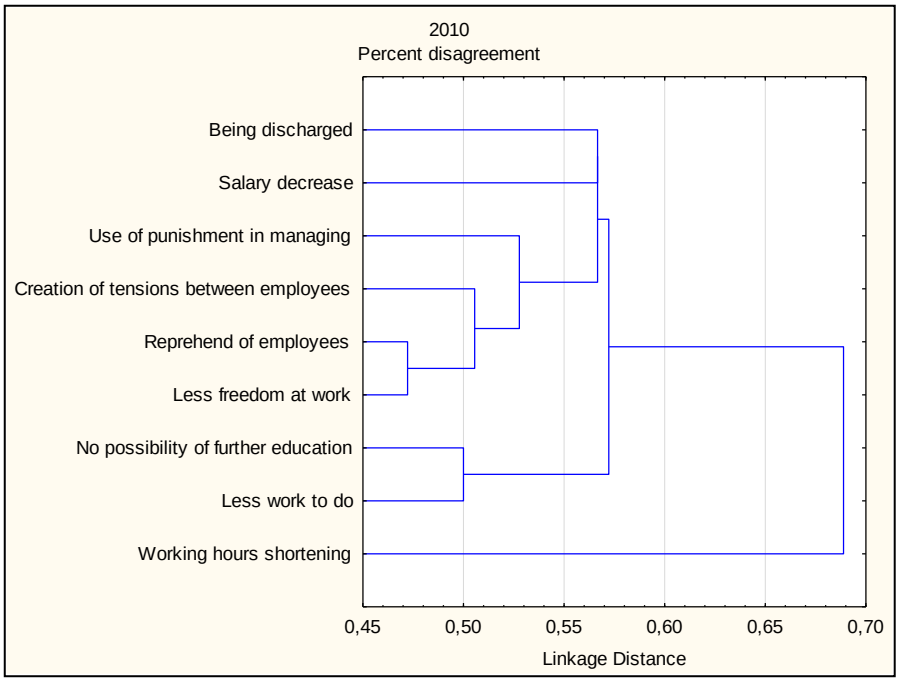

Figure 10.6. Tree diagram for the answers to question 6, clustering for the year 2010

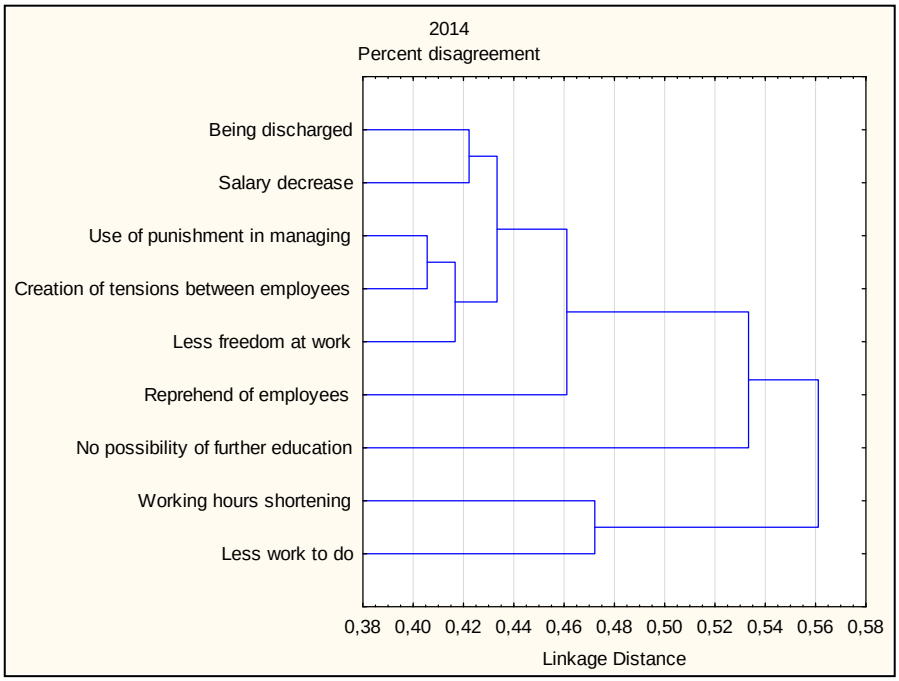

Figure 10.7. Tree diagram for the answers to question 6, clustering for the year 2014

10.6. FINAL REMARKS

Human resource management is very important part of management in general on which most of the company's business results highly depend. If the human resource management system is well based, the business results are better and employees are satisfied. Forest based industry is work intensive industry with low salary rate, so it makes it more important to establish the quality system of work evaluation, motivation and stimulation which would make employees satisfied and help company to achieve better work results.

Newly established model of work evaluation system guarantes the fixed part of the salary, while the variable part of the salary depends on work post, overfulfillment of the work standard, and many other parametters, so the employees have the possibility to double their fixed part of the salary with a variable part. The motivation/stimuation model is well accepted among employees and their personal efforts help them and the company in general.

The aim of this research was to establish the differences between the motivation of employees in a wood processing and furniture manufacturing company before the restructuring, at the time of an economic down-turn at its peak, and after the restructuring, at the time of economic recovery and after a new motivation and stimulation system was introduced. Research discovered that the differences between all given questions and answers were significantly different, so the cluster analysis was conducted to establish the linkage distance between answers to all the questions separately for both research years, 2010 and 2014.

The study discovered that employees were more afraid for their workplaces and their salaries in the time of a crisis, which is understandable, since the situation with the number of unemployed people in Croatia during the crisis was high and it was very hard to find another job. The number of employees in the wood industry branch decreased during the crisis from 25,000 in year 2006 to 21,000 in year 2011. So, physiological needs were the most important for employees in the year 2010. That situation changed in the year 2014, since the economic recovery had started. Wood processing and furniture manufacturing achieved the best results in exports ever (over 1 billion USD) and employees in the branch felt more secure about their jobs, so they began to think about other needs, such as social needs. In the year 2014 employees thought more about work conditions and a quality work schedule as their motivation factors.

Demotivating factors and their presence in the company also had changed and there was a significant difference established between results achieved in the year 2010 and those from the year 2014. The most important difference between the years 2010 and 2014 was established among the key psychological conditions at work. The grades in year 2014 are much higher than those in the year 2010, which is a very good trend.

The period of time after the restructuring took place and the survey was short, so the next study of this type should be conducted in a year or two from now, to investigate

if a normal economic environment has a better or any different influence on motivation and demotivating factors in the company.

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11. EFFECTIVENESS OF LABOUR RESOURCES IN BUILDING COMPETITIVE ADVANTAGE - A LESSON FROM THE FURNITURE INDUSTRY OF SELECTED EU COUNTRIES

Emilia Grzegorzewska, Renata Stasiak-Betlejewska

11.1. INTRODUCTION

In economics and management sciences, the positive dimension of competition is increasingly emphasized, accentuating the fact that the increase in its intensity contributes to lowering costs, implementing innovative solutions and improving efficiency (Eliss, Singh 2010). In addition, competition leads to the elimination of inefficient companies from the market that did not meet its requirements, and the transfer of production resources from withdrawing enterprises to new entities or competitors showing greater profitability of conducted business activity, which in turn promotes better allocation of resources (Report on Competition ... 2004). Competition is also a positive phenomenon for consumers, as it contributes to greater product variety, higher quality and lower prices, which further on drives efficiency gains and helps raise the standard of living for society (Aghion et al. 2005; Shapiro 2012). The increase in competition intensity is one of the more pronounced trends in the development of the modern economy (Kaleta 2009; Mantura 2009; Godfrey 2008; Don et al. 2008; GoMaa 2014).

Key factors to maintain and improve the competiveness of nations in the global market are labour productivity and economic growth (Auzina-Emsina 2014). A similar sentence is expressed by Wysokińska (2003), in whose opinion enterprises are competitive when their productivity of labour and all production factors grow consistently, which situation allows them to reduce the unit costs of their output, but also affects other enterprises at the national and international levels.

The furniture industry is an important element of the EU economy (Grzegorzewska, Stasiak-Betlejewska 2014; Grzegorzewska, Więckowska 2016). The development and competitiveness of this industry are determined by factors related to technical and technological progress, research and development activities, labour productivity or modernization of production (Bidzińska, Ratajczak 2003). As Mendonça (2009) emphasized, the low technology industry is a collection of active participants, not passive users of modern technologies that change parameters. Furniture production is an example of the low-tech industry (Boon-Kwee, Thiruchelvam 2012; Hansen, Winther 2015; Grzegorzewska, Więckowska 2017), and companies operating in this industry, despite relatively high labour costs, can be successful in international exchange (Maskell1996).

11.2. LITERATURE BACKGROUND

In the literature across various fields of management and economics can be found wide range of approaches to defining and measuring competitiveness. Some researchers believe that the concept of competitiveness applies most appropriately to firms and products. Others identify the national competitiveness as an important determinant of firms‘ overall competitiveness or analyze it from the sectoral perspective (Balkytė, Tvaronavičienė 2010). Cho (1998), Cho, Moon (2005) and Ambastha, Momaya (2005) had a similar opinion. They pointed three categories according to differences in unit entity: firm (organization) competitiveness, industry competitiveness and competitiveness of nations. Porter (1990) described the competitiveness of a nation as the productivity with which a nation utilizes its human, capital and natural resources. Altomonte (2012) defined external or international competitiveness as the ability to exchange the goods in which a country is abundant for the goods and services that in the same country are scarce.

In the past decades, many works on competitiveness with different perspectives have been published. But competitiveness is yet an elusive concept, the relevance of which is changing with time (Bhawsar, Chattopadhyay 2015). Competitive advantage is associated mostly with delivering the same benefits as competitors but at a lower cost (what is related to the cost advantage) or delivering with benefits competing products (Weng-Cheng et al. 2011). Competitive advantage is necessary for satisfied customers who will receive higher value in delivered products for higher income what the owners request from management and such requirements can be fulfilled with organization of production, higher application and as low as possible production costs (Ranko et al. 2008)

For an industrial sector, the main competitiveness criterion is maintaining and improving its position in the global market (Balkytė, Tvaronavičienė 2010). Previous studies on resource-based sectors in other countries have shown that production factors, including raw materials, labour, and capital, have the strongest influences on the productivity and industrial growth (Ratnasingam et al. 2017; Rahmah et al. 2012; Rosenkranz et al. 2015). Labour productivity in the context of competitiveness has been analyzed in many studies (O'Mahony, van Ark 2003; Felipe, Kumar 2011; Užík, Vokorokosová 2007).

Among the more important factors affecting the development of business entities and individual sectors of the economy and, as a consequence, affecting the level of competitiveness of enterprises on the local and international market, one can mention the effectiveness of labour resources. Achieving high labour productivity contributes to reducing costs, increasing the supply of cheaper goods and services, and thus translates into an increase in the purchasing power of societies, their wealth and competitive abilities (Gołaś, Kozera 2008). For this reason, this issue was addressed in this work.

11.3. RESEARCH METODOLOGY

The main goal of the research was to assess the importance of using labour resources in building competitive advantage in the furniture industry of selected EU countries. The analyzes were conducted on the basis of ten European Community countries, which were characterized by the largest share in creating the value of furniture sold production from all EU countries in the last year of the study. This group includes: Italy, Germany, Poland, Great Britain, France, Spain, the Netherlands, Austria, Sweden and Romania. First, the level of employment and the value of furniture sold production were presented, followed by selected economic and production categories related to labour productivity, namely: X_1 – value of sold production per employee (thousand euro), X_2 – value added per employee (thousand euro), X_3 – average annual cost of employee employment (thousand euro), X_4 – share of personnel costs in production costs (%). A comparative analysis was carried out against all EU Member States (EU28), a group of EU13 countries was also indicated. The time range of the research was adopted for the period of 2009-2017, because complete and reliable statistical data from the Eurostat statistical databases were obtained for this time. During the research, a horizontal analysis was carried out, allowing the dynamics of selected economic and production categories to be estimated. The research was complemented by vertical analysis, determining the significance of countries in creating individual economic and production categories that can influence the competitiveness of the furniture industry in the analyzed countries on the international stage. In addition, the mean and standard deviation of each of the analyzed variable, in each country were calculated. Then the coefficient of variation was used to determine the level of relative differentiation of the factors.

The coefficient of variation denoted CV (or V) eliminates the unit of measurement from the standard deviation of a series of number by dividing it by the mean of this series of numbers. Often the coefficient of variation is expressed as a percentage which corresponds to the following formula for the coefficient of variation. Formally, if, for a series of N numbers, the standard deviation and the mean are denoted respectively by *S* and *x*, the coefficient of variation is computed as [Abdi 2010]:

$$V = \frac{S_j * 100}{\bar{x}_j} \quad (1)$$

where:

S – standard deviation according to the formula:

$$S_j = \sqrt{n^{-1} \sum_{i=1}^{n} (x_{ij} - \bar{x}_j)^2} \quad (2)$$

$\bar{x}_j$ – mean according to the formula:

$$\bar{x}_j = n^{-1} \sum_{i=1}^{n} x_{ij}, \quad (i = 1, \dots n) \quad (3)$$

11.4. RESULTS

As Figure 1 shows, within the countries surveyed among the largest furniture manufacturers, the highest value of sold production was observed in Italy and Germany. The level of employment was also high in these countries, although in the first of these countries the number of employees in the furniture industry decreased at that time. A different tendency was noticed in Poland, where the employment level increased by 15% in the analyzed period. In addition, the value of furniture sold production increased by more than half, which resulted in the promotion of the Polish furniture industry to the third place in the ranking of EU producers. A clearly lower level of employment was observed in the Netherlands, Austria and Sweden. Also noteworthy is the Romanian furniture industry, which plays an important role in the domestic labour market.

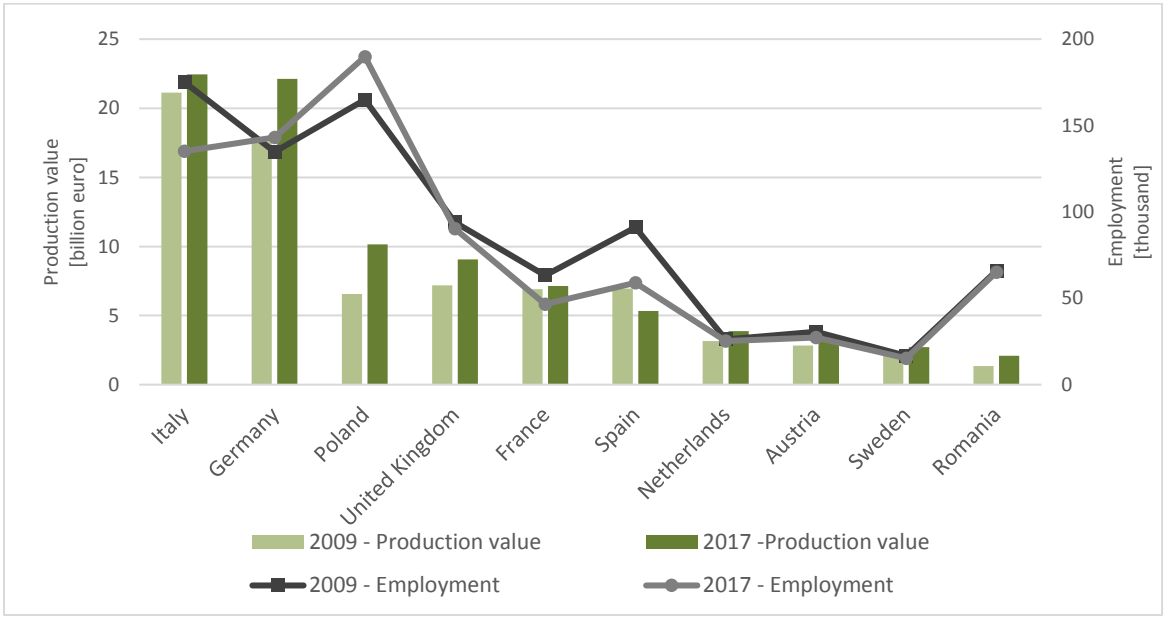

Figure 11.1. Production value and employment in furniture industry of selected countries EU

One of the basic measures of labour productivity is the production value per employee. At the beginning of the analyzed period, the average in the EU countries was 80.5 thousand Euro (Table 1). It should be emphasized that the value of production per employee in the EU-13 group of countries was clearly lower than in the EU-15 (33.9 and 105.2 thousand euro respectively). Among the countries covered by the survey, Sweden (131.8 thousand euro), Germany (130.4 thousand euro), the Netherlands (120.8 thousand euro) and Italy (120.7 thousand euro) showed the highest labour productivity, calculated on the basis of the value of production per employee. By far the lowest ratio in this area was achieved by Poland and Romania, where one employee generated, on average the value of furniture sold production in the amount of 39.8 and 20.4 thousand euro respectively. Although the level of this indicator in the Polish furniture industry was above the average, achieved by the new Community member states, it was clearly lower than the EU-28 and EU-15 average (by 51 and 68% respectively). In turn, in Romania, sold production per employee was even lower than the average in the EU-13. This proves that labour productivity in the furniture industry in these countries is definitely lower than in other countries covered by the analysis.

In the years 2009-2017 the value of sold production per employee in the EU-28 increased by 26.1% to the amount of 101.5 thousand euro. In the group of new Member States of the Community, this indicator increased by 43.1% and at the end of the analyzed period reached the level of 48.5 thousand euro. However, it was still significantly lower than in the EU-28. Again, the highest labour productivity in the group of countries belonging to the leading furniture manufacturers was observed in Sweden (178.5 thousand euro), Italy (166.1 thousand euro) and Germany (154.6 thousand euro). Despite a clear increase in this indicator among Polish furniture manufacturers (by 34.2%), they still had a relatively low value of sold production of the furniture industry per employee. In 2017 it was at the level of 53.4 thousand euro and was almost twice lower than the average in the EU countries. It is worth emphasizing that the highest increase in this indicator was observed in Romania (by 57.4%), however, the value of furniture sold production per employee remained still at a clearly lower level than the EU-28 average. The highest level of coefficient of variation in the value of furniture industry production per employee, which informs about the relative differentiation of this characteristic was observed in Great Britain (18.3%), France (15.7%) and Romania (14.3%), while the lowest in Germany (6.5%), Spain (7.1%) and Austria (7.3%).

The effective use of labour resources in the furniture industry is also reflected in high gross value added per employee. At the beginning of the analyzed period, in the EU member states this indicator was at the level of 26.0 thousand euro, while for the EU-13 it was more than twice lower. All countries covered by the survey, with the exception of Romania and Poland, had higher gross value added per employee than the EU-28 average. The highest level of this indicator was recorded by Germany (44.3 thousand euro), Sweden (42.1 thousand euro) and the Netherlands (40.8 thousand euro). Clearly less labour productivity in this area was again observed in Romanian

and Polish furniture companies. The indicator in these countries was at the level of 6.4 and 11.8 thousand euro.

Table 11.1. Production value per employee and gross value added per employee in selected EU countries

Itemisation	2009	2017	dynamic	min	max	mean	SD*	V**
Production value per employee								
EU28	80.5	101.5	126.1	80.5	101.5	92.1	7.0	7.6
EU13	33.9	48.5	143.1	33.9	48.5	41.5	5.0	12.0
Italy	120.7	166.1	137.6	120.7	166.1	143.4	16.3	11.4
Germany	130.4	154.6	118.6	130.0	154.6	140.8	9.2	6.5
Poland	39.8	53.4	134,2	39.8	53.4	47.4	5.2	10.9
Great Britain	76.3	100.6	131.8	76.3	130.6	102.8	18.8	18.2
France	109.3	153.8	140.7	98.6	153.8	127.4	20.0	15.7
Spain	76.5	90.4	118.2	74.2	90.4	81.1	5.7	7.1
Netherlands	120.8	153.8	127.3	120.8	153.8	132.7	10.7	8.0
Austria	92.1	113.1	122.8	92.1	113.1	101.1	7.3	7.3
Sweden	131.8	178.5	135.4	131.8	182.2	168.9	15.4	9.1
Romania	20.4	32.1	157.4	20.4	32.1	26.9	3.8	14.3
Gross value added per employee								
EU28	126.9	26.0	33.0	29.9	2.5	8.3	126.9	26.0
EU13	140.5	11.6	16.3	13.3	1.6	11.8	140.5	11.6
Italy	139.9	30.7	45.9	37.8	5.5	14.6	139.9	30.7
Germany	118.5	44.3	52.5	48.1	2.7	5.6	118.5	44.3
Poland	133.1	11.8	15.7	13.8	1.5	11.0	133.1	11.8
Great Britain	151.9	29.1	53.2	42.2	7.6	17.9	151.9	29.1
France	132.0	32.5	49.5	41.4	5.2	12.6	132.0	32.5
Spain	109.1	25.8	30.0	27.7	1.4	5.0	109.1	25.8
Netherlands	129.2	40.8	52.7	46.6	4.1	8.8	129.2	40.8
Austria	134.0	37.9	50.9	44.1	4.6	10.5	134.0	37.9
Sweden	134.2	42.1	60.2	54.5	5.4	9.9	134.2	42.1
Romania	134.4	6.4	8.6	7.4	0.9	12.5	134.4	6.4

Source: own elaboration based on Eurostat.

*SD – standard deviation

** V – coefficient of variation

In the years 2009-2017, the gross value added per employee in the EU countries increased by 26.9% to 33.0 thousand euro. At the end of the analyzed period, Sweden took the first place. One employee generated, on average, gross value added in the furniture industry at 56.5 thousand euro, by 1/3 more than in 2009. A relatively high labour productivity in this area was also observed in other countries covered by the survey. Again, they showed higher value per employee than in the EU-28 average. Spain and the countries included in the new Member States, i.e. Romania and Poland, were an exception. It should be emphasized, however, that the discussed indicator increased in these countries by over 1/3, which can be considered a positive trend. The highest level of coefficient of variation in the value of production of the furniture industry per one employee, which informs about the relative differentiation of this characteristic was observed in Great Britain (17.9%), Italy (14.6%), France (12.6%) and Romania (12.5%), while the lowest in Spain (5.0%) and Germany (5.6%).

In the analysis of employment and labour productivity, the average employment costs, including salaries, also remain a significant factor, as they are one of the most important variables determining the level of employee involvement. In 2009, the average personnel costs in the EU-28 furniture industry reached 22.2 thousand euro, while in the group of new member states of the Community they were at a clearly higher level – 9.2 thousand euro (Table 2).The highest personnel costs per employee were borne in furniture companies in the Netherlands (39.1 thousand euro), France (39.0 thousand euro), Sweden (38.7 thousand euro) and Germany (36.8 thousand euro). Economic entities in Romania and Poland incurred significantly lower and significantly different from the EU average employment costs. Their level was three times and two times lower than on average in the furniture industry of the EU economy.

In the years 2009-2017 the average personnel costs increased in the EU-28 by 15.8%. The highest dynamics of changes was observed in Romania (175.0%) and Poland (150.0%), i.e. in the countries where the level of these costs was clearly lower. However, these countries still lagged far behind in terms of the average annual cost of employment. In 2017, it was at the level of 7.0 and 10.8 thousand respectively, while the EU average in this area was 25.7 thousand. This confirms the high cost competitiveness of the labour factor of Romanian and Polish furniture industry on the European market. In turn, the top countries with the highest average personnel costs include Sweden (51.8 thousand euro), France (48.3 thousand euro), the Netherlands (44.3 thousand euro), Germany (41.0 thousand euro) and Austria (40.6 thousand euro). The highest level of the coefficient of variation of average personnel, who reports the relative differentiation of this variable was observed in Romania (20.4%), Great Britain (18.4%) and Poland (12.2%), while the lowest in Spain (1.9%) and Germany (4.9%).

Table 11.2. Average personnel costs and share of personnel costs in the production value in selected EU countries

Itemisation	2009	2017	dynamic	min	max	mean	SD	V
Average personnel costs								
EU28	22.2	25.7	115.8	22,2	25.7	24.2	1.1	4.5
EU13	9.2	12.2	132.6	9,2	12.2	10.4	0.9	8.9
Italy	30.1	36.6	121.6	30,1	36.6	32.9	2.3	6.9
Germany	36.4	41.0	112.6	36,4	41.0	38.4	1.6	4.1
Poland	7.2	10.8	150.0	7,2	10.8	9.1	1.1	12.2
Great Britain	19.9	27.9	140.2	19,9	34.8	27.5	5.1	18.4
France	39.0	48.3	123.8	32,5	48.3	41.8	4.6	10.9
Spain	26.4	26.7	101.1	25,8	27.4	26.7	0.5	1.9
Netherlands	39.1	44.3	113.3	39,1	48.1	43.2	2.5	5.9
Austria	32.6	40.6	124.5	32,6	40.6	36.3	2.9	8.0
Sweden	38.7	51.8	133.9	38,7	53.1	48.9	4.9	9.9
Romania	4.0	7.0	175.0	4,0	7.0	5.1	1.0	20.4
Share of personnel costs in the production value								
EU28	24.7	22.7	91.9	22,2	24.7	23.6	0.8	3.6
EU13	23.0	21.8	94.8	20,7	23.0	21.7	0.7	3.1
Italy	20.3	18.0	88.7	17,5	20.3	18.8	0.9	5.0
Germany	26.8	24.8	92.5	24,1	26.8	25.6	0.9	3.6
Poland	16.2	18.2	112.3	16,2	18.2	17.1	0.7	3.8
Great Britain	29.9	27.3	91.3	26,5	30.6	28.6	1.5	5.4
France	25.2	27.0	107.1	23,8	27.3	25.8	1.1	4.2
Spain	30.9	25.4	82.2	25,0	30.9	28.5	2.5	8.8
Netherlands	25.5	20.5	80.4	21,1	25.7	24.2	2.0	8.2
Austria	32.2	32.1	99.7	31,6	33.4	32.4	0.6	1.9
Sweden	26.8	25.8	96.3	24,8	27.6	26.1	0.9	3.4
Romania	19.2	21.7	113.0	16,9	21.7	18.6	1.6	8.4

Source: own elaboration based on Eurostat.

*SD – standard deviation

** V – coefficient of variation

The level of employment costs implies a differentiated share of personnel costs in the production value of the largest European furniture manufacturers. By far the lowest value of this indicator was observed in the Polish furniture industry. In 2009 it was at the level of 16.2%, while in EU-28 countries it amounted to 24.7% on average. In turn, the highest level of this indicator was shown by Austria (32.2%), Spain (30.9%) and Great Britain (29.9%).

In the years 2009-2017, the share of personnel costs in the production value in EU-28 countries decreased by 2 p.p. from 24.7 to 22.7%. Downward trends have also been noted for the new Member States (from 23.0 to 21.8%). At the end of the analyzed period, a relatively low level of this indicator was again observed in Polish furniture companies (18.2%), although it should also be emphasized that the share of personnel costs in production in Italy dropped from 20.3 to 18.0%. It caused that among the largest furniture manufacturers in the country this showed the lowest level of this indicator in 2017. In turn, the highest level of this indicator in the last year covered by the analysis was shown by: Austria (32.1%), Great Britain (27.3%) and France (27.0%). Such a significant level of personnel costs in the production value results, among others, from high salaries of employees. In the years 2009-2017 the lowest level of differentiation in average personnel costs per employee was observed in Austria (1.9%), Sweden (3.4%), Germany (3.6%) and Poland (3.8%), while the highest in Spain (8.8%), Romania (8.4%) and the Netherlands (8.2%). It should be emphasized, however, that in all countries covered by the analysis it was below 10%, which confirms the low level of diversity of this variable.

Important information on the relationships between variables that have been analyzed is provided by the Pearson's correlation coefficient. The results of the correlation analysis are presented in Table 3. The value of furniture sold production per employee is highly and positively correlated with the gross value added per employee in all countries that were included in the survey (P> 0.9). In addition, a significant correlation was observed in the case of the value of furniture sold production per employee and average personnel costs (except Spain). A positive relationship was noted for the relationship between gross value added per employee and average personnel costs.

Again, the exception was the Spanish furniture industry. In turn, the study of the relationship between the average personnel costs and the share of personnel costs in production varied across the countries studied. A positive and significant correlation between these variables was observed in Romania, a different tendency was noted in Italy, and in other countries the Pearson's correlation coefficient exceeded 0.7, which means that no strong correlation between these variables was recognized.

Table 11.3. Pearson's correlation coefficient

Itemisation	X_1-X_2	X_1-X_3	X_1-X_4	X_2-X_3	X_2-X_4	X_3-X_4
EU28	0.99	0.98	-0.95	0.96	-0.96	-0.86
EU13	0.92	0.94	-0.76	0.97	-0.55	-0.56
Italy	0.97	0.98	-0.96	0.98	-0.89	-0.89
Germany	0.96	0.90	-0.91	0.96	-0.81	-0.67
Poland	0.95	0.96	0.21	0.93	0.29	0.48
Great Britain	0.97	0.99	-0.57	0.96	-0.63	-0.61
France	0.97	0.92	0.24	0.95	0.11	0.05
Spain	0.92	-0.18	-0.95	-0.26	-0.84	0.31
Netherlands	0.90	0.56	-0.90	0.76	-0.77	-0.22
Austria	0.99	0.96	-0.10	0.97	-0.05	0.16
Sweden	0.93	0.93	-0.10	0.98	0.19	0.25
Romania	0.92	0.93	0.54	0.92	0.65	0.81

Source: own elaboration.

11.5. CONCLUSIONS

The competitiveness of enterprises, sectors and entire economies remains an important area of interest for both theoreticians and practitioners. In the economic sciences and management theories, the positive dimension of competition is more and more often emphasized, stressing the fact that it promotes the improvement of efficiency and, consequently, the reduction of costs. The research was aimed at assessing the importance of labour resources in building competitive advantage in the furniture industry of selected EU countries. The analyzes were conducted on the basis of ten Community Member States, which in 2017 were characterized by the largest share in creating the value of furniture sold production. This group includes Italy, Germany, Poland, Great Britain, France, Spain, the Netherlands, Austria, Sweden and Romania. A comparative analysis was carried out against all EU Member States (EU28), and a group of EU13 countries was identified. The research covered the years 2009-2017.

The conducted research shows that the production value per employee in the group of EU-13 countries was clearly lower than the average in the EU countries. Among the countries covered by the survey, Sweden, Germany, the Netherlands and Italy showed the highest labour productivity, calculated on the basis of the production value per employee. By far the lowest indicator in this respect was achieved by Poland and Romania, and thus countries included in the new EU members. This demonstrates

the relatively lower labour productivity in the furniture industry in these countries than in the other nations covered by the analysis. Despite a clear increase in the value of furniture production per person employed in Poland and Romania during the period under review, the indicator remained at a clearly lower level than the average in the EU-28. In Romanian and Polish furniture enterprises, clearly lower labour productivity in the area of gross added value per employee was observed again. It is worth emphasizing that the discussed indicator increased in these countries by over 1/3, which can be considered a positive trend.

In the analysis of employment and labour productivity, average personnel costs, including salaries, remain an important element as well, as they are one of the most significant factors determining the level of employee involvement. During the period under review, the average personnel costs increased in the EU-28 by 15.8%. The highest dynamics of changes was recorded in Romania (175.0%) and Poland (150.0%), i.e. in countries where the level of these costs was clearly lower. However, these countries still lagged far behind in terms of the average personnel costs. This confirms the high cost competitiveness of the labour factor of Romanian and Polish furniture industry on the European market. On the other hand, Sweden, France and the Netherlands are among the leading countries with the highest average employment costs. The level of personnel costs caused a differentiated share of personnel costs in the production value of the largest European furniture manufacturers. Definitely the lowest value of this indicator was observed in the Polish furniture industry, and a clearly higher level was shown by: Austria, Great Britain and France. The conducted research shows that the countries included in the new Member States of the Community are usually characterized by a lower level of labour productivity and at the same time by a relatively lower average wage. However, it should be emphasized that lower personnel costs in the future may prove to be an insufficient source of building the competitive advantage of new Member States on the international furniture market. For this reason, it is important to conduct further research on labour productivity in this industry.

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12. DETERMINATION OF CUSTOMERS AWARENESS TO WOOD BASE PACKAGING IN SLOVAKIA

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12.1. LITERATURE REVIEW

For centuries wood has been utilised to package different goods for storage. The importance of the wood based packaging system and its various functions is increasing over the last decades. Wood is the principal material used in packaging that grows naturally and represents one of the most available renewable sources. In traditional terms, the packaging is intended as a mean of protection, preservation, handling, transport and storage of different products. At the present time, the other functions of packaging, such as promotion, getting the attention of customers and brand communication are becoming more recognizable. As a result, the current interest of the company is therefore to offer a customer such a packaging that will meet the marketing requirements and the needs of handling and transport at the same time. In the case of innovation, it is important to target it to the specific customer segment. It is therefore in the company's interest to properly identify the target groups of the packaging innovation. Following above mentioned facts, the aim of the study is to identify the age categories which are the most interested in packaging innovation and to monitor the perception of active packaging functions in comparison to intelligent packaging functions among different age categories.

12.1.1. PACKAGING

The package can be understood as a tool or set of tools to protect the products from a potential damage during logistic operations. It allows better handling, facilitates the marketing and consumption of products. The package moves through various stages of marketing and consumption. Accordingly, the package can be divided into three stages: transport, sales and consumer package. The transport package has the protective and rationalizing function during handling, storage and transport processes. It is used for the transport of foodstuffs in the consumer packaging, for the sales packaging and for the transport of non-prepacked foodstuffs (Zeman, 2005; Straka, 2013; Štofková 2013; Pajtinková et al., 2012; Čorejová, Kassiri, 2015; 2016).

Two main types of packaging materials are distinguished with a high degree and low-degree of proactive behaviour. At the present time wood base materials are still required. The auxiliary packaging material is a part of the package. It ensures full functionality of packaging and fulfils specific packaging tasks. For example auxiliary

packaging material involves nails, adhesives, labels, corks, caps etc. (Dzurová, 1997 Kačenák 1996; Zeman, 2005).

From the marketing point of view, the packaging is one of the most important parts forming the product. Its size, shape, design, selected colour and font significantly influence the consumer decision-making process and thereby affect the marketability of the product itself (Kotler, 2001). In other words, packaging represents important competitive tool on the markets.

When creating product innovations, it is necessary to think about the product at different levels whereas each level increases its value to the customer. (Loučanová, 2016). Regarding the packaging innovation is necessary to monitor packaging functions and find out if it can be used also for another function than just the primary ones as security, handling and information function. Companies have to monitor changes in consumers' preferences and also focus on an attention to the new technology of packaging when introducing the packaging to the market.

There were changes in design about every 15 years, but now due to the fast development of the market environment and the impact of environmental pressure the companies should apply more creative approach to packaging. Therefore, the function facilitating recycling and reducing environment damages is becoming increasingly important to the packaging functions such as contain and protect products, promote products, and facilitate the storage, use and convenience of product. Traditional perception of packaging classifies the main functions of packaging into four basic categories: protection, communication, convenience and containment (Paine 1991, Robertson, 1993 In Yam et al. 2005, Paluš 2004, Šupín, 2009, Madudova et al. 2018), nevertheless, these functions are not totally exclusive – for example, the communication function of the package can also help to enhance food protection and convenience. The package is used to (Yam et al., 2005):

- protect the product against the deteriorative effects of the external environment,
- communicate with the consumer as a marketing tool,
- provide the consumer with greater ease of use and time-saving convenience,
- contain products of various sizes and shapes.

Based on the literature review, different authors deal with several ways of the packaging functions classification. For example, Zeman (2005) and Kačenák (2001) referred to 6 key function of classification: protection, guarantee, rationalization, economic, communication and ecological. Dzurová (1997) refers to the classification according to Schulte, who lists five functions, namely: protection, storage, transport, handling and information. According to Kollár (1999) essential functions are the protection, handling, information and publicity, environmental and economic.

The importance of packaging started to increase after the Second World War when the doctrine about packaging evolved from the empiric to the relevant scientific discipline. With the development of this discipline, other branches of science were interconnected, for instant discovery and invention of plastics (Kačeňák, 2001).

Plastics are substitutes of wood based materials and they are everyday part of our lives and we are in contact with them almost everywhere. Plastics are lightweight, long-lasting and their production is relatively cheap. One of the most important advantages is the low price of oil. Producers prefer to buy new raw material than to invest in recycling technology. This technology is not able one hundred percent guaranteed the quality. The largest producer of plastic materials is China where 39.5% of plastic production belongs to the production of packaging, 20.1% belongs to the building industry and 8.6% belongs to the car parts and electronic equipment production. The second place in the manufacture of plastic materials belongs to Europe. Association of Plastic Manufacturers "Plastic Europe" presents, that each year over 29% of the plastic waste is recycled in Europe. However, 31% of the plastic waste ends in landfills and more than 39% in incinerators. The level of recycling in the European countries varies. For example, the highest rate of recycling energy appreciation is in countries where the dumping site of plastic products is banned. Plastic Europe also states that Austria appreciates or re-uses up to 98% of plastic packaging. Germany, Netherlands and Sweden indicate similar standards. By contrast, in Slovakia just over 30% of plastic waste is recycled, 20% of waste ends up in incinerators and the rest in landfills (EUROACTIVE, 2016). Recycling of plastic packaging can save resources themselves as well as nature.

At present, recycling has been very popular in Slovakia as well as a solution to this problem since it is more favourable in economic terms and also facilitates their re-utilization. From January 1st 2016 a new Act came into force – Act on Waste No. 79/2015 and on amendments to certain acts. This Act governs programming documents for the waste management system, waste prevention measures, rights and obligations of legal and natural persons related to waste prevention and waste management, extended producer responsibility, etc. Thus, plastic packaging, which will be in color-coded containers will be re-used or energetically recovered. For instant, an impending fine of up to € 1,500 if a paper is disposed to the glass container. According to the new rules of this legislation, companies will fund the separation of waste and the collection of unseparated waste will remain as inhabitant's costs. This new approach should motivate residents to increase interest in waste separation because the proportion of sorted waste will be higher. The above-mentioned approach will have an influence on the lower ratio of residents reimbursed costs to producers (Aláčová, 2015). According to above mention hypotheses wood as renewable and ecology material has a lot of advantages and it is necessary to prefer it as material in the packaging industry. The key benefits of wooden packaging are a lifelong natural product with great design variety. We have to mention that wood has individual character, underlining quality awareness. It is a renewable, resource-friendly raw material that behaves completely CO_2-neutrally in. In general wood is used at all levels of transportation. Wood crates are one of the best materials for packaging. They are self-supporting structures that are the ideal choice for shipping various products, especially lightweight or breakable items. The advantages of wooden crates are that can be manufactured and repaired locally. Wood is relatively resistant to different weather conditions and is often used on more than one journey (Mujtaba, 2015).

Packaging is the result of creative, unconventional thinking outside the usual framework of thought (Yam et al., 2005). The result of an innovative approach to packaging is the creation of packaging with interactive features. Actually two groups of such packaging systems are distinguished: intelligent and active packaging. They focus to improve packaging functions to meet current consumer demands, increased regulatory requirements, as well as increased interest in security (Fig. 1).

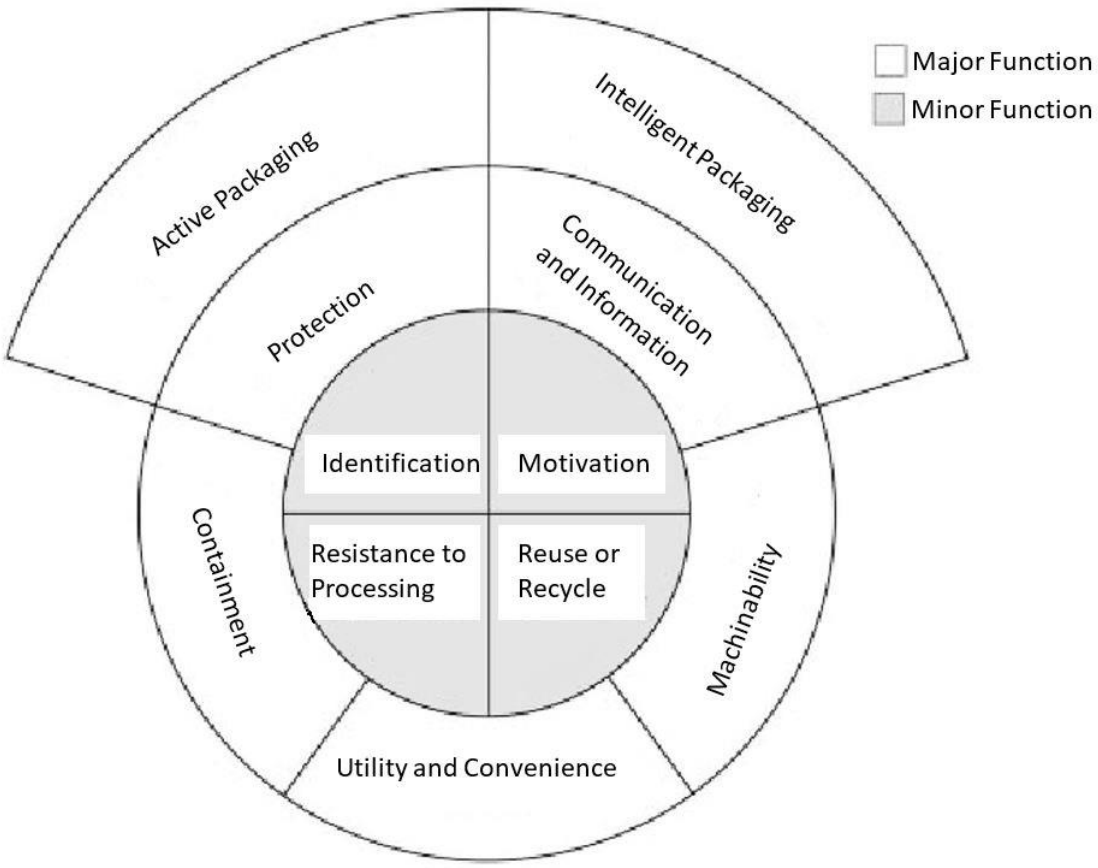

Figure 12.1. Model of packaging functions
Source: JANJARASSKUL, Theeranun; SUPPAKUL, Panuwat. Active and intelligent packaging: the indication of quality and safety. Critical reviews in food science and nutrition, 2018, 58.5: 808-831.

The perception of functions, namely, the protection function of packaging has been shifted from passive to active. In the traditional way of understanding the protection function means a passive barrier between the product and its environment. (Yam et al. 2005). Active packaging is able actively adapt the condition of the package to extend shelf life or improve product safety, while maintaining the quality (Kačeňák, 2001). Following the definition of active packaging materials, we group them according to affect the characteristics of the product as follows: absorbers – active packaging systems based on absorption and emitters – active packaging systems based on the release of substances (Sosnovcová, 2008).

Intelligent packaging represents a system that is efficient of carrying out intelligent functions (such as detecting, sensing, recording, tracing, communicating, and applying scientific logic) to facilitate decision making to extend shelf life. This new systems enhance safety, improve quality, provide information, and warn about possible problems (Yam et al., 2005). According to Kačeňák (2001), intelligent packaging is the term for systems that monitor conditions around the product and provide information about the quality during transport and storage. The time-temperature indicators, indicators of oxygen and carbon dioxide, the temperature indicators, pathogen indicators and breakage indicators are distinguished (Sosnovcová, 2008).

The importance of active and intelligent packaging means mainly significant expansion of two packaging functions: protective function – especially in active packaging shift from passive to active protection and information functions – especially as intelligent packaging providing information monitoring the packing conditions. According to Loučanová et al. (2016) the requirements of customers to the innovation of packaging functions are as follows: the majority of respondents expect the packaging to be ecological and to fulfil principally information and protection function. The companies should orientate mainly to these functions and innovate the packaging to be easily biodegradable in the nature, produced from friendly, recyclable materials, ensuring high degree of protection of the products as well as consumers. Potential customers are more and more demanding information of product composition, quality, date mark and durability, thereby the companies should respond by that kind of innovation to meet these requirements. Regarding that research (Loučanová et al., 2016) the target group for packaging innovation represents the age category from 41 to 50 years according to their highest innovation status. This age category recognizes its own requirements in purchasing and selecting products and it considers protection and information function as the main important and ecological function as attractive. These approaches confirm the needs of intelligent and active packaging in terms of required packaging functions and therefore innovative packaging thus respond to the current market requirements. On the other side, there is a question, how new innovations focused on intelligent and active packaging final consumers would accept.

12.2. METHODOLOGY

The approach of the research tries to identify the perception of packaging innovations in terms of the functions. A method of the Kano model is applied to understand how final consumers will accept these new features. The principal scope of the Kano model is to capture customers' opinion according to the requirements of an observed object (Goodpasture, 2003).

The study comes true the follows steps:

- identifying individual functions of innovation (questionnaire),
- analyse of questionnaire for gathering specifiable information,
- mathematical and statistical evaluation,

- display the results in a matrix of innovations perception in terms of the functions.

The first step represents market survey by the questionnaire, which provided concrete questions–statement collected data will by apply for KANO model. The survey was conducted through electronic forms as well as by personal questioning. For preliminary research the sample of respondents was set at 120 respondents. However, we kept the same proportion of respondents for each given age category. The questionnaire always consist pairs of positively and negatively conceived statements. For the question the Likert scale is applied. Each statement can be evaluated on a scale from 1 to 5. The higher number represents stronger agreement or strong disagreement based on the draft.

Received responses are evaluated according to the cross rule (Figure 2). According the KANO approach, the responses are subsequently evaluated by two-factor analysis based on age categories. From the point how respondents perceive new packaging, the findings were included in the following categories:

- M – are obligatory requirements that customers consider as normal and are automatically expected. These requirements can be identified as primary or basic and therefore. They only deal with customers in the event of non-compliance.
- O – are one-dimensional requirements that are represented by those product attributes that lead to fulfilment and satisfaction in the event of non-compliance to customers dissatisfaction.
- A – are attractive requirements that have a clear impact on customers satisfaction because it is a requirement that customers did not expect.
- R – are contradictory or reverse requirements in some literature (Loučanová, 2016).
- I – are requirements which do not have any influence on customers. They are also called irrelevant requirements.
- S – are sceptical requirements (Grapentine, 2015).

The Kano model is able to divide the monitored packaging functions into categories of mandatory, attractive, indifferent and reverse functions.

Subsequently, we applied the comparison analysis to identify and measure comparable data. The analysis identifies the differences between customers' perceptions of active packaging functions and perceptions of intelligent packaging functions. According to packaging functions definition by Yam et al. (2005) we considered expansion of protection and containment function as a nature of active packaging and the expansion of communication and convenience function as a nature of intelligent packaging.

Based on the customer requirements, the comparison analysis was applied by Kano model. Following about mention analysis, the weight of requirements were assigned. Each identified requirement is market by value 1 and is multiplied by weight according to identified category. In case: "M" obligatory requirements weight is 3, "A" attractive requirements have weight 2, "O" one-dimensional requirements have weight

1, “I” indifferent requirements or not having an impact have weight 0, “R” contradictory requirements have weight -1, “S” sceptical have weight -2 in different age groups and their sum (Loučanová, 2014, 2015; 2016). Based on the sum of values, we are able compare perceptions of active and intelligent packaging functions by consumers and we identify the target age group for active and intelligent packaging.

		Answer to the Dysfunctional Question				
		Like	Acceptable	No Feeling	Must-be	Do not like
Answer to the Functional Question	Like	Q	A	A	A	O
	Acceptable	R	I	I	I	M
	No Feeling	R	I	I	I	M
	Must-be	R	I	I	I	M
	Do not like	R	R	R	R	Q

Legend:
O: One-dimensional Evaluation
A: Attractive Evaluation
M: Must-be Evaluation
I: Indifferent Evaluation
R: Reverse Evaluation
Q: Skeptical (considered to reflect a mistake)

Figure 12.2. The Kano Model
Source: Grapentine, 2015, Ducár et al., 2006

According to collected data, the modified typology matrix of packaging innovations perception is created. The matrix describes two essential factors: different age groups and innovative status. The status is determined based on the results of the market survey. It represent a sum of the identified requirements imposed on the new packaging by their functions according to the assigned weights as indicated by Loučanová (2015, 2016, 2017). The significance of the identified requirements influence for new packaging according to their functions is defined as the weighted average of the identified requirements percentage. According to above mention analyses, the conclusion describes the phenomenon of perception of wood base packaging innovations in terms of their specific functions.

12.3. RESULTS AND DISCUSSION

Under the influence of global changes and improvement, considerable changes are apparent in the attitudes toward packaging materials. The consumers' approaches to the product packaging and favourite functions are changes as well. Innovative packaging is the output of original, unconventional and creative thinking extending beyond the ordinary thinking limits. The study describes a perception of smart packaging as innovation. We focused on evaluation of availability, functionality and

other requirements by using the Kano model. The hypothesis based on the assumption, that new products do not have equal success in the market (Chukhray, 2012). Some products are accepted by consumers almost immediately, whereas others need much time to get consumers' appreciation. Even a very successful innovation can end in failure because consumers are unaware of it (Garcia-Torres, 2009).

The results of our research indicate that smart packaging has various impacts on consumers in different age categories (Table 1).

Table 12.1. The smart packaging perception in different age categories and the innovation status

Age / Parameters	**15-26**		**27-40**		**41-60**		**61 and more**	
Concept of intelligent and active packaging	A	2	A	2	I	0	R	-1
Availability	I	0	I	0	I	0	I	0
Awareness	R	-1	I	0	R	-1	R	-1
Functionality	O	1	I	0	I	0	I	0
Voice performance	I	0	I	0	I	0	I	0
Attractiveness of packaging	I	0	I	0	I	0	I	0
Advertisement	I	0	I	0	I	0	I	0
Freshness indicators	Q	0	Q	0	Q	0	Q	0
Price	I	0	R	-1	I	0	R	-1
Innovation status		**2**		**1**		**-1**		**-3**
Age / Parameters	**15-26**		**27-40**		**41-60**		**61 and more**	
Concept of intelligent and active packaging	27,84	2,00	40,52	2	34,68	0	35,15	-1
Availability	54,12	0,00	41,52	0	56,1	0	49,7	0
Awareness	49,13	-1,00	43,28	0	86,74	-1	61,74	-1
Functionality	28,20	1,00	54,75	0	6,82	0	35,33	0
Voice performance	47,24	0,00	61,24	0	57,58	0	56,1	0
Attractiveness of packaging	45,74	0,00	50,15	0	49,7	0	35,15	0
Advertisement	47,10	0,00	57,25	0	49,09	0	57,58	0
Freshness indicators	37,14	0,00	31,55	0	35,15	0	41,82	0
Price	48,42	0,00	52,79	-1	53,33	0	57,36	-1
Factor size		**3,86**		**3,14**		**-9,64**		**-17,14**

In Slovakia the consumers´ awareness of smart innovations is still very low. Consumers do not positively evaluate these features. This fact is apparent in particular from the frequency of identified irrelevant (I), questionable (Q) and reverse (R) requirements by the Kano model (see Table 1).

The positive perception and attitude to the concept of smart packaging is evident in the age category 15 to 26 and then 27 to 40 years. For these consumers smart packaging is interesting and attractive. On the contrary, the innovations are differently perceived by the elderly respondents. The age categories 41-60 and especially older respondents are specific by experiencing such innovation with negative satisfaction. With increasing age the innovation status shows a downward trend, see. Figure 3.

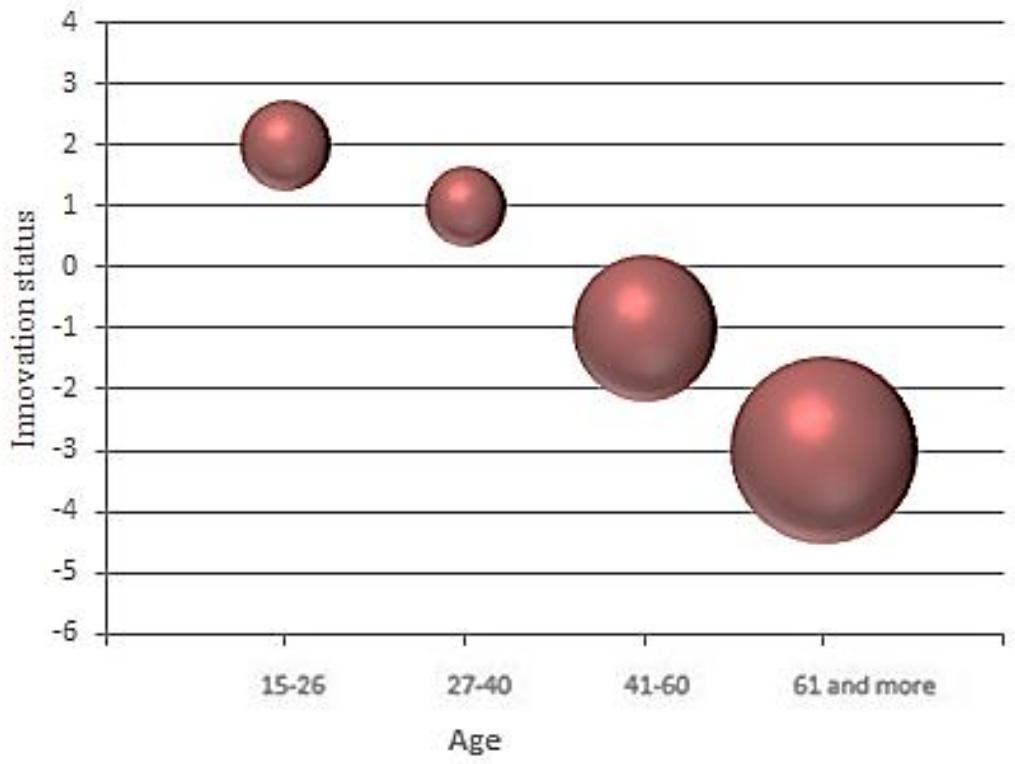

Figure 12.3. A typology matrix of smart packaging perception by respondents in Slovakia (2019)
Source: Research results

Nevertheless the research results indicate low understanding of smart packaging. The figure 4 describes the innovation status development according to the annual change for the years 2018 and 2019.

Continuously for the youngest monitored age categories (15-26 years and 27-40 years), smart and active packaging is still attractive. While retaining the innovation status at the same level, the impact of smart and active packaging has been changed. It signifies the acceptance of this innovation by a still larger percentage of consumers in above mentioned age categories. Constantly for these age groups, this kind of innovative packaging is still attractive with clear positive impact on customers' satisfaction.

Nevertheless, the innovation status of smart packaging in the age category 41 years and older is still negative. These changes indicate gradual increasing of awareness about active and smart packaging issues by elder people.

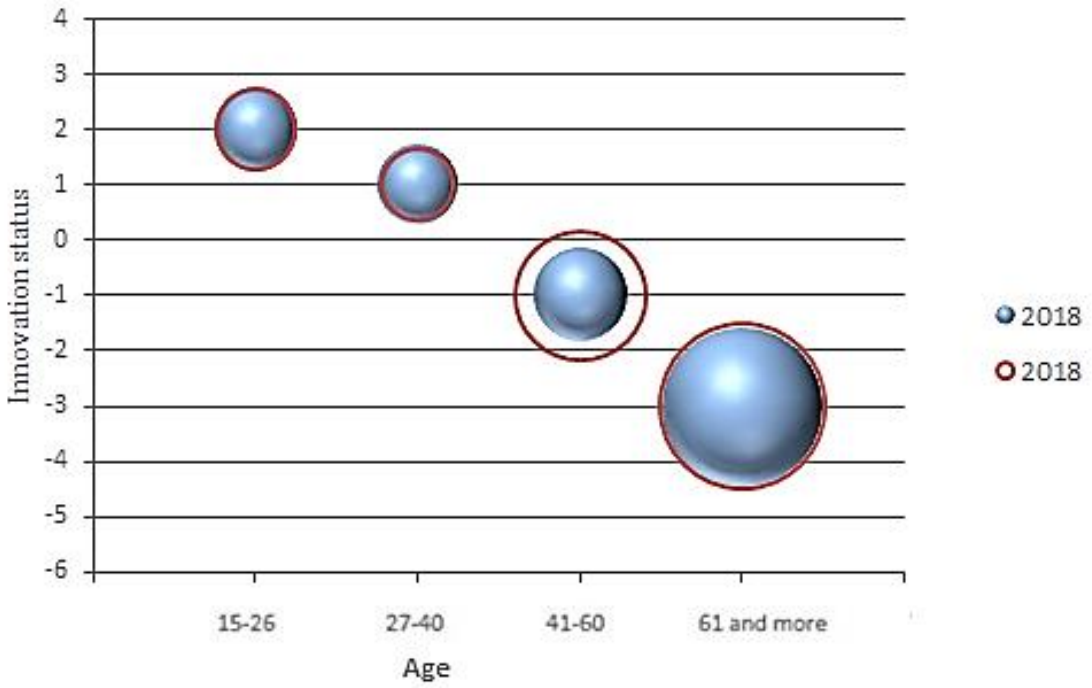

Figure 12.4. A typology matrix of smart packaging perception by Slovak respondents – the annual change 2018-2019
Source: Research results

The results comprehensively point to a positive shift in the evaluation of smart packaging by Slovak consumers. In the last age group same as in the first categories respondents identified only one of the packaging functions as important, namely innovations of handling functions. Therefore, companies should focus on new packaging that would simplify product handling. Although their innovative status is low, simplify product handling has the biggest impact on this target group. We can consider it as the key factor for buying a product. It has a clear effect on the satisfaction of these age category. As Lesáková (2012) mentioned the reason is related to the type of transport because a significant share of consumers using their own transport to shop with higher age gradually decreases. The respondents in this age group are becoming dependent on assistance when they come to the purchase. According to her research the increasing age is associated with increasing mobility problems of older people.

In terms of management aspects smart packaging to based wood from the customer's perspective are need to be upgraded according to different age categories. This can then be reflected in the performance of companies and their investment decisions as stated Balteş, Dragoe,Adelean (2014); Ipate, David, Ipate, Bogdan, (2015); Regattieri, Santarelli, Gamberi, Mora (2014) and Borlea, Mare, Achim, Puscas (2016).

12.4. CONCLUSIONS

Companies on the market looking for competitiveness advantages to successful establish itself on the market. During last period, many different approaches were applied. One of the best ways is innovation. Many a time innovation in packaging is optimal way. That is why the paper analyse new possibility to find gaps on the market and how consumers accept these innovations. Based on the Kano model, results show requirements for new packaging in terms of all elemental functions. We identified all of them, in particular handling, preservative, informative, economic, environmental, promotional and ecological functions of packaging. The Kano model indicates the main target group for the new packaging innovations are consumers in age categories from 41 to 60 years. They have the highest needs for packaging innovation given the highly innovative status. However, not all packaging functions are interested for them. This target group mostly (the older generation) requires innovation of the handling function of packaging. On the other side, they have a low innovative status with significant influence on their purchasing decision.

Finally, we can conclude that all age categories of consumers require ecological innovation in packaging and applying wood as renewable material.

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13. QUALITY ECONOMY

Anna Šatanová

13.1. INTRODUCTION

Quality as one of the most important sources of economic efficiency has effects on business performance in the short term, and its long-term impact on the prosperity of the organization is also of paramount importance. Quality is one of the intensive properties of an organization's economic development contributing to its return. This has already been recognized by many successful companies, and quality has become the primary source of profitability and success of their business. The following sections of this chapter will outline the different approaches and basics of how to examine quality impacts on an organization's economic performance.

The practical benefits of traditional economic quality analysis are:

- Reducing the amount of scrap
- Reducing the cost of warranty repairs, claims and other unproductive activities
- Not providing an additional discount on the sale price of a product
- Avoiding the loss of customers

13.1.1 The essence of quality economics

At present, quality is an important tool for maintaining and enhancing the competitiveness of every organization and sector of the economy. The economic strength of an organization is also determined by the quality of production process, based on the volume of sales and prices of the products of a particular organization. By organizing a certain minimum level of quality of its production at a specific time, organizations can guarantee its stability and secure its existence and future economic development. Otherwise, if the required quality level is not met, the survival of an organization may be uncertain.

Another important factor that works and attributes importance is time. In the past when the markets were relatively stable and there was no fierce competition between businesses, the production process had enough room to improve and look for deviations from the required quality level. However, the increasing role of competition has played a significant role in the costs that have had advantages or disadvantages compared to competition, and have had a significant impact on the pricing policy of organizations. This fact changed the view of organizations themselves on meeting the needs of its customers, to which they always need to react flexibly.

Under the changing market conditions, there has been another change in preferences and customer desires that focus on multifaceted quality aspects. The price of a product has become a key component of value-for-money.

From all aspects of assessing the importance of quality for an organization, the perception of quality as a permanent source of profitability in business can be considered as the most important. In this case, it is important to know that 2 different factors are involved in the profitability and overall prosperity of a business.

The profitability of entrepreneurial activity is determined by rapid and intensive properties of development, while extensive properties are sources of economic development such as land, labor, capital, machinery and equipment, for which it is necessary to spend money. On the other hand, in the case of intensive properties of development an organization gains a higher effect from resources that already belong to it, including education, knowledge and knowledge acquired by research, scientific activity and its own creativity (Leščišin, 2001).

In the historical development of assessing economic aspects of quality, the trend of monitoring benefits has been around since the early 1990s. The main objective was and still is to highlight the economic benefits and quality effects of a company's economy (change in sales, growth of market share, long-term production potential, stable customer base), because informing management about the amount of costs related to quality is not enough.

The essence of quality economics can be summarized in a simplified manner based on the analysis of the behaviour of the manufacturer and the user resulting from Figure 1.

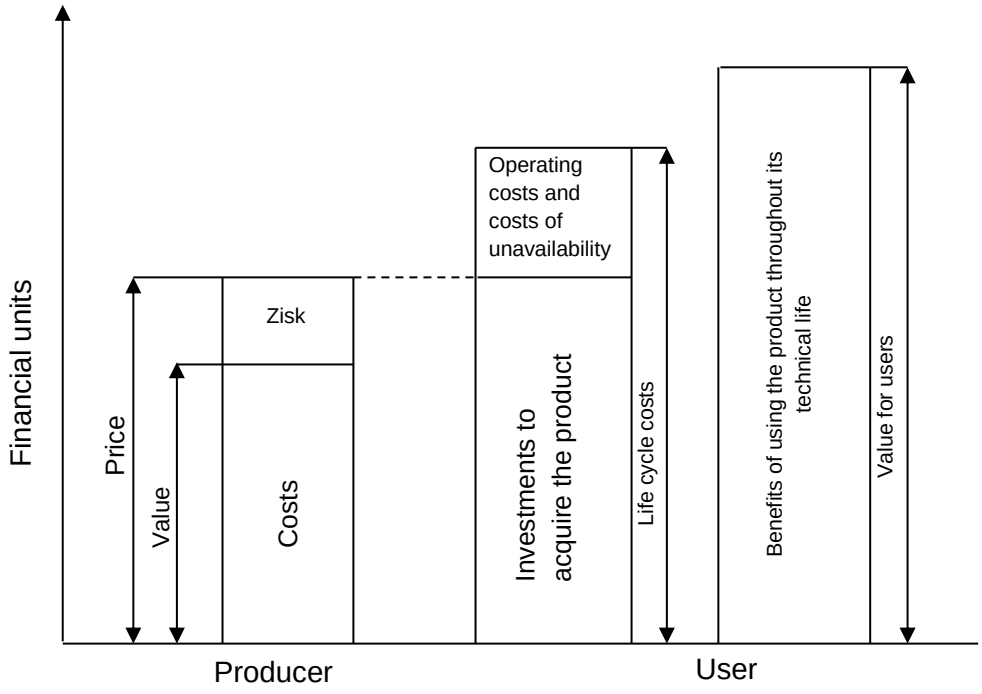

Figure 13.1 The essence of quality economics
Source: own processing

The basic price for the buyer will be the price of the product. From the perspective of the producing company, this includes the value it put into the product, the material used, the wages paid to its employees, depreciation of the material and non-material security of the company and indirect costs, and we collectively call this costs. Because all entities in the market are dependent on achieving a certain value, a product's sales price is always a quantity called a profit.

From the buyer's point of view, the price is a one-time investment expense that is needed to acquire a product, where the user has to spend money. By buying the product, the process of its use will continue to entail costs as a result of its natural wear and tear. This group of costs is referred to as life-cycle costs (one-off investments, operating costs, disposals), and they are not negligible.

However, what is most important is that the advantage and total benefits gained from the purchased goods exceed the total life-cycle costs of the product over its useful life. When examining the quantities mentioned above, we find that the quality is not clearly expressed in either case. The experience and theoretical knowledge of many authors, however, point to the fact that each quantity influences quality significantly and differently. Its impact on economic results is clear and quantifiable both for the producer and the customer, and it therefore cannot be limited to passive monitoring of costs associated with quality in terms of quality economy, it needs to be transformed into the following areas (Čierna, 2006):

- "Monitoring and evaluating quality costs (including life-cycle costs),
- monitoring and evaluating the effectiveness of quality,
- pricing products based on their quality,
- monitoring and evaluating the performance of the quality management system."

After summarizing the acquired knowledge, it is possible to define the basic function of the quality of economy, which, according to Nenadál (1995), is to "*allow the quantification of the necessary funds for planning, regulation and quality improvement, to record significant benefits and to evaluate the economic efficiency of quality assurance at an enterprise level*."

We also draw on the fact that the value of a product is given by its quality to price ratio. The value is then determined by how many units are sold on the free market. The driving force behind the market economy is the fact that the value provided for which the customer is able to pay must be higher than the cost of obtaining the product, which should determine the lowest possible price. On the other hand, product quality should determine the highest price the customer is able to pay. This is where the question what we actually mean by the " value for the customer" arises. Gale (1994) briefly and comprehensibly defines this term when he asserts that the value for the customer *H* is the value perceived by the customer as a defined quality level *K* that he has obtained on the market at an acceptable price *C*. We can therefore say that the value is always two basic elements: quality and price (see the following Figure).

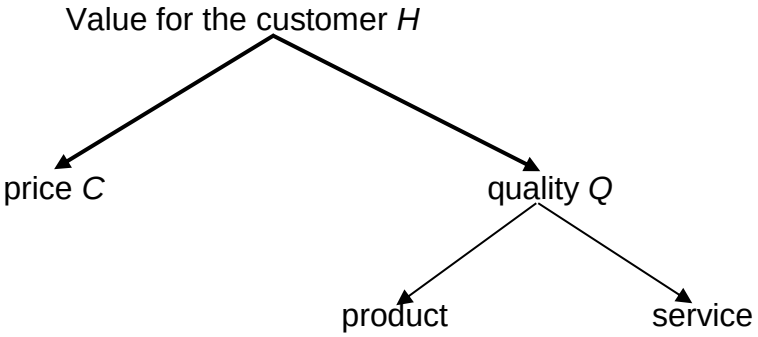

Figure 13.2 Value elements for the customer
Source: Nenadál (2001)

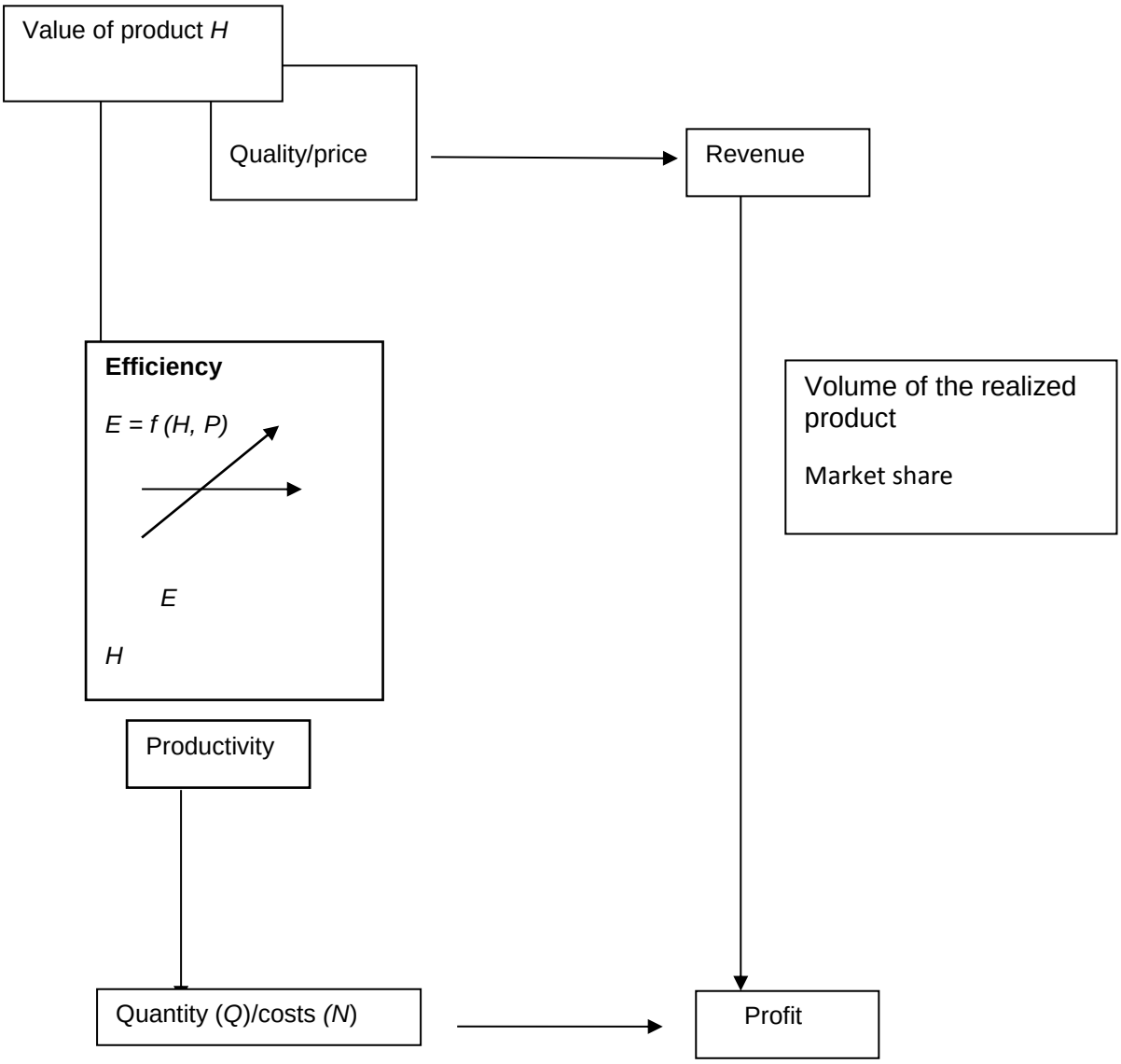

Figure 13.3 Effectiveness of products and production
Source: Šatanová (2004)

13.1.2 Characteristics of quality costs

In general, costs are an expression of the consumption of production factors (land, labour, capital) for the creation of business performances, and they arise during the consumption of these factors. In the case of quality costs, we mean "*the amount necessary to ensure quality and cover losses from poor production*" (Mateides, Strašík, 2004). Profit stemming from quality assurance arises as a difference between the revenues from the sale of quality production and the costs incurred to implement it. These costs are part of the total enterprise costs and contribute significantly to their amount. According to the EOQ, quality costs are defined as "costs incurred by the manufacturer, user and company associated with the quality of a product or service" (Mateides, Strašík, 2004). In general, their breakdown can be applied as shown in Figure 4.

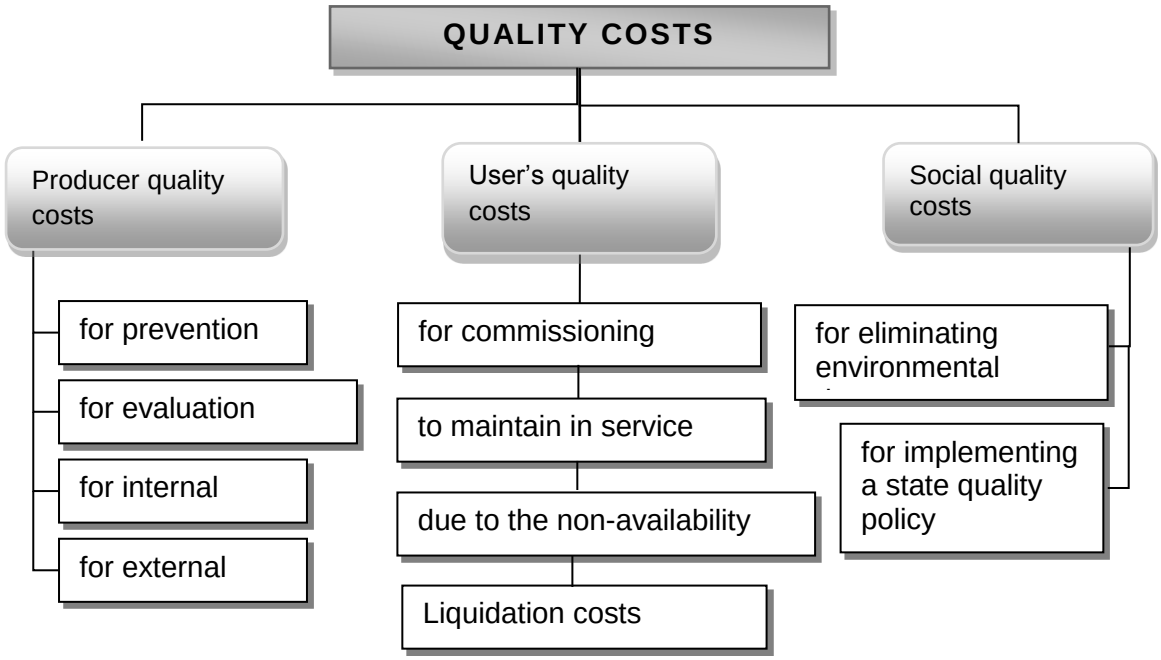

Figure 13.4 Breakdown of quality costs
Source: Mateides, Strašík (2004)

From our corporate practice, we know that by improving the level of quality we have achieved a sufficient reduction in quality costs as well as production costs many times. However, high-quality production does not only bring down costs, it also causes price shifts. For the customer, this means that they will purchase the goods at a higher purchase price, but the corresponding consumer operating costs and any loss of disposability will be reduced. The manufacturer must be aware of these costs in order to determine the sale price.

13.1.3 Quality cost monitoring models

The content of the total cost can be specified through several breakdowns using the following models:

- PAF model
- COPQ
- Process cost model
- Life-cycle cost model

The basic differences between the models are shown in Table 1.

Table 13.1 Basic differences between quality cost models
Source: Nenadál (2001)

Model / Costs	PAF model	COPQ model	Model of process costs	Life-cycle cost model
Internal losses	×	×	×	×
External losses	×	×	×	×
Cost of evaluation	×		×	×
Prevention costs	×		×	×
Lost investments and opportunities		×	×	×
Environmental damage		×		
Cost of user quality				×

The PAF model is a classic model for quality costs (abbreviation of prevention, appraisal, failure). This cost group arises and is recorded exclusively by the manufacturer. The breakdown into 4 core groups allows you to keep track of how the costs of prevention and evaluation are appreciated by reducing the cost of errors. This has been a standard model in the United Kingdom since 1990. It is the most used model.

The manufacturer's quality cost tracking model is an appropriate support tool for strategic business decisions. It is used as a comprehensive model within the internal quality management system, and its basic source of information are accounting records. It provides an overview of the costs incurred according to type, and it is primarily used by top and middle management in managing quality costs. The disadvantage of the PAF model can be mentioned in the controversial calculation of the cost of a produced piece and its insufficient information on the effectiveness of the activities performed.

The breakdown of the manufacturer's quality costs is as follows:

a) Prevention costs
b) Appraisal costs

c) Internal failure costs
d) External failure costs

a) Costs to prevent deficiencies (NP)

These are costs of a business spent to prevent errors, poor quality and nonconforming products, as well as for the improvement of quality through corrective actions. This cost group includes planning and forecasting costs, documentation, various quality analyses, education, quality of material and human resources.

b) Quality assessment costs (NH)

These costs incurred due to the process of evaluation, testing and quality research. This always consists in examining whether the necessary quality is maintained in relation to the customer's standards or requirements. This includes the cost of purchasing and ensuring the availability of measuring equipment, the cost of certification, the operation of business premises, etc.

c) Costs of internal errors (NI)

There are intra-company costs resulting from the fact that production does not meet the quality requirements before delivering to the customer as a result of errors in its performance. Consequently, activities such as repeated production, reprocessing, product testing and the like are carried out to eliminate these errors.

d) Costs of external errors (NE)

These costs only arise after production and delivery to the customer. They show up during the use of the product by the customer, and the cost of external mistakes the organization’s response to the quality of a product that the customer is dissatisfied with. This includes complaints, warranty service, discounts on non-standard quality products and the loss of markets and customers, which is a big economic loss for an enterprise (Mateides, Strašík, 2004).

The manufacturer’s quality costs can be quantified based on the already known relationship:

$$NQ = NP + NH + NI + NE, \qquad (1.1)$$

where:
NP are the costs of prevention
NH are the costs of evaluation
NI are the costs of internal losses
NE are the costs of external losses

The manufacturer's quality costs (NQ), depending on the quality level acieved, is illustrated in Figure 5. "It is clear from the graphical representation that an improvement in quality can be achieved with a total cost reduction, as investment in prevention and quality assessment (NP + NH) will make a significant contribution to reducing the cost of non-compliance (NI + NE)." (Šatanová, Gejdoš, 2007)

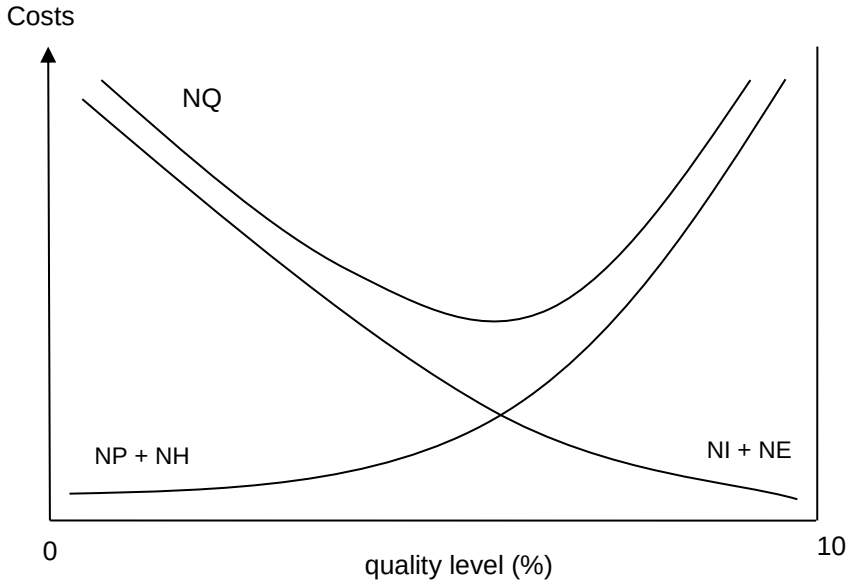

Figure 13.5 Course of the manufacturer's quality costs depending on the level of quality
Source: Šatanová, Gejdoš (2007)

Based on the experience we have gained, we can predict the likely development and cost structure of the NQ producer (Figure 6). The individual stages represent the stages of building quality systems.

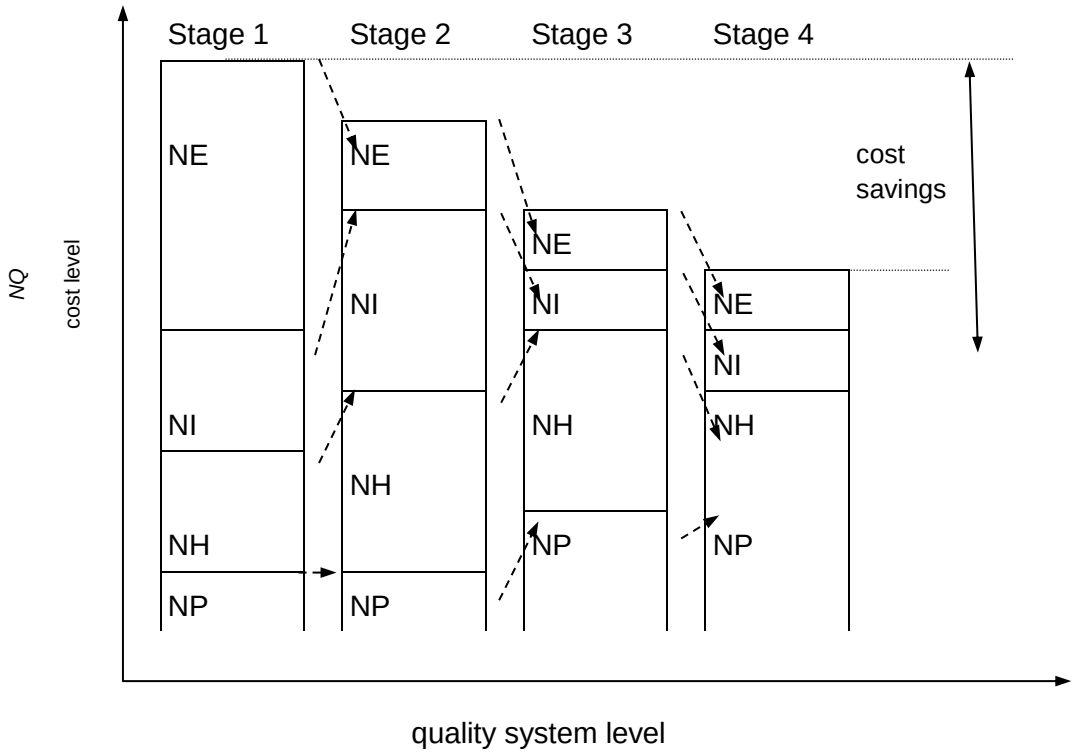

Figure 13.6 Prognosis of the development of manufacturers' quality costs
Source: Šatanová, Gejdoš (2007)

Stage 1: The interest in quality is minimal. The manufacturer offers high-quality products, which is mainly reflected in the high cost of external mistakes.

Stage 2: Business leadership focuses on output control during quality assurance.

Stage 3: Quality management is based on rigorous inspection throughout the entire production process, and preventative action is still inconsistent.

Stage 4: The quality management system implements preventive measures across the enterprise.

The Cost of Poor Quality (COPQ) model assumes that failure to meet requirements always causes significant economic losses to manufacturers. The uniqueness of the model lies in its focus on monitoring non-productive losses. The COPQ quality cost monitoring model is based on the PAF model. It was created by H. James Harrington in 1987, who defines low cost (COPQ) as costs spent on enabling workers to do their jobs flawlessly and provide acceptable work results (Mateides et al., 2006).

Compared to the PAF model, this model provides a wider view of the cost of quality, introducing a new group of costs incurred by the purchaser after the product is purchased during its use – indirect costs (low quality costs of manufacturers result from a product not corresponding with its specification), while pointing to a cost item that is not directly involved in the growth of product quality.

In practical use of COPQ, costs are divided into 2 groups as direct (controllable, triggered and conditional) and indirect (consumer, expense due to customer dissatisfaction and loss of reputation) costs.

The COPQ model is used in the case of quality cost analysis similar to the PAF model, its application is particularly significant from a strategic point of view (it offers a top-quality management structure a clear cost-quality structure), whereby reducing low-quality costs achieves positive economic effects. It is often used in large-scale production and especially in the production preparation stage.

Another model, shown in Table 11, is a cost process model that does not follow costs associated with products but with processes, i.e. a set of activities that change inputs into outputs. Its nature corresponds to the TQM concept, which includes process orientations among the basic principles. At the time of its inception when it was introduced in 1992 as the UK's BS 6143, Part 1, the philosophy of this standard was considered a vision of the future, and its applicability has not found a place anywhere in the world, not even Britain. Currently, when comparing the cost process model with the PAF, the process model represents a higher level of cost monitoring, and incorporating TQM concept principles into the ISO 9000 series takes on its importance in process-oriented quality management systems.

The model distinguishes between 2 basic subsets of expenditure (Čierná, 2006):

- Cost of Conformance is the "real cost of converting inputs into outputs in accordance with process-specific regulations in the most effective way." This group represents the minimum cost necessary for the implementation of a process, and its identification is associated with excellent knowledge of the normative basis of process management (standards of time and material consumption, ...).

- Cost of Nonconformance is the "cost of time, materials and capacities lost associated with receiving, processing, dispatching, and repairing the mismatched process result." These are all costs that exceed the cost of compliance and are the primary source of achieving greater efficiency of processes; they are also a potential source of savings.

The main purpose of introducing and using the process model is to monitor the total cost of a predefined process to eliminate the cost of non-compliance and streamline processes. This is an unconventional approach that does not apply to PAF's cost of prevention and evaluation being cost of conformance, and the cost of errors is the cost of nonconformance.

The Life Cycle Model model is used to track user costs. It is the total cost of the user to purchase and install a product, and throughout its lifetime. The model assumes that the cost of the product includes the manufacturer's quality of the product, and it is the only model that focuses on the user's costs.

This model is most often used to track the cost of products with a service life longer than 1 year, and where a significant proportion of the total cost is operational in relation to acquisition investments. Despite the many difficulties in its application, it is positively rated due to the need to monitor costs not only during the production phase, but also after the subsequent delivery through the customer's use to the actual disposal of the product.

The role of this model is to support strategic decisions of the company's top management with respect to the entire life cycle of a product. The incentive to implement it is the fact that an enterprise can significantly reduce the costs associated with operating, maintaining and servicing a product. Another real incentive to apply this method is the cost of high energy consumption, where it is possible to reduce operating costs while increasing the cost of ownership as well as the service life. In addition to this, it is important for large investment establishments to create a favorable ratio between the level of total investment and the expected lifetime, which is important from the perspective of the manufacturer for determining the warranty period. Another case where it is appropriate to use this model arises in connection with high initial investments, which usually carry the same expense over the lifetime. Last but not least, the purpose of this model is the cost of disposal in relation to environmental protection.

The importance of monitoring life cycle costs can be summarized as follows (Nenadál, 1995):

1. "When a product is being designed, the possibility of influencing the characteristics of its use that are relevant to the overall cost of its life cycle,
2. the possibility of comparing different product design alternatives, where the criterion of convenience is the minimum cost of the life cycle,
3. life cycle costs are an important component of the design review stage."

13.2 PROPOSAL OF A METHOD OF EVALUATION (MEASUREMENT) OF THE COST OF QUALITY

In order to evaluate cost-related information, it is appropriate to use ratios or statistical or analytical tools. The most used relative indicators include (Šatanová, Gejdoš, 2007):

1. Cost of manufacturer's quality per euro of the gross turnover (HO):

$$i_1 = \frac{NQ}{HO} \qquad (1.2)$$

1. Cost of manufacturer's quality per euro of total ownership cost (UVN):

$$i_2 = \frac{NQ}{UVN} \qquad (1.3)$$

Production with high material intensity reduces the ability to provide this indicator.

2. Indicator of the proportion of the manufacturer's cost of quality in added value (H_p):

$$i_3 = \frac{NQ}{H_p} \qquad (1.4)$$

H_p is the added value that includes wage costs, social security costs, taxes, levies, profits and depreciation.

3. Manufacturer's cost of quality per euro of unit wages:

$$i_4 = \frac{NQ}{JM_{Z_{HOD}}} \qquad (1.5)$$

This indicator is appropriate if the production of a product is demanding in terms of staff, taking into account the effort for automation.

4. Cost of manufacturer's performance per euro of unit wages:

$$i_5 = \frac{NQ}{JM_{Z_{eur}}} \qquad (1.6)$$

This indicator is less dependent on the degree of automation, but it is heavily influenced by the inflation index.

5. Cost of manufacturer's quality per unit of production (JV):

$$i_6 = \frac{NQ}{JV} \qquad (1.7)$$

This indicator is suitable for large-scale production and for a small number of product types.

6. Manufacturer's cost change index NQ:

$$i_7 = \frac{NQ_1}{NQ_0} \qquad (1.8)$$

where:

Q_0 are the manufacturer's total quality costs over period 1,

Q_1 are the manufacturer's total quality costs in period 0 immediately preceding period 1.

7. Share of manufacturer's quality costs for revenue T:

$$i_8 = \frac{NQ}{T} \cdot 100\ \% \qquad (1.9)$$

where T is the sales volume of the enterprise, which is given by the sum of the prices of realized performances in the monitored period.

8. The proportion of the producer's quality costs in income P_{PR}:

$$P_{PR} = \frac{NQ}{P} \cdot 100\ \% \qquad (1.9)$$

where P is the total revenue from realized outputs obtained during the quality cost monitoring period.

9. Other ratios that consider the percentage of each component of the manufacturer's quality costs to the total cost of quality:

$$k_1 = \frac{NP}{NQ} \cdot 100$$
$$k_2 = \frac{NH}{NQ} \cdot 100$$
$$k_3 = \frac{NI}{NQ} \cdot 100 \qquad (1.10)$$
$$k_4 = \frac{NE}{NQ} \cdot 100$$
$$k_5 = \frac{NI + NE}{NQ} \cdot 100$$

User’s cost of quality (N_{CU})

These are costs that are not directly identifiable but are incurred over the life cycle of a product. These are broken down into:

a) Costs incurred by a user (NU) if the function of the product does not meet his requirements
b) Costs incurred as a result of customer dissatisfaction (NZ)

The issue of customer satisfaction with a product or service is essentially binary: satisfaction yes, no. Customer dissatisfaction can be defined as the dependence of loss of revenue on quality. In connection with customer dissatisfaction, it is important to realize that their requirements for product quality have an increasing tendency. This means that the customer is satisfied with a product or service within a given time horizon, and in a subsequetion period he will no longer be satisfied due to increased requirements for product quality.

c) Costs resulting from the loss of goodwill (NM)

The difficulty and complexity of expressing the cost of quality is most evident in the cost of a manufacturer losing his good reputation, which greatly affects overall costs due to low product quality. The specificity of these costs is that they do not only apply to individual products or the type of the company's products, but they express the customer's approach to the whole business.

d) Costs of disposal of a product (NL)

The total cost of the user can then be expressed as follows:

$$N_{CU} = C + NÚ + NZ + NM + NL, \quad (1.11)$$

where:
C is the price of a product or service.

Social costs of quality (N_{CS})
These are the least known costs even in advanced Western states. In the future, however, they will form an important part of the total cost of quality, mainly as a result of the elimination of environmental damage, so entrepreneurs must also consider them.
The social costs of quality can be expressed in terms of:

$$N_{CS} = \sum_{i=1}^{n} NU_i + NŽP \quad (1.12)$$

where:
NU_i is the total cost of the i-th user,
n is the number of users,
NŽP are costs and damages due to the negative impact of the existence of products on the environment, which are financed from all sources of society, e.g. the production of ecological facilities, expenditures for the removal of damages to the health of the population, expenses for waste disposal, etc.

Example 1

Suppose an enterprise produces 100 products per day. The range of nonconformity in production is 8% on average, with half of nonconforming products being unrecoverable. The product price is 600 € per 1 piece. The average cost of repairing one nonconforming product is € 114. Other production costs are € 562 per 1 piece. The company's management decided for alternative 1 next year – to increase productivity by 5%. Traditionally, an increase in production to 105 per day resulted in an increase in the average number of nonconforming products to 9 pieces. The number of identical products per day increased, but not by the required 5%; the main target was not met because productivity increased by only 1%.

Let us now consider alternative 2 – increasing productivity by reducing nonconforming products by monitoring, evaluating and lowering the cost of quality. By realizing such a project, the average range of nonconforming products will be reduced to 3% with an unchanged production volume of 100 pcs per day, while considering the reduction of other costs from 562 € / piece to 540 € / piece. From the data in Table 12, it is clear that alternative 2 clearly brings the best results.

For comparison, let's consider alternative 3 with unchanged conditions as in alternative 1, but reducing the % of nonconforming products from 8% to 3%, while maintaining manufacturing costs at the original level of 562 euro / pc. It is clear from

the data in the third column of Table 12 that even this alternative is more suitable for an enterprise than merely increasing production.

Table 13.2 Alternatives for increasing productivity

Indicator	Original status	Alternative 1 Increasing production	Alternative 2 Improving quality	
Number of pcs made per day	100 pcs	105 pcs	100 pcs	
Average % of nonconformity per pc	8% = 8 pcs	8.5% = 9 pcs	3% = 3 pcs	
Number of nonconforming pieces, total of which can be repaired, not repairable	8 pcs 4 pcs 4 pcs	9 pcs 5 pcs 4 pcs	3 pcs 2 pcs 1 pc	Alternative 3 Improving quality with unchanged other costs
Number of conforming pieces per day	92 pcs	96 pcs	97 pcs	
Yield of identical pieces (%)	92%	91.4%	97%	
Total number of pieces / year (320 working days)	29,440 pcs	30,720 pcs	31,040 pcs	
Revenues per year	17,664,000 €	18,432,000 €	18,624,000 €	
Total nonconformity expenses	947,200 €	960,000 €	281,600 €	
Other total costs	16,545,280 €	17,264,640 €	16,761,600 €	17,444,480 €
Total annual profit	171,520 €	207,360 €	1,580,800 €	897 920 €
Profit per piece	5.82 €	6.75 €	50.9 €	28.92 €
Productivity	100 %	101 %	109.3 %	105.1 %

Source: own source

As we can see in the example above, most productivity problems are associated with a lack of quality, and efforts to increase productivity must primarily lead to the solution of problems in the area of nonconformities in processes. It can be said that efforts to improve performance are also attempts to address the issue of productivity and hence quality improvement (Nenadál, 2001).

Example 2

Task 1

Determine and explain the individual NQ ratios of the monitored enterprise for a given accounting period based on actual NQ items in the XY forestry enterprise listed in Table 3. Additionally, graphically display the individual items of average cost of quality in the pie chart (see Figure).

Table 13.3 Development of quality costs and their structure
Source: own source

Nr.	Item in €	2013	2014	2015	2016	2017	
1.	NP		6,389,225				
2.	NH		38,568,828				
3.	NI		100,465,964	144,046,3	144,256,9	138,440,5	121,971,9
4.	NE		24,191,451				
5.	NQ		169 615,468	225,513,3	227,026,6	225,165,0	197,929,5
6.	% NP/NQ						
7.	% NH/NQ						
8.	% NI/NQ						
9.	% NE/NQ						
10	%						

* Note: average means average NQ values and their average structure over a 5-year period.

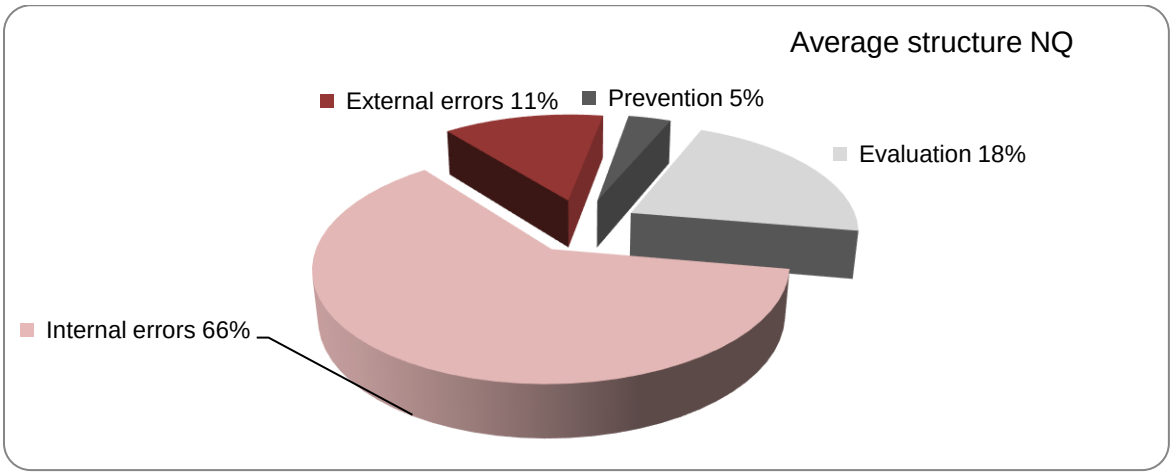

Figure 13.7 Average cost quality structure over a 5-year period
Source: own source

Task 2
Calculate the NQ ratios in 2017 if T revenues amounted to € 9 billion this year, UVN = € 5 billion, JMZ_{eur} = € 3 billion.

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14. VALUE ADDED OF WOOD PRODUCTS: *CASE: VALUE ADDED OF BEECHWOOD PRODUCTS IN THE FOREST WOOD SUPPLY CHAIN IN SLOVENIA*

Jože Kropivšek, Dominika Gornik Bučar

14.1. INTRODUCTION

Manufacturing products with greater value added is an important strategic goal of every industry, including the wood industry. According to the principles of the sound management of scarce resources, which include wood and energy, the provision of high added value is crucial to achieving the economic efficiency of operations. The high added value of various wooden products as a result of processing is crucial in this context. However, not all uses or products are comparable from an economic point of view and in terms of value added.

A number of indicators have been suggested for evaluation of the value added in beechwood products and/or for a comparative analysis among different products depending on the value added (Sathre & Gustavsson, 2009; Chernatony, Harris & Dall'Olmo Riley, 2000; Lantz, 2005). However, the basic indicator of value added to the product is an absolute value, which does not allow comparability between products. This indicator gives sufficient information with regard to making decisions on the priority of various production activities only when used in combination with some other indicators. It shows that the expanded model to calculate the value added of wood products is needed, including all these indicators. One of the problem is that proportion of wood actually used in different products varies. In addition, each product is different with respect to the technological and other requirements of its production. For example, as shown in the case later in this paper, a standard dining chair has higher value in terms of the total value added of the product and value added as a share (of volume and value) of used wood in the product in comparison with, for example, a wood product for energy (e.g. wood chips), but has a lower share of value added in the selling price. This makes the production of wood chips a better choice than the production of standard dining chairs.

The potential of wood as a raw material is often unexploited in the Slovenian forest wood supply chain. Beechwood, an important material of the forest wood chain, can be used for the production of hundreds of different products (Kropivšek, Čufar, 2015). As such, the decision as to which beechwood products are worth producing is a difficult but crucial one for the Slovenian woodworking industry. The calculation of specific value added indicators for decision-making support is therefore both worthwhile and necessary. Moreover, there are also some other indirect and positive effects on the economy that can be achieved through exploiting the full potential of the woodworking industry, and the innovations that it can foster and apply.

14.2. VALUE ADDED

Value added is defined as the difference in economic value between the physical inputs and outputs of a production process, and is generally analysed at the firm or national economy level (Sathre & Gustavsson, 2009). When calculating value added, the cost of materials/supplies and energy must be subtracted from the value of the production output (Sathre & Gustavsson, 2009; Chernatony, Harris & Dall'Olmo Riley, 2000). Specifically, value added production is defined as follows (Lantz, 2005) (Eq. 1):

- *Value Added = [Value of Output] – [Costs of Materials Supplies] – [Costs of Purchased Energy]* *(1)*

According to Rebernik (2008), the gross added value (GVA) is the difference between the sales value of goods and services and the cost of raw materials and all other inputs that are directly attributable to their production (Eq. 2):

- *Gross added value (GVA) = [Gross profit from operations] – [Cost of goods, materials, and services] – [Other operating expenses]* *(2)*

In terms of content, GVA means the value newly created by a company in one year.

Value added is an important indicator within financial analysis, the goal of which is to assess the performance of a company in the context of its stated goals and strategy (Palepu et al., 2004), where financial analysis is a set of tools and techniques that allow you to measure the current fiscal condition of a government or business and predict trends in its future fiscal condition (Friedlob & Schleifer, 2003), and the process of determining and weighing the financial impact of business decisions (Helfert, 2001).

Among the more important indicators related to value added is the gross value added (GVA) per employee (Eq. 3), which expresses the relationship between value added and the number of employees, thus showing the average newly created value per employee.

$$\text{GVA per employee} = \frac{\sum \text{Gross added value}}{\sum \text{Number of employees}} \quad (3)$$

Value added is a measure of the contribution of production factors, economies of scale, and technological change that completely accounts for the total product (Ringe & Hoover, 1987). Given a forest-based industry process with a range of inputs and outputs, such as that illustrated in Fig. 1, value added can be determined based on the identification and economic valuation of the related material and energy flows (Sathre & Gustavsson, 2009).

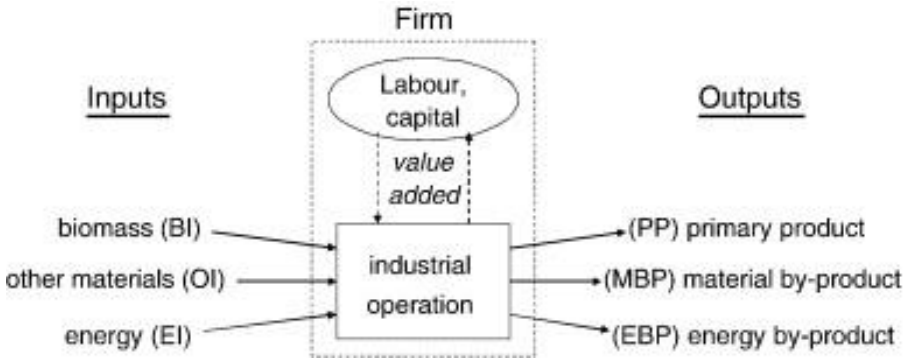


Figure 14.1. Conceptual diagram of the process of adding exchange value within a forest-based industry firm (Sathre & Gustavsson, 2009).

Wood (industrial) processing can be represented by energy and material flows, and with the consumption of labour and capital the flows change and gain value (Figure 1). We can thus conclude that several different materials (and energy) go into wood (industrial) processing, and what is produced includes the main product, by-products (e.g. for further production or for direct sale) and by-products in the form of energy (e.g. residuals for the purposes of burning or energy production) (Sathre & Gustavsson, 2009). Estimation of economic added value, therefore, refers to the valuation of both types of flows. Sathre and Gustavsson (2009) suggest the following general definition to determine the total value added by a forest industry process (Eq. 4):

$$VAT = (V_{PP} + V_{MBP} + V_{EBP}) - (VC_{BI} + VC_{OI} + VC_{EI}) \quad (4)$$

where

- VAT is the total value added by the operation;
- V_{PP} is the value of the primary product produced by the operation;
- V_{MBP} is the value of the material by-products produced by the operation;
- V_{EBP} is the value of the energy by-products (fuel and electricity) produced by the operation;
- VC_{BI} is the value of the biomass inputs (roundwood, residues) to the operation;
- VC_{OI} is the value of the other material inputs (non-biomass, non-energy) to the operation;
- VC_{EI} is the value of the energy supply inputs (fuels and electricity) to the operation.

14.3. EXPANDED MODEL TO CALCULATE THE VALUE ADDED OF WOOD PRODUCTS

The model for calculating the value added of a product based on the definition of Sathre and Gustavsson (2009) is shown in Eq. 5.

$$VAT_p = \left(\sum V_{pb}\right) - \left(\sum vc_w - \sum vc_o\right) \quad (5)$$

where

- VAT_p is the total value added of the product (€/item)
- V_{pb} is the value of the primary product and by-product(s) (€/item)
- vc_w is the variable cost of wood material in the product (€/item)
- vc_o is the variable cost of other material and/or energy in the product (€/item)

The value added of each product, in its absolute value, is limited information (Kropivšek et al, 2015). It does not allow comparability between products, particularly due to the different proportions of wood used in each product, as well as the various technological and other production requirements. It is therefore necessary to know the quantity (m^3) of wood used in the product in order to find the actual value that is added to that of the timber (Eq. 6). The results can then be compared between products, and thus we can learn which product has the most value added per m^3 of used wood.

$$VAT_{pw} = \frac{VAT_p}{\sum Q_w} \quad (6)$$

where

- VAT_{pw} is the total value added to the quantity of wood used in the product (€/m^3)
- Q_w is the quantity of wood used in one product (m^3/item)

Furthermore, the calculation of the value added related to wood or biomass (Eq. 7) is crucial, whereby the calculated value added of the product is divided among the materials used according to their value proportions in the product. This way the influence of the value of the other materials used to the overall value added of product is eliminated, and so the calculation of value added is only related to the wood used. This is especially important for products that make use of some other, more expensive materials (e.g. diamonds, gold etc.), which contribute significantly to the total added value. In this way it is possible to discover which product has the highest value in terms of the value of wood embedded in the product per unit (usually m^3).

$$VAT_w = VAT_{pw} \times \frac{\sum vc_w}{\sum vc_w + \sum vc_{om}} \quad (7)$$

where

- VAT_w is the total value added to the share of the value of wood used in the product (€/m^3)
- vc_{om} is the variable cost of the other materials in the product (€/item)

Even more important information can be obtained from the calculation of the share of value added in the selling price of the product (Eq. 8). This way the products can be ranked according to profitability, as the result is information about the share of the selling price needed to cover labour costs, indirect costs and profit.

$$\%VAT_p = \frac{VAT_p}{sp_p} \quad (8)$$

where

- $\%VAT_p$ is the percentage of value added in the selling price
- sp_p is the selling price of a product

The template in Figure 2 can be used for data collection (Kropivšek et al, 2015). The input table contains information on the quantities and prices of the materials used (separately for wood, other materials and energy) per unit of the primary product. The output table contains data on the quantities and selling prices of the primary product and by-products. To calculate the value added it is particularly important to get data on the quantity of wood used and also the maximum capacity of production of the primary product per year. The data for capital, work and other overhead costs per unit of product are also interesting, but are not necessary for the calculation of value added.

Product:

INPUT

WOOD and other BIOMAS					OTHER materials and/or ENERGY			
Input material	units	Q_w	p_w	vc_w	units	Q_o	p_o	vc_o
				0,00 €				0,00 €
				0,00 €				0,00 €
				0,00 €				0,00 €
Total				**0,00 €**				**0,00 €**

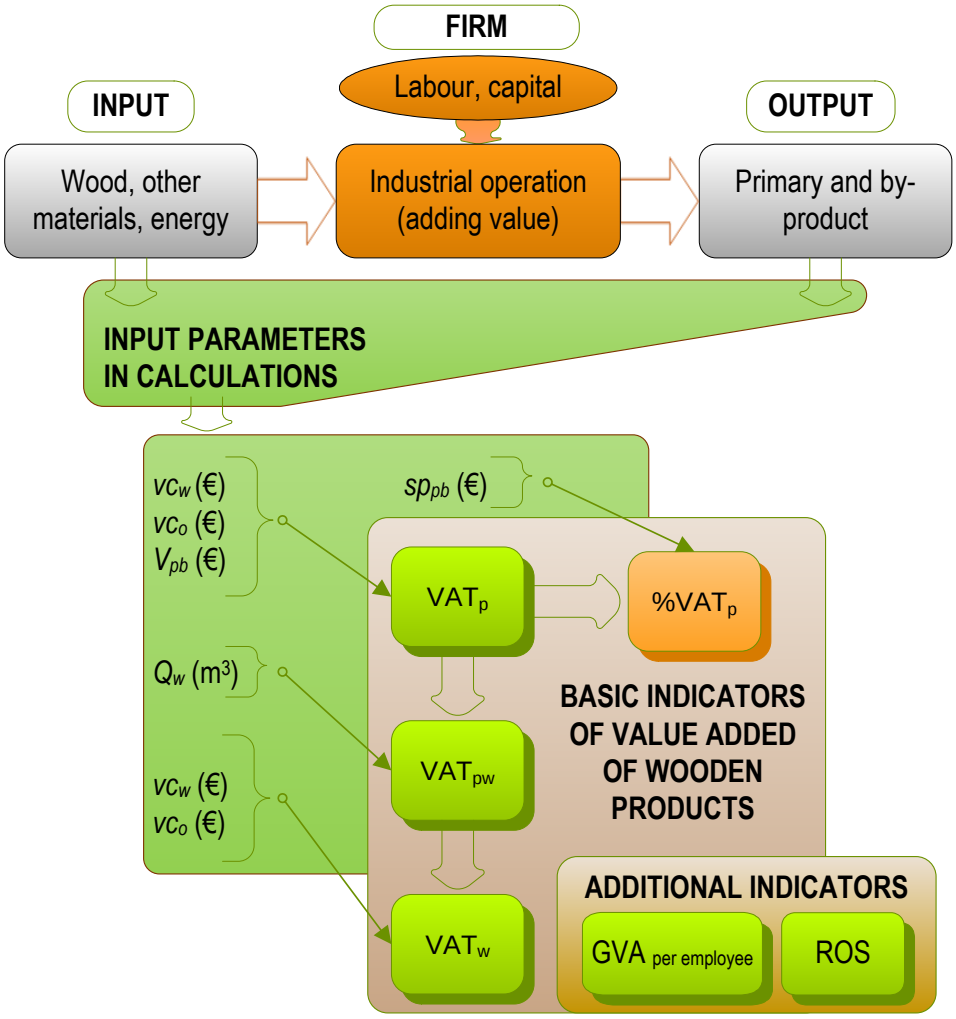
OUTPUT

PRODUCT and BY-PRODUCTS					
Output product	Category of product	units	Q_{pb}	sp_{pb}	V_{pb}
	primary product		1		0,00 €
	by-product				0,00 €
					0,00 €
Total					**0,00 €**

Legend: Q_w = quantity of used wood, p_w = price of used wood, vc_w = variable cost of used wood material, Q_o = quantity of used other materials or energy, p_o = price of used other materials or energy, vc_o = variable cost of used other materials or energy, Q_{pb} = quantity of product and by-product, sp_{pb} = selling price of product and by-product, V_{pb} = value of primary product and by-product.

Figure 14.2. Template for data collection to calculate the total value added of a product (Based on: Kropivšek et al, 2015)

Figure 3 presents the final model for estimating the value added of wooden products, which graphically shows all the value added indicators described above. In order to calculate these it is necessary to collect data on the quantities and prices of the materials used (separately for wood and other materials and energy) per unit of product and data on the quantities and prices of main and by-products. In order to calculate the value added in the product, it is especially important to determine the quantity of the wood used.



Legend: Q_w = quantity of used wood (piece, m3, m2, etc.), vc_w = variable cost of wood material used (€), vc_o = variable cost of used other materials or energy (€), sp_{pb} = selling price of product and by-product (€), V_{pb} = value of primary product and by-product (€), VAT_p = total value added of product (€/item), VAT_{pw} = total value added to the quantity of used wood in product (€/m3), VAT_w = total value added to the share of value of used wood in product (€/m3), $\%VAT_p$ = percentage of value added in the selling price; $GVA_{per\ employee}$ - gross value added per employee (€); ROS – Return on Sales (€)*

** item is the quantity unit of one main product (piece, m3, m2, etc.)*

Figure 14.3: Model for estimating the value added of wooden products (based on Kropivšek & Čufar, 2015)

If we want to do a more detailed interpretation and application of the value added indicator for individual products, then we need some other financial indicators. At the company level, it is extremely important that the value added of a product is

supplemented with the indicator of gross value added per employee ($GVA_{per\ employee}$) *(Eq. 3)*. The value added of a product is exclusively oriented towards the more economical consumption of scarce natural resources, while the value added per employee is related to the organization, human motivation, management and also to technological equipment. This way the company management gets additional information about the employment potential and other measures in the field of human resource management. Return on sales (ROS) is another very interesting indicator, as it is a widely used ratio (net income/sales) to evaluate a company's operational efficiency (Eq. 9) (Gitman, 2004):

$$ROS = \frac{Net\ profit}{Sales} \tag{9}$$

where

- Net profit is a subtraction of all costs from the gross revenue (€)
- Sales is sales revenue (€)

With this indicator, we can obtain additional information on the profits from the sale of different products with different degrees of value added, which can also be used to make better business decisions.

14.4. PRACTICAL PROBLEMS IN OBTAINING AND EVALUATING DATA

In developing a value added model for wood products, and based on pilot projects in three Slovenian wood companies, we identified the following problems and challenges that need to be taken into account when interpreting the results:

- the diversity of standards and rules used to determine quality throughout the forest wood chain between countries as well as within the country, which is often not directly comparable (Marenče & Šega 2015; Marenče et al. 2020); as the quality evaluation and price of inputs and/or outputs are closely related, any deviations in quality evaluation directly affect the calculated value added, which can then be misleading due to these anomalies;
- the great impact of price negotiations and the dependence on current market conditions (equilibrium prices in both the input and output markets), directly affecting the results of the value added calculations;
- overhead (indirect) cost allocation, where different methodologies are used within companies; among the indirect costs, extremely low depreciation costs are calculated due to obsolete equipment, which could allow the company, even with a relatively low value added product, to achieve high profits;
- difficulties in obtaining information about the quantities (potential and actual) produced, as this industry often deals with unique products that do not differ much from other products and can be potentially combined into groups;

- difficult valuations of by-products and residues (often used for energy purposes, and for the producer's own heating purposes), as companies often do not evaluate the market values of these;
- technological obsolescence, which is reflected mainly in low depreciation costs (iBON, 2017), which, despite the low added value per product, can still enable (relatively) successful businesses, albeit with a lack of development potential,
- national economic policies can have a significant impact in particular areas (e.g. subsidies for investments in biomass boilers have led to increased demand for wood chips and pellets, which has stimulated the production of these. However, in the long run this does not provide high added value and, more importantly, does not encourage the production of high value added products, much less the circular economy and the concept of marginal quality);
- certain data necessary for the calculation of value added is inaccessible and/or and confidential, since it is a business secret of the companies involved.

The biggest problem in estimating and collecting data to calculate the value added of product is in the determination of the price of both inputs and outputs, which is closely linked with the problem of the incomparability of the quality determination standards used within an entire chain, from the standing trees in the forest to the sawn wood and wood products. The fact is that from a certain quality of raw material we can economically produce only certain products. Ringe and Hoover (1987) suggest the concept of the marginal log, which states that producing the product from logs of a higher grade than a marginal log would not be feasible. At this point arises the problem of determining those limits of quality/price for the inputs of certain products, although at this stage of our work we have not dealt with this problem.

In practice, we often encounter a situation in which the value added of certain products increases only on the basis of a reduction in the prices of the input raw materials, i.e. the use of cheaper raw materials to produce the same output without any change in the production and/or productivity. In such cases value added is not a measure of the pure contribution of primary inputs, but an indicator of economic welfare instead.

14.5. CASE: VALUE ADDED OF BEECHWOOD PRODUCTS IN THE FOREST WOOD SUPPLY CHAIN IN SLOVENIA

14.5.1. Introduction

The potential of wood raw material in the Slovenian forest wood supply chain is often insufficiently exploited. Slovenia has the third highest forest coverage in Europe, and the percentage of forest cover in the country is stil increasing. However, half of the harvested logs are exported completely unprocessed (in the form of logs), and thus there are (new) possibilities of producing more wood products with higher value added that remain to be exploited. With regard to beechwood, the share of which in forests

has risen in recent years, and which now accounts for around 30% of wood raw material, this issue is even more important. First of all, beachwood (*Fagus sylvatica* L.) can be widely used, both for the production of very traditional products (such as furniture, flooring, parquet, etc.) as well as for new innovative, products, such as a raw material for chemical processing (Zule et al, 2017; Kropivšek & Gornik Bučar 2017), and innovative light structural composite elements, like I-beams (Gornik Bučar et al. 2017). However, not all uses are comparable in terms of operational efficiency. The decision as to what product(s) to produce is very difficult although crucial for the economical management of this raw material, as only certain uses provide products with higher (or high) value added.

The promotion of more valuable and rational uses of wood raw material, while having indirect effects on the wider economic environment, is also necessary to: (1) ensure the effective functioning of the entire forest wood supply chain, providing products with high added value; and (2) fully exploit the potential of wood raw material in terms of quality. In the case examined in the current paper, the potential of beechwood raw material was demonstrated in terms of both the impact on society and economic development by classification of beechwood products according to the amount of value added. We thus confirmed the importance of the development and operation of the entire forest wood supply chain, and the importance of government economic policy in its functioning. The availability of raw materials based on the quality and purpose of use, and the value added per cubic meter of beechwood, were assessed in order to assess the logic of investing in the newest technologies for hardwood processing and veneer production.

14.5.2 Problem background

The awareness that the forest wood supply chain is not functioning properly (yet) and that its operation is crucial for the success of the entire wood industry, has led in recent years to establishing a forest wood supply chain at various levels, from the local (Šubic, 2017) to national, by adopting an action plan for increasing the competitiveness of this supply in Slovenia by 2020, adopted by the Government of the Republic of Slovenia.

Some of the reasons for poor operation of the forest wood supply chain have been presented elsewhere (Selišnik, 2014; Zavrl Bogataj, 2012; Humar et al., 2012), but it is obvious that primary wood processing is (one of) the weakest part of the chain. This is also a key reason for not utilizing the potential of wood raw material sufficiently and/or adequately, and why the value added is (too) low in terms of the quality of the raw material. The marginal log concept, where the purpose determines the quality of logs used (Ringe & Hoover, 1987), allows maximum utilization of available logs to produce high value added products, as well as maximizing the utilization of wood residues throughout the supply and production chains, according to their potential.

This thinking is very similar to the concept of a circular economy (Circular Economy, 2020), where the emphasis is on the reuse, repair, and recycling of existing materials and products. Among other things, it reduces raw material consumption and, through careful product design, reduces waste generation to zero. The concept comes from natural systems where each component optimally complements the whole. Products in the circular economy are carefully designed to allow materials to circulate and maintain added value for as long as possible. They remain inside the economy even after the material or product reaches the end of its useful life.

In order to apply this approach in this context, the whole forest wood supply chain must implement the concept of the marginal quality of raw materials at all steps in the process. Moroever, one of the most important economic indicators for the operation of a forest wood supply chain that takes into account the concept of the marginal quality of raw materials is the added value in products (Kropivšek & Čufar, 2015). High value added products can be provided in various ways, but the good operation of all the participants in the supply chain, from the forest to the final product, is crucial.

In the present case, it is assumed that most of the added value is lost in the interruption of the forest wood chain, and further in the insufficient efficiency of primary wood processing. Many semi-finished products (eg veneer, sawn wood, etc.) produced in primary processing, which are input materials for many high value added products, can greatly enhance their potential added value and are thus an important link in entire forest wood supply chain. Numerous synergistic effects can also emerge in the wider economy (e.g. with the use of wood residues for the production of high value added products).

14.5.3 Materials and methods

In the financial analysis, the data for companies operating in sub-sector C 16.100 (sawmilling, planing and impregnation of wood) in Slovenia (NACE, 2018) was taken into account. Based on this data, the evaluation of some financial indicators in time series was done and a comparative analysis carried out, especially with respect to the sub-sector C 16 (wood processing – except furniture).

The value added in different beechwood products was calculated using the model for estimating the value added of wooden products (Figure 3). We also calculated the indicators of operating profit (using Eq. 10):

Operating profit = [operating income] - [operating expenses] (10)

The identification of problems in the evaluation of the value added in beechwood products was carried out baseed on a detailed analysis of three pilot examples of the forest wood supply chain in Slovenia. This analysis was performed in 2015-2017, using the template in figure 2 and official financial databases iBON (2017).

14.5.4 Value added analysis of beechwood products

Based on summarized findings (Kropivšek et al, 2015) with regard to the value added evaluation of a product, it can be argued that the precise valuation of the value added in specific products does not make sense, because there are too many factors that affect the calculations. Therefore, on the basis of the proposed beechwood product classification groups (see: Kropivšek & Čufar, 2015), we have made a classification of product groups according to the amount of value added in the products (according to the criterion: invested work or capital), which is shown in Table 1.

The value added in more complex end products (eg wooden chair) can be very high (see table 1) and, as a rule, much higher than in simpler products. High added value in complex products is usually the result of a large amount of invested work and knowledge, (more or less demanding) technology and (a lot of) invested capital. More detailed calculatons of some value added indicators can differ significantly, as seen from Figure 4 where the results in the case of products in Group 1.1 (“energy” wood) and Group 3 (stairs, furniture, wooden toys, etc…,) are presented. The high added value in the product does not necessarily provide (in the short-term) profit from the business. The consequence of this fact is that only a few companies produced products from Group 3 or Group 4 (Table 1), or have greatly reduced their production volume of such items. This is also evident in the decline in the number of companies and employees in C 31 and their (declining) business performance (Likar & Valentinčič, 2016).

Figure 14.4: Value added of two selected products and estimated annual profit from their production (Kropivšek & Gornik Bučar, 2017)

Table 14.1: Classification of beechwood group products according to the amount of value added (based on: Kropivšek & Gornik Bučar, 2017)

Group	Goal	Examples of products	Added value
1. Primary production products	1.1 Market	Solid biofuels (wood chips, pellets, firewood, briquettes)	Low
	1.2 Further processing	Sawn wood, veneer, pulp, auxiliary materials (dowels, slats), etc.	
2. Simple, batch production products	2.1 Market	Wood composites, veneer, parquet, flooring, railway sleepers, structural glued wood, pallets, linings, wood fancy goods, etc.	Medium-high
	2.2 Further processing	Wood composites, paper, dried sawn wood, prepared timber, glulam beams, curved semi-finished products, impregnated wood, chemical products, nutrition supplements, biofuels (bioethanol and butanol), etc.	
3. Products of complex production	3 Market	Stairs, furniture, wooden fancy goods, sports tools, toys, school supplies, tools and measures, musical instruments, works of art, structural composites, chemical products, uses in nutrition, etc.	High
4. Products of innovative production	4 Market and further processing	Modified wood, LVL, advanced structural composites, nanofibrillated cellulose from residues, advanced products of the chemical industry, advanced uses in nutrition, etc.	Potentially extremely high

One of the reasons why the production of certain finished products is not commercially interesting, despite the high added value according to raw material consumed, is the inefficient functioning of the forest wood supply chain, which is reflected in the lack of products in Groups 1.2 and 2.2 (Table 1). These products do not primarily represent very high added value, but they represent very high potential for added value for the products in further processing, and thus are an important link in the operation of the entire forest wood supply chain. In this context, it should be emphasized that not all product chains are of equal interest, so it is necessary to find those that can provide the highest total added value and, in light of their multiplier effect, these then need to be carefully designed and encouraged. Of particular importance are the products of primary products (boards, veneer, …) and easy batch products for further processing (particleboard, plywood,..), since they have the highest potential added value (Table 1, Groups 1.2 and 2.2), which is reflected in the multiplier effects on further processing, where we can produce products with (very) high added value. On the other hand, these products connect the source of the raw material (i.e. forest) with the producers of finished products, making it much easier to implement the concept of the marginal quality of input raw materials, and enabling more comprehensive utilization of all wood residues for processing into products of very high

added value (Table 1, Group 4). This ensures optimal utilization of the approriate quality of raw materials for products with the highest possible added value (and thus, for example, wood of top quality is not used for energy). Due to the ineffective functioning of the supply chain, the true potential of a raw material can be underestimated and so it is used for less than optimal purposes (including ones with lower added value). It is often observed that higher quality logs are used for the production of less demanding products or even energy purposes (e.g. firewood, wood chips). This may be because these products have high added value relative to other (more in demand) products, or because of logistical problems (and costs) that would make the production costs of more demanding products too high. Therefore, in each particular situation the forest/log owner makes the most economical decision, which is not necessairly the optimal solution with regard to exploiting the raw material according to its full potential.

14.5.5 Forest wood supply chain and primary beechwood processing

The annual possible felling in Slovenian forests, taking into account the forest management plans prepared in 2018 (Poročilo… 2018), amounted to 6,837,356 m^3 in 2018, of which deciduous trees represent 54%. Assuming that the gross amount of wood is 58% logs (Marenče et al., 2016), then the available potential is 2,141,459 m^3 of deciduous logs. Assuming the representation of tree species is the same as the tree composition of forests based on timber stock, beachwood logs account for 59% of the total, which equals 1,263,461m^3. The quality of sawlogs differs a lot, but logs in the B-C quality classes prevail (Marenče et al, 2020).

In 2017, 726 companies operated in the C16.100 sector in Slovenia (iBON, 2017). Based on the 2016 business data (iBON, 2017), of these 726 companies just less than half (47%) are profitable. Altogether, these profitable firms employ 1,466 people and generate more than €53 million of added value and just over €240 million of revenue, with value added this representing a 22% share of revenue, and the companies generating just over €14 million in profit (giving a revenue share (ROS) of just under 5.8%). Within the structure of the C 16 industry as a whole, these 342 profitable companies represent more than a third (36%) of enterprises but employ only a fifth (20%) of the people. This means that micro and small enterprises are dominant (86% in total) (Figure 5). These companies generate 27% of C 16's revenue and just as much profit. Slightly fewer create value added (22%). In the C 16 industry as a whole, the companies generate 27% of value added in revenues, while in the C 16.100 industry they only generate 22%. Similar differences can be observed in the share of profit-making enterprises (in C 16 56% of companies are in this group, and in C 16.100 only 47%). It can be concluded that activity C 16.100 is dominated by smaller companies whose value added per employee is very high (over € 36,600), but less than half of these generate profits.

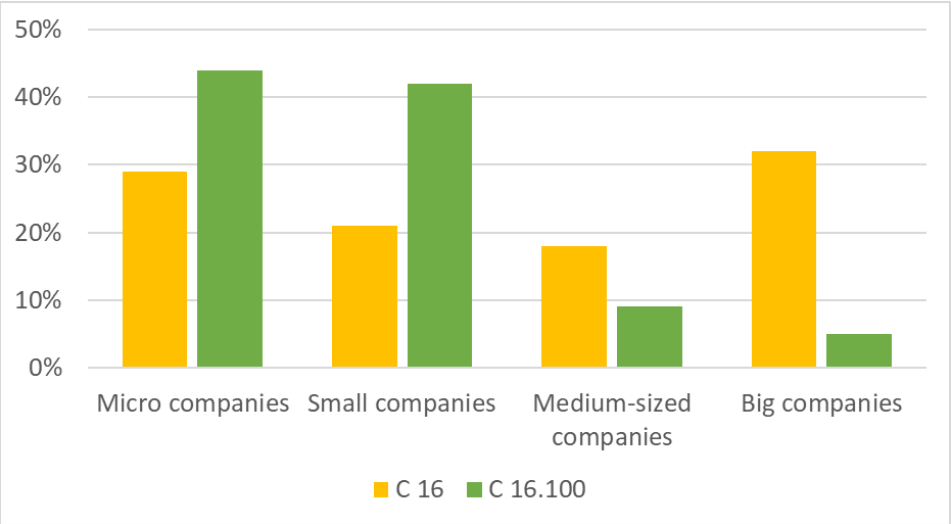


Figure 14.5: Shares of wood industry companies by size and subsector

The situation in the primary industry is a result of both the current situation and past activities. Uncertainty in the supply of raw materials, non-systematic updating of technology, inefficiency and uncompetitiveness in finding new markets and new products (Gornik Bučar, 2014), as well as horizontal non-cooperation (among sawmills), are factors that undoubtedly impact this sector.

Due to technological and technical factors, a lack of focus on market-oriented quality products, poor integration within the industry in all stages of production, and certain characteristics of the labour market (i.e. the rigidity of employment, labour taxation), the profit for the production of traditional products with higher added value (e.g. chairs, etc.) is very low, which reduces their commercial appeal, because companies do not make investments in their development. On the other hand, only these kinds of products provide high levels of employment, the development of specific and in-depth knowledge, the better use of available (scarce) resources, closer links in the supply chain for greater synergy, and faster economic development from investing in research and development, thus strengthening the industry as a whole and with benefits for the wider economy. The biggest problem here is the insufficient performance of primary wood processing (veneer and sawn timber production), as these products represent huge potential added value with regard to further processing and treatment. The main obstacle in this context is the wide dispersion of sawmill plants and their relatively small size (Figure 5), as their capacity does not allow the processing of large quantities of raw materials or larger and/or more demanding orders, and thus these sawmills represent a weak link in the value added chain. As such, due to this part of the chain the whole sector loses both directly, since a large part of the value added of these products remains unexploited or is obtained by foreign companies, and indirectly. This decreases the efficiency of the entire forest wood supply chain, causing losses of jobs and market share, and thus reducing the development potential of the Slovenian wood industry sector. The importance of forest wood supply chains has been studied in greater detail by a number of authors whose findings are very well

summarized by Larsson et al. (2016), and readers interested in this issue can learn more there.

In recent years, there has also been a positive shift with regard to investing in technology and the modernization of slovenien sawmills. The role of band saw technology (Prislan et al., 2014), which is the optimal sawing technology for deciduous trees, has increased significantly. Appropriate equipment (e.g. band saws combined with circular sawing machines) is certainly an advantage, as production can be more flexible, letting firms adapt more quickly to the characteristics of the raw material and market requirements, allowing them to (also) produce niche products that should also have high added value. It has to be noted that one area with great potential is the use of wood processing residues, not (only) for energy purposes (as firewood), but above all as a source for bioproducts (Zule et al 2017) of really high added value.

14.5.6 Value added potential of beechwood

Based on the concept of the marginal log and the potential of specific groups of products, and particularly products of primary wood processing, with regard to inreasing added value, this study confirmed the importance of the development and effective operation of the whole forest wood supply chain, and the importance of the country's overall economic policy in its functioning.

In the entire forest wood supply chain, the value of the deciduous raw material (according to Slovenia's forest management plans, the current possible felling of deciduous trees is 3.9 million m^3) can be greatly increased. The very high added value of beachwood can also be ensured in primary wood products (Table 2), which also provides a key link in the value chain and is an important source of final wood production, where very high value added products are generated. The residues in this production are an important resource for other, innovative uses (chemical processing, etc.), thus ensuring the functioning of the circular economy. According to some estimates (Selišnik, 2014), €300 million of value added can be generated from 1 million m^3 of beachwood. In practice, this potential is not achieved, as inefficient operation of the forest wood supply chain causes among other things, the disruption of sales channels and consequently higher logistical costs and organizational problems, the difficulty of ensuring the maximum use of raw materials based on their quality, and the limited implementation of the circular economy. It should be pointed out that the added value per raw material consumed in some products (e.g. veneer) can be much higher (up to 1000 €/m^3), which can be further increased in further processing. The potential for added value in further processing, which in particular ensures the optimal implementation of the circular economy and thus has many positive effects on the wider economy (employment, investment, rural development, etc.), is assessed in Table 2.

Table 14.2: Estimated value added potential in further processing per cubic meter of beechwood

Sector	*Chain link*	*Assortment*	*The average range of added value per m³ of beechwood (€/m³)*	*Added value potential in further processing*
Forestry	Forest owner	Tree	**10 - 20**	High
	Forestry company	Logs, firewood, logging residues, wood chips, etc.	**50 – 100**	High (low at energy usage)
Primary wood processing	Primary processing	Sawn wood, veneer, carpentry products, wood residues of primary processing, etc.	**100 – 400** (also up to 1000)	Very high
	Production of semi-finished products	Dried sawn wood, prepared timber, structural wood, glued beams, wood composites, wood residues of primary processing, etc.	**300 - 1000**	Very high
Final wood processing and other	Production of finished products	Furniture, construction wood, fancy goods, linings, wood residues of final processing, etc.	**400 – 1000** (also >1000)	Low
	Production of innovative products	Chemical processing products, paper, advanced structural composites, nutritional supplements, advanced bio-based material, etc.	**>1000**	Very high

(Based on: Kropivšek & Gornik Bučar, 2017)

14.5.7 Conclusions

If the forest wood supply chain were to operate perfectly and efficiently in terms of primary wood processing, then many products could be produced. With this, numerous synergistic effects would also emerge in the economy in general. However, in order for this chain to efficiently achieve its potential (as shown in Table 2), it is necessary to invest in the newest technologies within the entire forest wood supply chain.

Taking into account the available quantities of beachwood, we estimate that with the use of the newest technology in primary wood processing up to ten new sawmill plants with the total capacity of 500,000 m³ of hardwood logs should be introduced, and at least three veneer plants with a capacity of around 150,000 m³ top quality veneer logs. With the horizontal integration of these plants, it would possible for them to supply bigger customers with their products, as well as maintain flexibility and the production of niche products. More efficient operation of this part of the chain would also allow appropriate conditions for the more efficient and successful operation of furniture production, and enable the full utilization of raw materials, including residues.

Roughly estimated, around 300,000 m^3 / year of residues suitable for further processing would be produced under the plan set out about, which would also encourage integration with other industries and provide additional synergistic effects. New jobs would be created and, above all, effective investment in R&D would be made, which would also have a positive impact on the development of the entire timber industry. By organizing a reliable raw material market, primary production could encourage the productions of more products for further processing (sawn wood, veneer, decimated wood, etc.). Better utilizatization of the raw material is also a great advantage for forest owners. In addition, primary production, with its local character and potential to further transform its products and by-products into high value added items, can promote the creation of local networks and/or chains with high employment potential, and thus rural development. Low value added products intended for final consumption will thus become less attractive for production, as they represent very limited development potential for both industry and rural areas.

Decisions on which products to produce are highly influenced by state incentives (subsidies, public procurement, etc.). These can have the effect of either reducing certain costs or increasing demand (and thus potential revenue) if the measures are targeted at the end user. While these impacts are (for the most part) short-term, they can greatly change the business orientations of companies (and industries), and should be planned with great care.

The fact is that within the whole forest wood supply chain the added value of products varies, and there are also other important financial indicators that vary in different parts of the chain. We therefore suggest that economic policy should be aimed at strengthening the entire forest wood supply chain, not just its component parts, since all members of the chain are important for the complete and rational use of the important natural resource that beechwood undoubtedly is.

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15. PROBLEMS OF THE INDUSTRIAL PROPERTY PROTECTION IN POLISH FURNITURE INDUSTRY

Renata Stasiak - Betlejewska, Emilia Grzegorzewska

15.1. INTRODUCTION

The proper use of creativity and innovation in the business activity leads to increased competitiveness and enterprise development. The progressive use of modern technologies and their presence in the economy causes problems in managing these assets and defining intangible property and their protection, which is directly related to the basic processes of making important decisions in the development of the enterprise. Industrial designs (e.g. new packaging designs), trademarks (e.g. product names, advertising slogans, logos) and other technical solutions (utility models, recipes or inventions) that are the result of work in an enterprise. The lack of protection of the industrial goods as a consequence often leads to the appropriation of the idea by the competition and their commercialization on the market without the participation of the enterprise that created them.

Industrial property protection, i.e., the protection of innovative solutions, unique design, as well as trademarks, is an essential issue for the furniture industry. It is an issue closely linked to the processes of creation, development and use of acquired knowledge, skills, and experience, and it constitutes an outcome of human creative activity, creativity, ingeniousness, inventiveness and enterprise [Podobas 2015].

Awareness of the importance of proper care for the protection of intellectual property is in opposition to the objective difficulties faced by entrepreneurs. Short product life compared to the duration of implementation procedures, a large number of products and markets, which are distributed, necessary expenditures for registration and then protect the rights, until the problems with the term, what really is meant by intellectual property rights are problem of many companies. Intellectual property, intangible good, which includes: copyright and related rights; utility models and patents, industrial designs; trademarks; apart from the price of the final product, it is the basic tool for building a competitive advantage of furniture companies.

The protection of industrial property, i.e. the protection of innovative solutions, distinctive design, as well as trademarks is extremely important for the furniture industry. It is closely related to the processes of creation, development and use of acquired knowledge, competences and experience and it is the result of human creativity, creativity, ideas and invention and entrepreneurial behaviour.

The Polish furniture sector is one of the most dynamically operating industries in Poland. Sales of medium and large furniture producers have been maintaining around 2% of GDP for many years. As one of the drivers of the development of the furniture industry, next to the automation of production, as well as the integration of the value

chain, are material, functional and design innovations. Higher profitability in the furniture industry can be achieved through material innovations (e.g. in lighter board materials, cheaper decorative materials, etc.), development of functional innovations (e.g. relaxers, integration with the Internet and digital systems, etc.) or through the development of design innovations.

Polish furniture industry has become a highly competitive market owing to investments concerning the protection of knowledge, technological innovations [Podobas 2015]. That's why respecting and observing intellectual property rights leads to development of society and as it fosters authors to create and modernize their own works [Katz 2007].

15.2. INDUSTRIAL PROPERTY RIGHTS – THEORY AND STATISTICS

There are three principal methods of intellectual property protection currently exist globally: copyrights, patents and commercial secrets [Alguliyev and Mahmudov 2015]. Other methods of intellectual property protection have also been applied [Dinwoodie 2013]:

- moral-ethical norms;
- administrative measures (e.g., the organisation of a confidentiality regime, the establishment of security services and staff training);
- physical protection measures (locking doors and windows, etc.);
- technical protection systems (electromechanical, acoustic, radio-technical, magnetometric, etc.);
- cryptographic methods (the modification of information to conceal its logical essence);
- labour contracts with potential dismissal (employees are obligated to not reveal commercial secrets).

Intellectual property refers to creations of the mind: inventions; literary and artistic works; and symbols, names and images used in commerce. Intellectual property is divided into two categories [WIPO 2015]:

- industrial Property includes patents for inventions, trademarks, industrial designs and geographical indications;
- Copyright covers literary works (such as novels, poems and plays), films, music, artistic works (e.g., drawings, paintings, photographs and sculptures) and architectural design. Rights related to copyright include those of performing artists in their performances, producers of phonograms in their recordings, and broadcasters in their radio and television programs.

Protection of the intellectual property is important for several reasons. The first reason is related to progress in the invention of the new works in the areas of technology and culture that will be created for the human well – being. The second reason is related to encouraging the commitment of additional resources for creating new innovations. Third reason confirms that protection of the intellectual property is

related to economic growth, creating of new jobs and industries and the life quality improvement. The intellectual property protection is focused on the respect to the other creations results and this way promote inventing innovative products and solutions that differs business entities in the market.

A preliminary report on the protection of business secrets in European Union countries has recently been published by the European Intellectual Property Office and it is intended as a starting point for further research and a more comprehensive report to be published in 2021. it is related to Directive 2016/943 of the European Parliament and of the Council on the protection of classified know-how and classified commercial information (business secrets) against their unlawful acquisition, use and disclosure, adopted on 8 June 2016, whose transposition deadline expired on 9 June 2019 year.

The number of Polish patent applications to the European Patent Office (EPO) increased in 2018 by almost 20 percent; the rate of increase in the number of applications was one of the largest in Europe according to the just published report summarizing the activities of EPO last year. Statistics on patent applications (Table 1) presents growth in the patent applications in Poland and European countries as well. There is noted significant growth for Poland (19.7%). In total, in 2018 applicants from Poland submitted 534 patent applications to EPO (in 2017 it was 446 applications). Universities were the driving force behind Polish patent activity - to a greater extent than in most other European countries.

Almost a quarter (24.2%) of applications came from Warsaw and the surrounding area. Next in terms of the number of patent applications were following voivode ships: Małopolskie (16.9% of all applications), Pomorskie (9.8%), Śląskie (8.8%) and Dolnośląskie (8.3% percent).

The vast majority of applications from Poland (71%) concerned various types of technologies, especially transport, civil engineering and thermal processes (each of these sectors accounted for 7 % of all Polish patent applications). 6% all applications concerned pharmaceutical products, and 5% were related to: medical technologies, biotechnology and computer technologies.

Number of patent applications of the furniture industry in Poland comparing to other countries was presented in the Figure 1.

Table 15.1. European patent applications. Poland in comparison with other key countries in 2017 – 2018 [EPO 2019]

Origin	2017	2018	% change 2018 vs. 2017	Share in total applications 2018
Poland	446	534	19.7%	0.3%
EPO states[2]	78 493	81 468	3.8%	47%
All countries	166 594	174 317	4.6%	

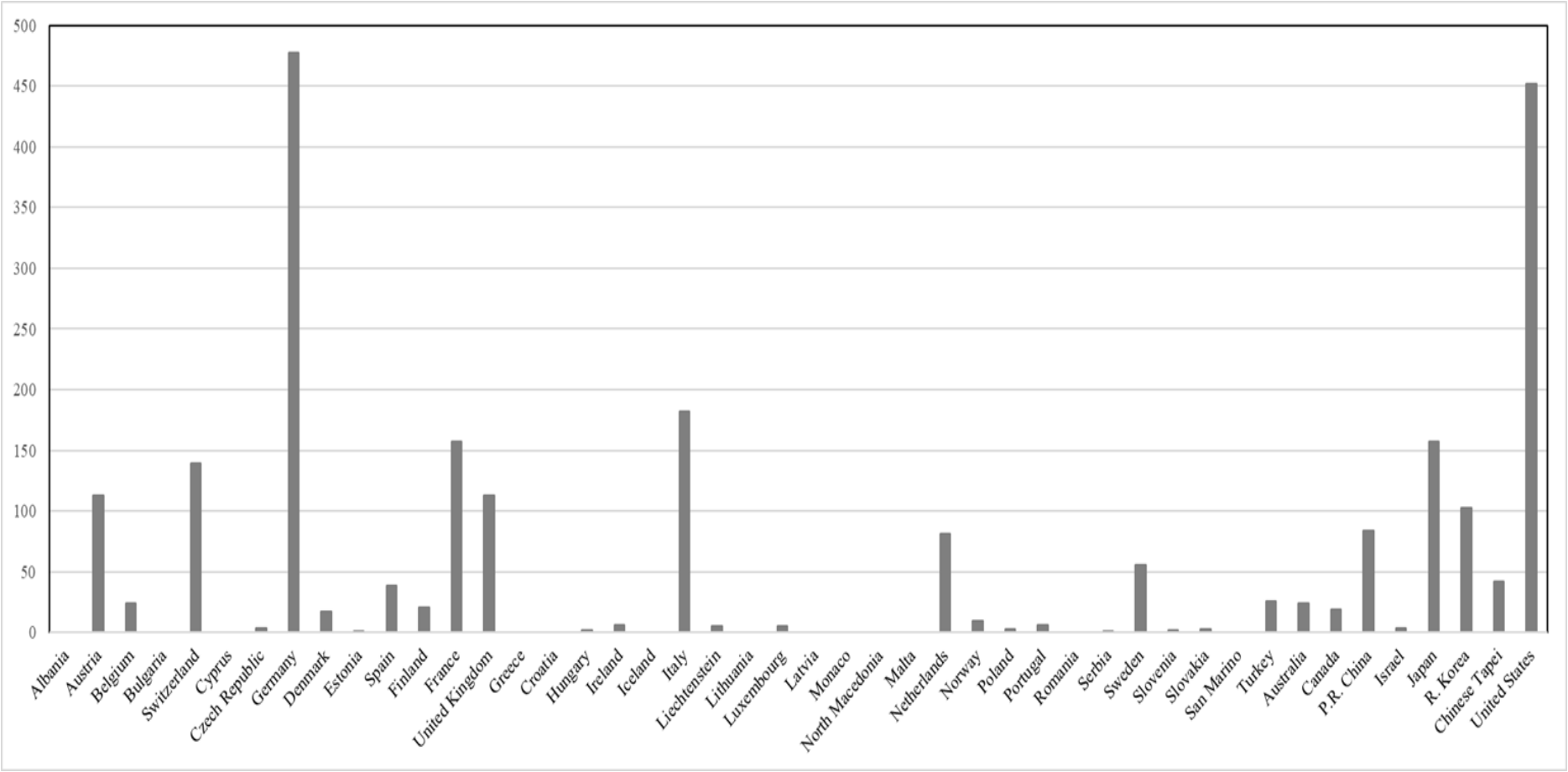

Figure 15.1. European patents granted1 2018 by field of technology [EPO 2019].

In general, in 2018, EPO received over 174 thousand European patent applications (an increase of 4.6% compared to 2017). The number of applications from China increased by 8.8 percent. (which is the lowest result in five years). The United States ranks among the top countries with 25% of total number submitted applications followed by Germany, Japan, France and China. EPO has seen an increase in the number of patent applications from most European countries - except France and Finland [Deloitte 2019].

The situation is different when it comes to filing inventions with the Patent Office in Poland by foreign entities. Since 2012, when they reached 247, there are fewer and fewer applications. In 2018, foreign entities submitted only 115 inventions to the Patent Office. As in previous years, the majority of patent applications in the Patent Office - among foreign entities - are filed in Poland by Germans and Americans. It should be noted that with the reduced interest in registering inventions in the Polish Patent Office by foreign entities, the number of European patents in force on the territory of Poland is increasing. In 2018, the number of these patents was 64,366. The decrease in the number of patent applications filed at the Patent Office by foreign entities is not inversely proportional to the increase in the number of European patents in force in Poland. The number of the latter increases much faster than the decrease of the former. Four years ago, in 2014, the number of European patents in force in Poland was 34,179 [Deloitte 2019].

As for the utility model application by Polish entities, their number remained for years at around 950 per year. In 2018, there were exactly 943 applications. In the case of foreign entities, the number of utility model applications in the Patent Office shows a downward trend and in 2018 it reached only 115. For comparison, five years earlier, in 2013, the number of utility model applications by foreign entities was 175. In 2018, Polish entities filed 1,081 applications for registration of industrial designs with the Patent Office. Although this is more than in 2017, in which 971 applications were submitted, from the long-term perspective, however, the trend is definitely decreasing. For comparison, in 2010, Polish entities filed 1,723 applications for registration of industrial designs with the Patent Office. In light of the above, it is not surprising that the total number of industrial designs registered in the Patent Office is systematically falling and as at 31 December 2018 was 8,476. For comparison, in 2014 this number was 10,626 industrial designs.

Half of Wielkopolska voivodeship entrepreneurs producing furniture declares that the possession of quality certificates, patents, licenses, proprietary product design is beneficial for their company. For 14% of them, this is very beneficial, and 1% of them consider it to be a key factor in achieving lasting competitive advantage. Almost every third surveyed entrepreneur (30%) believes that possessing quality certificates, patents, licenses, registered designs is partly beneficial and partly unfavourable for his company. In addition, 11% of entrepreneurs regard this as an unfavourable factor from the company's point of view, and 9% of them did not address this issue in any way. Number of owned by the above companies documents are very different: 21% of companies declare having one such document, 13% - two, 9% - from three to five, and 3% - at least six. One Wielkopolska furniture company has on average slightly over

one (1,1) document of this type. The number of patents, certificates, and registered designs is the smallest in micro enterprises employing up to 9 people (an average of 0.9 documents per 1 company). It grows in companies with a larger number of employees: in small enterprises (employing from 10 to 49 people) it is on average 2.6 documents per company, in companies from 50 to 249 people it is on average 6.6 documents per company, and in the largest enterprises (employing over 250 people) the average number of documents is 20.2 documents per company [Janowicz 2016].

15.3. INDUSTRIAL PROTECTION OBJECTS IN THE FURNITURE INDUSTRY

Furniture design and production generates intellectual property in many different forms: the visual appeal of individual products (for example tables, chairs, cabinets and 2D patterns/surface decoration) protectable by unregistered and registered designs; the look of your websites, brochures and new software are protectable by copyright; and the technical innovations (for example new fixtures and fittings, or methods of assembly) required to make items function are protectable by patents, or may be retained as secret know-how.

Besides protection relating to products and methods of manufacture, trademarks allow the enterprise to protect and assert its brands. Know-how, when recognised as such and kept confidential in the form of trade secrets, can be a powerful way of retaining valuable information inside the enterprise for an indefinite period of time.

On the other hand, should the information be leaked, it becomes public knowledge, and the options for protecting the enterprise intellectual property are greatly reduced. Know-how arises organically, and can be lost, for example as personnel move on, taking with them their knowledge and expertise.

Another drawback is that know-how provides no protection against independent generation of the same ideas by a third party. Know-how can be captured and defined, and if commercially important, can be actively protected through registered rights, or managed through internal confidentiality procedures.

Building the brand position is a business challenge, which already at the stage of its creation will involve the need to ensure appropriate legal protection. A brand is directly associated with a trademark that should be ensured and properly protected by registering it. However, the brand is the sum of the impressions that consumers get as a result of using it. There is also a place for technical solutions that should provide adequate protection under patent law in order to monopolize an invention or a utility model.

For enterprises operating on the furniture market, however, design is particularly important in the brand building. Furniture is a good example of everyday products that are defined through the prism of functional and technical features, and for which the aesthetics (appearance) has a direct impact on the customer's decision to buy. The industrial design defines the real value of the product, determining its attractiveness and stimulating the desire to buy.

The range of possibilities for the protection of industrial designs is very wide, because an industrial design as a manifestation of creative activity of an individual nature can also be a work within the meaning of the Act on Copyright and Related Rights. Therefore, if the product meets the features of a work, it is protected on the basis of the provisions of the Act. Products that are subjects of industrial design can be additionally protected under the Act on combating unfair competition [Janoszek 2019].

There has been a growing belief that investing in industrial design is beneficial to a firm's performance as well as economic growth. The contribution of industrial design can be reflected in higher turnover and employment for those firms which invest in design compared to competing products or firms which do not have targeted investment in industrial design investment, and this can be linked to innovation and economic growth.

Design is a feature of new product development, alongside R&D, manufacturing, commercialization and marketing. It can contribute as a sector in and of itself, as well as a complementary strategic discipline in other sectors in the manufacturing and service industry (Whicher et al 2011). In a broad sense, "design is what links creativity and innovation, which shapes ideas to become practical and attractive proposition for users or customers" (Cox, 2005).

The Oslo Manual defines design from the perspective of product innovation. Design can be recognised as an integral part of the development and implementation of new product or process innovations as well as changes in product characteristics which affect the appearance, but not the functional performance of products (OECD/Eurostat, 2005). Despite this progress it remains a challenge to identify design as product or process innovation, and as such the review and modification of the Manual is in a discussion among related bodies.

The European Union regards design as a central element of innovation and the value of design was emphasised in the EU's growth strategy Innovation Union 2020. According to the EU Design Regulation, design is defined as an appearance of the whole or a part of a product resulting from the features of, in particular, the lines, contours, colours, shape, texture and/or materials of the product itself and/or its ornamentation. In this definition, design is recognised as the "look" of products [European Commission 2011].

The registration of an industrial design is the most frequently used instrument for protecting intellectual property by the furniture manufacturers. In order to obtain an exclusive right for an industrial design, it should be submitted to the relevant office. In Poland, registration is made in the Patent Office of the Republic of Poland. On the other hand, if the entrepreneur is interested in extending protection to the entire territory of the European Union, then you should consider filing a Community design with the European Union Intellectual Property Office in Alicante. The right from the registration of an industrial design gives grounds to claim our rights and exploitation of the product covered by it, however, it is a right limited in time, protection is granted for a period of 25 years, divided into 5 years. Therefore, the authorized person decides, also depending on the adopted marketing strategy of the company, how long to renew

the protection of the design, or after a certain time to invest in the protection of their new products.

The Polish legal regulation in the form of the Industrial Property Law Act regulates in detail issues related to the protection of exclusive rights granted by granting the right from registration for the industrial design. In accordance with art. 105 of the aforementioned Act, by obtaining the right from the registration of an industrial design, the authorized person acquires the exclusive right to use it in a commercial or professional manner throughout Poland. The right holder may prohibit third parties from manufacturing, offering, placing on the market, importing, exporting or using the product in which the design is contained or used, or the storage of such product for such purposes. Art. 19 of Council Regulation (EC) No 6/2002 on Community designs, with the relevant territory being the territory of the European Union. It should be remembered that these rights, however, are subject to certain restrictions, e.g. the right to quote or the so-called repair clause.

Basically, the scope of design protection is determined by its individual character - the right from registration of an industrial design covers any design that does not create a different overall impression on an oriented user. In practice, this means that it is forbidden to use in the trade (professionally or for profit) an industrial design whose external appearance gives the same general impression as compared to that generated by a previously registered industrial design. That is why it is so important to present the industrial design accurately on the plans attached to the official application. How the pattern will be presented determines the extent of its protection and the possibility of its effective enforcement.

Both the national and Community registration of industrial designs is a formal procedure, i.e. the competent Office does not carry out a substantive examination to verify the registration capacity of a design - the novelty and individual character of the submitted design are not assessed. The offices only carry out a formal examination of the application, i.e. they check whether the submitted product is an industrial design, whether it is not contrary to public policy or decency, and whether the application documentation is complete and meets the requirements arising from the provisions.

The Polish national system gives us the opportunity to submit an industrial design in several variations (maximum 10). The process of registering an industrial design at the Polish patent office takes from 3 to 6 months. The Community system is much less formal and requires only providing data on the applicant, presentation of the design and indication of the product to which the design relates, along with an indication of the class of products in accordance with the so-called Locarno classification. Unlike the national system, it is not possible to cover several variants of an industrial design with one application. Nevertheless, it makes it possible to cover, with one declaration, a virtually unlimited number of designs for goods in the same class of products (so-called collective declaration).

The registration process of an industrial design at EUIPO is fast and takes about 1-3 weeks, sometimes it is carried out quickly, because when applying in the so-called "Fast track" exclusive right can be obtained even in about 2 hours. Such a quick possibility of obtaining the right results from the specifics of design, where trends

change quite quickly and what consumers like today may be out of date next year. However, it has a disadvantage. The Competent Office only checks the basic formal requirements. However, it does not analyse whether the proposed solution is new and has individual character. In practice, therefore, you can easily register a design that has been on the market for many years. However, it should be remembered that in the event of a dispute, such a design may be annulled.

Accordingly, in the furniture industry, the objects of protection of industrial property are definitely the most common, such as industrial designs, i.e. new and individual forms of the product or its parts, given to them in particular by the features of lines, contours, shapes, colours, structure or material product and by its ornamentation [Industrial Property Act]. A utility model means a new and useful technical solution regarding the shape, construction or composition of an item with a durable form. A design is considered useful if it allows the achievement of a practical goal in the manufacture or use of products. In the case of the furniture industry, an industrial pattern can be identified with the shape, colour, and ornamentation of a new piece of furniture. A utility model is a new functionality of the furniture, and the trademark is a company or collection logo. Protection can not only cover the functions of the furniture, but also technological solutions in production.

15.4. TRENDS AND TRADEMARKS IN POLISH FURNITURE INDUSTRY

The furniture market, like any other industry, abounds in numerous novelties in the field of trends, technological solutions and fashion. These changes are cyclical, they undergo more or less transformations with the arrival of the new season. They are characterized by short duration, while most customers build their preferences based on long-term experience and established taste. It is no different when choosing and buying furniture.

Despite the passing trends, most furniture companies offer several permanent collections in order to reach the widest possible group of customers. Furniture manufacturing companies are aware of the inconstancy of fashion, which is why they focus on high quality, design, comfort and the ability to respond to consumer needs in their furniture. As the results of the study show, the vast majority of Polish consumers (58%) indicated modern style as the most popular. It convinces with simplicity and functionality, and furniture blocks are usually characterized by geometric shapes and colours dominated by subdued colours. This is also due to the opinions of furniture companies, which in the vast majority (74%) indicated this style as bestseller. This can also be seen in the collections presented by furniture companies, which often offer lightweight constructions in universal colours with useful technological solutions, using high-quality materials.

In the 90’s for industrial design, that new situation meant unavoidable confrontation with foreign goods and technological developments, as well as the need of introducing new skills, such as efficient management, competitiveness, flexible readjusting to changes, new model of work (an independent studio) and including computers in the

designing process. Those were conditions, which individual designers and newly established small (usually employing no more than a few persons) designing firms (e.g. Ergo Design, NC Art, NPD, Triada Design, Towarzystwo Projektowe) were facing and tried to overcome. At the very beginning of the second millennium, in an awareness of the government, society, and media, industrial design was not yet perceived as an element influencing the growth of competitiveness and innovative character of a product [Institute of Industrial Design 2020].

Analysing contemporary customers' preferences, one can notice a tendency towards simple, light forms with bright colours. Hence the popularity among consumers of the minimalist style (24%), characterized by lightness, naturalness and clarity of colours in shades of white, brown, black and gray. The growing Scandinavian style, which is characterized by a lot of light, naturalness and dominance of wooden furniture, most often in white, was indicated by 22% of consumers and 11% of companies. Interiors in a classic style dominated by antiques and old-style furniture, and the colours are kept in subdued shades of beige, brown and gray, were indicated by 18% of consumers and 17% of companies. It is worth remembering, however, that we are dealing with different styles, which are increasingly intermingling, which results in the fact that it can be difficult to clearly define the style of a given furniture [Grochowina et al. 2017].

For customers, the most important is the quality and durability of furniture - users care mainly about the precise manufacture and use of materials of the highest quality. Projects made of wood are becoming more and more popular. Users value minimalism, but at the same time they are individualists, which is why they are looking for unusual projects. Customers also pay a lot of attention to functionality, so furniture for multi-functional use of space is increasingly being bought. The subdued range of colors creates unlimited arrangement possibilities, and at the same time allows you to give the room an individual style. Design based on the latest global trends, which is why the Szynaka-Meble company visits the most valued industry events, such as the Milan Salone Internationale del Mobile or Interzum in Cologne.

Trends that will shape the furniture industry most strongly in the near future [KPMG 2017]:

- Aesthetics. Furniture should, above all, look nice and present well inside the apartment (97%);
- Functionality. The basic task of furniture is to fulfil certain functions (92%);
- Simplicity. Moving away from rich decorations, functional search solutions (89%);
- Subdued colours. Preferring light shades of wood, white and gray, giving up from dark or intense colours (81%);
- Representativeness. The living room is a room in the apartment, which is to meet above all representative role (81%);
- Lightness of forms and shapes. The popularity of light, delicate furniture, moving away from heavy furniture, massive (76%);

- Usable approach. Furniture is just a utility product that should not be spend too much money (75%);
- Hygge. The apartment should be above all cosy, it should rule mood of carefree, intimacy and peace (74%);
- Value for money. Searching for the best value for money, hunting for promotions (66%);
- Mixing styles. Combining different styles of furniture, different colours and materials in one Indoors (51%);
- Short-termism. Furniture is an element of the room's decor, changed whenever possible bored users (43%).

Consumers prefers products that meet their expectations related to: colours, shape, functionality and unusual desires. Contemporary consumers are also characterized by less and less attachment to the brand, while the desire to have unique furniture, tailored to their taste, requirements and dimensions of housing, is increasingly stronger.

Technical solutions used in furniture making are protected under industrial property rights as so-called utility models. Thanks to this, the enterprise in which a given utility model has been developed can obtain protection for it, which will guarantee its exclusive use of such a design and will prohibit copying of innovative solutions by competitors.

In some cases, innovative utility solutions used in the production of furniture or used in the furniture itself may be subject to patent protection. Patents are granted regardless of the field of technology for inventions that are new on a global scale, have an inventive level (they are not obvious) and are suitable for industrial use.

The shape of the furniture can definitely be protected by industrial designs. These types of designs are among the most popular. Creating an attractive armchair, table or wardrobe requires time and money. In the end, it's still uncertain whether a potential customer will like the product. However, if this happens happily, it acquires special value. Furniture that has been on the market for over 12 months cannot be protected in the form of designs. According to the Act, these are not new designs. The submitted design should also have an individual character. This means that an oriented user (e.g. potential buyer) when looking at a given furniture must have a different overall impression compared to what he has already seen. This hypothetical legal construction means, more or less, that the furniture you create must look different from that of your competitors. A cosmetic change is not enough. An oriented user cannot be mistaken. It is important to stress what is actually protected. The right from registration of a design does not cover product features resulting only from its technical functions [Lech 2014].

The most popular means of preventing copying of designs in the furniture and decorative industries is the registration of products as industrial designs. However, the protection of industrial designs is limited in time and can be up to 25 years. No wonder that some manufacturers are trying to reserve their products as spatial trademarks in order to be able to have a monopoly on them forever - trademark protection is in principle unlimited in time. However, these attempts often fail. A trademark may consist of any sign, in particular the shape of the goods, provided that the sign makes it

possible to distinguish between goods offered by different traders. In principle, it is therefore possible to obtain exclusivity for a specific shape of the furniture by registering it as a three-dimensional designation (Figure 2) [Roszak 2018].

Figure 15.2. Example of trademarks in the furniture industry [Roszak 2018]

However, it is unjustified to grant a monopoly on signs whose shape is closely related to the function of the good. It should be remembered that trademark protection law covers not only the identical shape of the product, but also similar shapes to the mark. Registration as a trademark, e.g. a four-legged table, could therefore grant exclusivity to one entrepreneur for the production of tables as such - i.e. furniture consisting of a worktop and legs. This would be contrary to the general interest, the essence of which is that there be free use of shapes that can be used to designate the characteristics of the good. Therefore, at both national and EU level, the registration of spatial markings which consist solely of:

- the shape which results from the nature of the good;
- the shape of the goods necessary to obtain a technical result;
- shape that significantly increases the value of the goods.

The above registration obstacles are intrinsic, which means that the existence of any of them is the basis for refusing to grant protection. Moreover, these conditions constitute the basis for revocation of already registered trademarks [Roszak 2018].

15.5. BAD PRACTICES IN THE FIELD OF INDUSTRIAL PROPERTY PROTECTION

The data on the subject of infringements slightly changed compared to 2008. Design indicates most, because over 70% of respondents. Technological solutions are copied in the next place. Every tenth participant of the survey indicates other intangible goods, which are not reproduced in accordance with the letter of the law. It is common to use photos from professional photo sessions, which does not necessarily co-exist with the process of copying entire collections. Frequent use of photos by third parties without the consent or knowledge of their owner (Elprim-Wika company). Pictures are used in press advertisements, own advertising leaflets, stands or on cars. Most often

these are companies that have nothing to do with the owner of the photo and the product presented on it, and advertise it as their own product. An equally bright example is associated with Mebelplast. The Italian manufacturer, Calia Maddalena, not only introduced the copied piece of furniture from the "Residence" collection under the unchanged name, but also used an original photo on the website, the copyright of which is owned by Mebelplast.

In Poland, the appearance of the furniture is protected against unauthorized imitation under three regulations - industrial property law, combating unfair competition and copyright. The protection resulting from the first of these regulations applies only to those who register the design of their furniture in the patent office. On the other hand, protection resulting from regulations on combating unfair competition and copyrights is independent of any registration of furniture image. Industrial property rights and the Act on combating unfair competition are the most common grounds for claims based on imitation of products. An example is the dispute over the "Kacper" beds, which reached the Supreme Court in 2016.

One of the easiest ways to enforce protection is protection based on rights in the registration of industrial or European Community designs. Currently, tens of thousands of such cases apply to furniture designs in Poland - both Polish and EU ones. They protect the design for 5 years with the possibility of extension to 25 years. Design registration rights prohibit competitors from making, selling, or even storing the product in which the registered design is included.

Exceptions have been made to the protection arising from the registration of a design, which is, inter alia, the right from registration of a design, which does not cover product features resulting solely from its technical function and which must be reproduced in the exact form and dimensions in order to be able to combine it or interact with another product.

In turn, the Act on combating unfair competition protects against committing unlawful acts or decency that harms the interests of competitors or customers. An act of unfair competition is, for example, imitating the finished product, consisting in the fact that by means of technical means of reproduction the external form of the product is copied, if it can mislead customers as to the identity of the producer or product.

Protection applies if the misrepresentation results from the fact that the product has been copied by technical means. The regulations also allow imitating the functional features of a product, including its construction, construction and form ensuring its usability. If imitation of the functional characteristics of the finished product requires taking into account its characteristic form, which may mislead customers as to the identity of the manufacturer or product, the imitator is required to properly mark the product. It should also be emphasized that the Act on combating unfair competition protects not only against misleading, but also against, for example, abusing of a competitor, market position of a competitor, or against unfair exploitation of a competitor's efforts and expenditures on implementing and promoting a product. It should also be mentioned that industrial design may also be covered by copyright, but then we are talking not only about protection arising from industrial property rights, but also intellectual property. This means that if the design is a work, and thus a

manifestation of creative activity of an individual nature, the law protects against the use of the design itself and its studies without the consent of the right holder [Jakubiak vel Wojtczak 2017].

In addition to copying furniture, there is a phenomenon of imitation that is far more difficult to prove. Frequently asked questions about changes used to distinguish products that can also be read as imitation or copying. This is the subject of court decisions, which usually end with a settlement of the parties. There is a tendency to stop such practices that mislead consumers as to the manufacturer's brand. Imitation and copying are measurable losses for the manufacturer, and thus less investment in the development of subsequent product lines and collections. It is worth making consumers aware of the purchase of much cheaper and deceptively similar furniture. Furniture often has to be protected as soon as the company intends to present it at the fair for the first time. They can already be copied. A few years ago, the issue of taking photographs during furniture fairs was agreed by European furniture chambers, fair organizers and the press regarding the ban on photographing exhibits. Then, educated cartoonists sketching new furniture appeared on the invasion. In addition to the issues discussed above, unfair practices include: theft of designs and trademark infringement, non-compliance with commercial confidentiality and theft, failure to respect confidentiality. Therefore, if the sale of furniture to the market has fallen, the brand loses prestige, and customers complain about the high price, these are tips to examine whether a dishonest competitor does not accidentally offer similar cheaper products or does not use our trademark unfairly. Therefore, if the company does not want to bear In addition to assessing the level of risk and searching the databases, it is necessary to create a strategy for the protection of intellectual property and then to follow it [Wiktorski et al 2019].

One of the good practice promoting protection of the industrial property protection is initiative called IP Friendly that is promoted by Grupa MTP, Poland's largest organiser of trade fairs, conferences and congresses, intensifies the fight against intellectual property rights violations during its events. Together with one of the largest Polish law firms − SMM Legal, MTP Poznan Expo implement an innovative project that allows exhibitors to quickly resolve disputes concerning intellectual property − IP Friendly. The main objective of the IP Friendly project is to enable exhibitors to quickly and effectively respond in the event of disputes, without engaging in prolonged litigation. The aggrieved party has the possibility to apply for the resolution of the dispute, which is done during the exhibition event by an independent and impartial arbitrator who is an expert in the field of intellectual property rights. Similar solutions based on models of accelerated arbitration procedures developed by the World Intellectual Property Organisation are already used, among others, at the trade fairs organised by SingEx in Singapore and Palexpo in Geneva. An application to initiate the Friendly IP procedure may be submitted by both an exhibitor and other persons. It is essential that the applicant holds the intellectual property rights which are violated. In practice this means that applications may be submitted by the author and those to whom the author transferred proprietary intellectual property rights or granted a licence to use the rights [MTP Poznan Expo 2020].

15.6. CONCLUSIONS

Due to the number of Polish furniture manufacturers and their high position on the list of exporters, the issue of protection against plagiarism solutions developed while creating furniture is extremely important. To strengthen their market position and deepen customer awareness of the uniqueness and uniqueness of the product offered, manufacturers can take advantage of protecting their rights. It should be noted that not every behaviour of another furniture manufacturer can be considered as the appropriation of someone else's property.

Polish law provides for the principle of freedom of imitation of solutions used by competitors, provided that they do not mislead customers or are not reserved as exclusive rights. It should be explained that imitation of the finished product by technical means of reproduction, its external form is considered, according to the Act on combating unfair competition, as an act of unfair competition, if it can mislead customers as to the identity of the producer or product.

Thus, it is forbidden to faithfully copy the product and provide it with the name or trademark of the entity whose product was copied instead of the indication of the entity that actually produced it. On the other hand, it is not forbidden to imitate the functional features of the product, such as e.g. construction, construction or form ensuring its usability. Nevertheless, the freedom of imitation is not unlimited - when imitation is significant, the regulations protect manufacturers by imposing an obligation on the copier to label their product to prevent customers from being misled - e.g. by placing their logo in a visible place of the product.

Whereas the specificity of the furniture industry, it seems that the most important role in protecting the rights of the manufacturer has the option to register an industrial design, a new and having individual character of a piece of furniture or a part thereof, he was given in particular by the characteristics of lines, shapes, colours, structure or the material of the article and its decoration. In the event of an infringement of intellectual property, a furniture manufacturer should request a cessation of infringement of its rights, and in the event of ineffectiveness of such actions, it may bring an action to the court to order the termination of infringement of rights, or to pay compensation (unjust enrichment).

In the furniture industry, new products and designs appear every day, which should be submitted to the Patent Office and placed in appropriate bases, so as to avoid copying or imitation after spending on product development. After all, the success of many companies depends on the design of the furniture. These characteristics are guided by customers purchasing, and they result from the idea and concept of the design team, i.e. the intellectual resource of the company. The medium-sized company offers at least several furniture collections and an average of two introductions per year to the offer. It can be estimated that several thousand new furniture designs are launched annually. In practice, only those companies that want to promote products under their own brand allow themselves to create permanent, professional design teams. For smaller companies, the designer is usually the business owner or chief

technologist. However, some companies produce furniture only on order and do not develop their own projects. Among the companies regularly submitting industrial designs for protection are, among others: Black Red White, Forte, Kler, Vox].

Obtaining a protection right for an invention, design or mark does not eliminate the threat that these rights will be violated. However, an important protective factor is the set of claims due to the owner in case of violation of his exclusive rights. Industrial property law makes it possible to take preventive measures even before a breach of law. Namely, the owner of exclusive rights or a person authorized by law may request that the activities threatening to violate the law be stopped. In a situation where the violation has already taken place, it may demand that the violation be ceased and its consequences be removed, the benefits obtained unreasonably obtained, as well as compensation for the damage on general principles. In addition, he may request an appropriate statement in the press, and, if the violation is culpable, demand payment of an appropriate amount of money to one of the social organizations involved in the promotion of industrial property.

For furniture or any other manifestation of industrial design to be protected by copyright, it is necessary that such work is a manifestation of creative activity of a creative nature. The point is, therefore, that the project should not have a routine or routine character, but should be characterized by originality and constitute a subjective new intellect.

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16. ORGANIZATIONAL CULTURE - MANAGERIAL AND MOTIVATIONAL TOOL

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16.1. INTRODUCTION

It is indisputable that innovative behavior is key to sustainable competitive advantages, as it allows companies to be flexible and to improve the ability to adapt to market changes. Therefore, the cultural values that encourage innovative behavior is relevant to business development. (Manzanares, 2016) The aim of this chapter is analysis of an organizational culture impact. An appropriately designed organizational culture can greatly facilitate the motivation of employees and management of innovation processes within an organization (Wei, et al. 2013). Innovative organizations that develop aspects of organizational culture present superior performance in the development and implementation of innovations (Quandt, et al. 2015). The most important part of the paper is a partial research result presentation concerning state of innovation organizational culture in Slovak medium sized enterprises (over 50 employees) from 2010 to 2014. Considerable reserve of the adequate background for encouragement of an employee's innovation behaviour was discovered. Factors like leadership style and the development competencies and skills of human capital, largely determine the innovation path of a firm as well as its ability to establish a corporate sustainability process. (Carvaja, et al 2015). Therefore a general proposal of step by step methodology with point evaluation of an orientation rate of organizational culture to the innovation was created during formation of adequate organizational culture. Case study of level of attribute in three monitored enterprises endorsing innovations was applied for identification of barriers to innovation process improvement.

16.1.1. Organization culture as precondition of motivation

Organizational culture reflects human inclinations in thinking and behavior as well as it affects human consciousness and subconsciousness. It strengthens the relationship of a person to work, regulates relationships between employees and has a significant impact on the activity of employees (Kachaňáková, 2010; Jønsson & Jeppesen, 2012), whereby it directly affects the level of engagement or the inner motivation of employees to work in the respective organization and to achieve results for it (Westover & Taylor, 2010). Generally presented and declared organizational culture elements include essential convictions, values and standards outwardly manifested by symbols and artefacts which were designed, discovered or developed

in an organization as a result of successful problem solution, and a group of people bearing organizational culture in which such a culture is shared. Authors like Deal & Kennedy (1982), Kilmann et al. (1985), Trice & Beyer (1993), Alvesson (1993), Hall (1995), Brown (1995), Cameron & Quinn (2011), Collins & Smith (2006), Schein (2009), Kachaňáková (2010), Cow (2012), Kachaňáková & Stachová (2012) and others commonly recognize that:

- Organizational culture is a considerable subsystem of an organization, a determinant of the effectiveness of an organization and the quality of working life of organization members.
- Organizational culture does not have an objective form of its existence. It exists in the form of essential convictions, values, standards and patterns of behavior shared by individuals within an organization. It is outwardly manifested by means of behavior and artefacts.
- Despite the fact that organizational culture only exists through individuals, it is a group phenomenon with a supra-individual nature.
- Organizational culture is a result of a learning process carried out within solving the problems of external adaptation and internal integration. It is accumulated experience of an organization, transferred in socialization process.
- As accumulated experience of an organization, transferred to individuals in socialization process, organizational culture is relatively stable. However, as a product of dynamic tendency occurring on the grounds of constant confrontation of environment's requirements and internal possibilities of an organization, it always comprises a certain potential to change.
- The organizational culture acts as a significant element of motivation in decision-making of employees and applications to select or stay in the organization (the position of the organizational culture as motivating element gains in importance especially when there is a larger opportunity to choose employment in organizations, i.e. at a time when there are enough job offers on the market, as is the case in the present, and also in case of individuals who posse specific work skills organizations need to obtain, but there is only a limited number of such individuals on the market).

In relation to the aforementioned facts organizational culture can be comprehended as a management component of an organization, it *unifies individual levels of management* and leads to a situation when organizational objectives and methods to achieve them are accepted and supported by all employees (Ohara & Cherniss, 2010), because only in such way are all *employees motivated to behave in their contextual concord* not only in standard but also in crisis situations.

The existing culture in the organizations is outwardly manifested by its external elements, namely items represented by symbolic artefacts of material nature (including signs, logos, images, style and formal arrangement of correspondence, architecture of buildings, interior furnishings, organizational colors, promotion items, staff clothing, etc.), verbal symbols (including jargon, jokes, metaphors, proverbs, slogans, stories, legends, myths, sagas, etc.), symbolic behavior and actions (including customs, behavioral standards, codices, rituals, ceremonials, etc.) and also status symbols

(traditional designation of some work positions (e.g. president, inspector), various titles awarded as the expression of appreciation of the employee's work (e.g. the best employee of organization), or tangible means corresponding to individual, especially higher, positions (such as the size, placement and furnishing of office with furniture, artistic items, plants, allocation of secretary, organization car, mobile phone, membership in clubs, visit cards, etc.).

It is possible to act on means of organizational culture relatively simply, mainly through direct measures, as they can be clearly named and are easily understood and grasped for employees. It is significantly more difficult to act on inner elements of culture, represented by values, attitudes, and beliefs. To have them internally accepted by employees, it is not enough to use direct measures, but it is necessary to act on employees more deeply and with indirect tools. From among them, a prominent place belongs to *motivation of employees,* both inner (consistency between values of the employee and values of the organization (Da Silva, et al., 2010) and outer in form of stimuli (Brown, 1995), which characterizes the system of remuneration as the method of clear expression of values of the organization and a key to the understanding of culture of the organization by employees. An important role in this acting on is played especially by a direct superior of the employee, who should be in the position of the instructor of organizational culture, as well as the system of individual functions of human potential management and development, through which the suitable culture can be not only spread, but also promoted.

Clearly legible organizational culture is more and more becoming an important added value of services and products offered on the market by the organization, a determinant of relationships with business and other partners and especially a way of distinguishing the organization in the eyes of present and potential employees and a tool of management and motivation of people in the organization (Uriga & Obdržálek, 2009). However, in order to apply the said in practice it is required for top managers of organizations to start to consider the organizational culture as a real tool which can be influenced in a targeted and systematic manner (improved, motivated, cultivated, managed) and through which it is possible to assure the achievement of the required level of performance of the given organization in a long-term manner (Cagáňová et al., 2010).

Unfortunately, the organizational culture as such belongs in the perception of the management to so-called soft areas, which are relatively difficult to measure, and therefore is considered by the management of the organization to be only an extra activity which is shifted to the background in times of crisis or during bad times of the organization. However, suitable organizational culture directly affects the performance (Ogbonna & Harris, 2000; Škerlavaj et al., 2011; Rezaei, et al., 2016; etc.) and resulting financial success of organization. All studies from the past (since the eighties of the last century) until the present are linked with a common idea which attributes key importance to the organizational culture in influencing the performance. What is the organizational culture like, i.e. what is its power and content, depends on the particular organization and conditions under which it operates at the given time.

Authors dealing with the issue of the organizational culture in general are of the opinion that suitable organizational culture contributes to long-term maintenance of organization's performance, of engaged or motivated employees, and especially that it is the source of competitive advantage (Wilderom, Glunk & Maslowsi, 2000). This is clearly implied also by functions of organizational culture, on which authors relatively highly agree both in the past and in the present. It is also implied by the agreement in opinions that organizational culture reduces conflicts, assures continuity, intermediates and simplifies coordination and control, reduces uncertainty of employees and affects their work satisfaction and emotional wellbeing, can be an important source of motivation and is a competitive advantage (Lukášová, 2010). A survey completed by the organization Armstrong Competence Consulting in 2009 showed that as much as one fifth of performance of employees can be explained by differences in organizational culture.

The aforementioned implies that it is necessary for an organization to ensure concordance, respectively the greatest possible intersection between the values declared within the sustainable development concept, values enforced by an organization, and the values of its employees. In order to be able to achieve the greatest possible extent of concordance between human resources in an organization and desirable elements of organizational culture declared by an organization, it is necessary to interconnect activities within individual functions of human potential management and development with required values, approaches, and behavior at work (Stachová & Kachaňáková, 2011). We can claim on the grounds of the above that there is an important mutual influence between the content and power of the organizational culture in the organization and the level of motivation of organization's employees to act and make effort for the benefit of the organization.

The basic task of both the postmodern management and the concepts of sustainable development and 'shared value' is to identify the performance with morality. As Branson puts it: "Ethics is not an important part of business, but forms its substance," (2009). It is important to assure that "achieving the performance is not considered more important than following the rules," (General Electric, 1993, In: Hroník, 2012). However, this task can be achieved only with the precondition that the behavior of employees is based on and corresponds to their own attitudes, which will be in compliance both with their own values and values of the organization and that such values will be 'right'. That requires dealing with the system of values and standards employees of the organization would actually accept and which would be manifested in their behavior as well as in the expectation of such behavior from other including new employees. Even though their presence is mainly natural and depends on people's wishes, the management should influence them in relationship to objectives of the organization.

Whereas the individual value system of a person determines what is significant for him or her personally, organizational values express to what important is attached in the organization as the whole. According to e.g. Hofstede (1994), Hall (1995), Kachaňáková (2010), Lukášová (2010), Hroník (2012), Muller et al. (2013), organizational values form the *core or roots* of the organizational culture. Formulation

of key values and their communication to employees is therefore an important tool of building the culture of the organization. Defining values in the organization was characterized by Jack & Suzy Welch (2007) as the: “description of acting of the best employees on their best days.” Values of the organization should not represent only some extra addition or ‘icing on the cake’, but should be roots in the organization.

16.1.2. Change and anchor of organization culture

When an organization decides to focus on organizational culture and on its positive adjustment, supporting sustainable development of an organization in accordance with a vision and objectives of an organization, it is desirable to follow several steps, within which three levels necessary in the process of creating a suitable culture should be fulfilled (Cooper et al., 2001; Lukášová, Nový et al., 2004; Schein 1999).

Justification of the organizational culture and its influence on the motivation, performance, profitability and sustainability of an organization was and has been permanently confirmed by world-recognized authors (e.g. Deal & Kennedy, 1982; Hofstede, 1991; Kotter & Heskett, 1992; Pfeifer & Umlaufová, 1993; Denison, 2006; Buckingham & Coffman, 1999; Lencioni, 2002; Kachaňáková, 2010; Lukášová & Nový, 2004; Hofstede & Hofstede, 2007; Kotter & Rathgeber, 2008; Lukášová, 2010; Cagáňová et al., 2012; and many others). The above implies that focus of organizations on creation or support of suitable, desirable, supporting or positive organizational culture is necessary, because same as it is proved that suitable organizational culture supports the organization in the context with its sustainable development concept. It is also proved that unsuitable organizational culture prevents its progress.

It is therefore of priority importance for that managers or the management of the organization to succeed in determining what culture is the most suitable for the particular organization and subsequently to be able to achieve the ‘popularization’ of such suitable culture in the organization to a level where employees would not be forced to adjust their behavioral values to cultural values in the organization, but where consistency between such two sets of values would be achieved. It is this state of consistency between the values of the organization and values of employees which can be deemed an ideal state, when the organizational culture in itself is considered to be competitive advantage. In order for the managers to succeed in determining which culture is suitable for the organization, i.e. the most suitable, it is necessary to complexly analyze the present state of culture in the organization and to continue further only on the grounds of analysis results (Stachová & Stacho, 2013).

An impulse for the analysis of organization culture can be on the one hand also the realization of justification of the organizational culture by the management with regard to the achievement of organization’s sustainable development, but also for instance:

- The fact that the established culture does not correspond with changed conditions in the environment;

- The fact that there is a non-compliance between the established organizational culture and strategically necessary culture (e.g. in case of change of the vision, mission, objectives, strategy);
- The fact that the organization passes from one development phase into the next;
- The fact that there is a major change of the organization's size;
- The fact that there is a substantial change in the scope of business activity, the position of the organization on the market is changing;
- The fact there is a merger or takeover of the organization;
- The fact that the organization changes because technology or the business environment changes, or the change is expected from them (Deal & Kennedy, 1982; Williams, Dobson & Walters, 1993; Pfeifer & Umlaufová, 1993; Šigut, 2004; Lukášová, 2010; Kachaňáková, 2010).

The process of formation of the suitable organizational culture, which generally expresses the sequence of individual steps, can be expressed by various schematic models. One of the first was the Lewin's three-stage model of organizational culture change, which was later elaborated by E. Schein (1999). The nine-step model of Lukášová, Nový et al. (2004) is also clearly transparent, as well as 6-step process of Sackmann (2002) and the D-V-Z methodology, which was defined by authors Pfeifer and Umlaufová (1993) for the purpose of creation of the suitable organizational culture. Several various step-by-step processes, methodologies and schemes can be found in literature for the formation of suitable or desirable organizational culture, but despite they differ in scope, height, width and depth, it is possible to point out a certain parallel of three levels of the process of formation of the suitable organizational culture in all of them, namely:

1. Level of understanding;
2. Level of directing;
3. Level of implementing or anchoring.

An idea is very important that the process of building or re-building the organizational culture is based on sufficient level (strength) and quality (orientation and content) of the motivation of managers and employees.

16.1.3. Selected functions of human resources management in context of organization culture and motivation of employees

Regarding the achievement of a required state of organizational culture change, encouraging organization sustainable development, authors like Lukášová, Nový et al. (2004), Kotter and Rathgeber (2006), Welch and Welch (2007), Armstrong (2009), Koubek (2010), Covey (2013), etc., state that there are several factors having a significant impact on success, respectively a failure of the whole process of creating a suitable organizational culture, as well as several instruments appropriate in order to support the implementation of a suitable organizational culture. Selected human potential management and development processes/functions are declared by Hroník

(2013) and Stachová & Stacho (2013) as both significant factors and essential instruments for achieving the objectives of a process of changing a culture. However, as Lukášová (2010) presents, none of the human potential development processes has such a significant impact itself, i.e. without a relation and interconnection with other processes. All activities carried out within human potential management and development have an effect in relation to culture, and each of them can be a critical element in the process of organizational culture change, however in isolation their effects are limited by the present culture. They can thus work as instruments of change only in case they will represent an integrated group focused on the promotion and implementation of suitable ways of behavior of employees, compliant with the orientation of culture and strategic goals of an organization, supported by appropriately declared desirable approaches and values.

The aim is to achieve that all employees perceive the organization as successful in the context with sustainable socially responsible business practice with priority focus on the social pillar, i.e. as the organization with which employees associate their objectives, desires and ambitions, whereas it is a set of relatively permanent (developed and maintained on a long-term basis) ideas, approaches and values shared within the organization. It is primarily about people having the opportunity to perform work for which they are qualified, which they like and which satisfies them, because they perform it in pleasant environment and thus achieve above-standard results, from which both the organization and they profit. Their *motivation,* participation in organizational intentions, energizing, ability and willingness to engage for the organization (Barták, 2010) all stem from it.

In order to achieve such a link between human resources and their values, attitudes and working behavior, i.e. with organizational culture elements, it is necessary to link activities within individual human resources management functions with required values, attitudes, and working behavior so that employees do not feel pushed into something they are not, but are linked with individual elements of culture in the company to the extent that they do not even realize their conformity and take it for granted.

Within the characteristics of the mutual impact of individual functions of human resources management of the organizational culture and the level of employee motivation, we consider the most important to focus on selected functions and tools used in them as follows.

As part of the work analysis, the company ensures the systematic collection and evaluation of information on the content of work, conditions of its performance and requirements (work and value) for job holders as well as for updating all information. The recruitment and selection functions as part of a comprehensive personnel marketing system should be implemented in such a way as to obtain those employees who have a related value orientation (properly formulated advertising, a suitable place for publishing the advertisement) and hence the prerequisites for identification with organizational culture. This means that the organization should clearly present its philosophy and policy to job applicants in this process. Candidates should then be selected by methods (Dr. Roger Harrison questionnaire, P - O fit tool, case study

methods, and role-playing methods) that will also allow their prerequisites to adapt to a given organizational culture. The selection process of the new employee should be followed by an adaptation process, in which, besides work and social adaptation, adaptation to organizational culture must be ensured, including activities such as transferring the adaptive employee through the company premises, acquainting him with the organizational structure individual levels of management, acquainting the adaptive employee with the desired behavior and action, acquainting him with the history, strategy, code of ethics, the founder and heroes of the company and to convey clearly and comprehensibly the individual elements of culture, the use of a mentor. The basic behaviors of supervisors and colleagues become a model for new employees. The adaptation process in this area aims to help new employees to understand and adapt to existing social and management standards. Employee education and development is one of the basic forms by which elements of organizational culture are brought to the attention of employees. Through targeted training and employee development, it is possible to contribute to their better identification with organizational culture and its values (company magazine, intranet, lectures, workshops, role-playing, brainstorming, case studies, simulations, outdoor methods, or experiential training). As part of this function, it is also necessary to focus on career management and talent management, which includes activities that ensure the development of employees so that the company has the necessary number of qualified successors corresponding to future requirements, who will be loyal and able to share and then spread the values of the company both externally and inwards.

In order for the previous function to be provided effectively, it is essential that businesses pay attention to and based on the employee performance appraisal function. When evaluating work performance, it is very important to focus not only on assessing the quantity and quality of work but also on willingness, approach to work, work behavior, attitudes and values of employees, also the frequency of work accidents, fluctuations, reasons for absence, relationship to people in connection with work, as well as other characteristics of the evaluated employee, which are considered significant in relation to the work performed and the company (Koubek, 2006). The evaluation function is directly followed by the employee compensation function, which represents the interrelated policies, processes, and procedures of the company in compensation of employees in relation to their contribution, competencies and market value, and focuses on dealing with monetary and non-monetary compensation and various employee benefits. The compensation function is described by many authors as key to building the content of organizational culture, as employees are directly or financially or non-financially compensated for their behavior during their work, which in turn motivates them to maintain, progress, or to change their behavior. Compensation affects employees through their motivation. Creating the right system of employee compensation, which would stimulate them to achieve the goals of the organization and their personal goals, is based on the right identification of employees' needs, interests, and value orientation. On the grounds of such bases and evaluation results, a system of monetary and non-monetary compensation can be developed and implemented that will encourage the desired behavior and performance of employees

in terms of organizational culture. As stated by Kachaňáková and Stasiak-Betlejewska 2013, a clearly formulated personnel policy and its actual implementation in practice through individual human resources management functions clearly show the values that are preferred in the organization. If they are oriented positively and reflect basic priorities in people management, they can become an important stimulus tool affecting the behavior and performance of employees in meeting the goals of the organization.

However, for practical application of the given statements it is necessary that top managers in organisations start to consider organisational culture to be a real tool that can be consciously and systematically influenced (improved, cultivated, managed), and through which it is possible for the given organisation to ensure long-term reaching of required performance (Cagáňová, Čambál, Weidlichová Luptáková, 2010). In order to find out what is the current state of theoretically described issues in Slovak companies, we focused on the questionnaire survey, which runs cyclically in 2010-2018. We have gradually analyzed their focus on organizational culture in the context of its support and belief in its importance of organizational leadership, focusing organizations on the need for analysis as a first step in considering the current situation and possible (necessary) change of organizational culture, moreover, we also focused on suggestions for organizational culture analysis. Last but not least, we were also interested in whether organizations are aware of the interconnection of selected human resources management functions with organizational culture.

16.2. MATERIALS AND METHODS

Research presented in the paper was conducted each year between 2010 and 2018. Its objective was to find out the present state of human resources management and organisational culture in organisations operating in Slovakia. Organisations engaged in the research were interviewed by means of a questionnaire delivered personally to a person responsible for human resources management in the given organisation.

In order to determine a suitable research sample, two stratification criteria were set out. The first criterion was a minimum number of employees in the organisation, which was determined at 50 employees. The given stratification criterion excluded micro and small enterprises from the research on the one hand, however, on the other hand, the justness and need to focus on a formal system of human resources management in companies with more than 50 employees were observed and especially declared by means of this criterion. The second stratification criterion was a NUTS 2 region of organisation´s operation, while the structural composition of the research sample was based on the data of the Statistical Office of the Slovak Republic.

According to the Statistical Office of the Slovak Republic the number of companies with a number of employees 50 and more was between 3,261 and 3,359 over the period between 2010 and 2018. The NUTS 2 regional structure of companies with more than 50 employees in the given years is shown in Table 1.

Table 16.1. Regional structure of companies with more than 50 employees

Region	**Bratislava region**	**Western Slovakia**	**Central Slovakia**	**Eastern Slovakia**
Districts	**BA**	**TT, TN, NR**	**BB, ZA**	**KE, PO**
Number of companies in 2010	1069	962	655	622
Number of companies in 2011	1078	983	666	632
Number of companies in 2012	1095	930	652	618
Number of companies in 2013	1102	915	645	606
Number of companies in 2014	1098	907	644	612
Number of companies in 2015	1105	916	651	613
Number of companies in 2016	1114	923	649	621
Number of companies in 2017	1121	935	652	623
Number of companies in 2018	1129	956	655	633

Source: data processed according to the Statistical Office of the Slovak Republic

Determining an optimal research sample of the given basic group of companies, Confidence Level of the research was set at 95 %, and Confidence Interval of the research was set at H = +/- 0.10. On the grounds of the given criteria an additional, respectively relevant research sample for individual regions of Slovakia was set in the analysed years. It is shown in Table 2.

Table 16.2. Size of the research sample for individual regions of Slovakia

Region	**Bratislava region**	**Western Slovakia**	**Central Slovakia**	**Eastern Slovakia**
Districts	**BA**	**TT, TN, NR**	**BB, ZA**	**KE, PO**
Number of companies over 2010 - 2018	1069 -1129	907-983	644 - 666	606 - 633
Size of the research sample	89	88	84	83

Source: Own processing

Approximately 500 organisations were included in the research each year, however due to a great extent and the form of data collection only approximately 65 % of questionnaires used to be returned comprehensively completed. Subsequently, 344 organisations, corresponding to the optimal research sample determined on the grounds of stratification criteria, were randomly selected from these organisations. We did not take into account the repeated participation of the same organizations in individual years of the research.

Companies from all sectors of economy were represented in the research each year (Table 3), while 7 % to 10 % of the analysed companies were operating in agriculture and forestry; however the research results did not show any significant

differences at cross-sector comparison. For the given reason, the research results were evaluated cumulatively, i.e. regardless of sectors companies operate in.

Table 16.3. Percentual share of companies operating in individual sectors

Sector / share of companies in % in year									
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Industry	40	37	40	38	39	40	41	42	38
Agriculture, forestry and fishery	8	9	7	10	8	9	7	8	10
Power industry and water management	4	3	4	2	4	3	3	4	3
Services	25	32	34	35	33	32	31	32	35
Banking, finance and insurance	9	5	3	4	5	7	2	4	3
Civil engineering	10	11	10	9	10	7	14	9	9
Other	4	3	2	2	1	2	2	1	2

Source: own research

Key methods used in the conducted research include logical methods, adopting the principles of logic and logical thinking. Particularly the methods of analysis, synthesis, deduction and comparison were applied from this group of methods. Mathematical and statistical methods were also applied in the paper. From software products available on the market, a text editor, a spreadsheet and statistical software were used in the research work, particularly including MS Word 2007, MS Excel 2007 and SPSS 15.0 statistical software for Windows®.

16.3. RESULTS

Within the research, we were predominantly interested in whether managements of questioned organisations realized the importance and justification of dealing with creation and maintaining of appropriate organisational culture. Majority of questioned organisations, 95 %, agreed on the positive answer to this question. Most frequent answers to the sub-question “Why?” were: because it increases motivation to work and enthusiasm about work, which results in increase within performance and efficiency, while creating favourable and productive environment, enhancing relationships and mood at the work place, having a significant impact on the view of customers and the public on the organisation, and being representative of the organisation. Over the past three years, organizations have begun to highlight the positive impact of organizational culture in the selection of candidates (on the candidate side, in the selection of the organization), and is also the reason why employees in the organization remain similar throughout the business life cycle. The given answers clearly suggest that almost all the questioned consider organisational culture to be a significant and important part of the organisation´s success.

Table 16.4. Creating and maintaining an appropriate organizational culture

Percentage of managers considering important to develop and maintain an appropriate organizational culture [%]								
2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
91	87	88	84	87	91	93	92	95

Source: own research

Answers to the first question sounded very positive, however, in searching for whether the organisations had defined organisational values in writing within their corporate strategy only 49 % of them answered positively (Table 5). While as long as a clearly and understandably defined strategy is absent it is very difficult to derive organisational culture particular parameters and values from it. The written definition of organisational values within corporate strategy can also be considered to be one of the first possibilities how the organisation management can declare its engagement in the sphere of culture. Like upon implementation, it is necessary also upon maintaining of required organisational culture to ensure that professional promoters have the possibility to rely on a powerful authority within the organisation that is able to actually enforce individual steps. Complete support from management is the crucial condition of success in implementation and subsequent maintaining of required organisational culture.

Table 16.5. Spheres covered by elaborated documentation in analysed organisations

Spheres covered by elaborated documentation in analysed organisations	**Written document in [%]**								
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Mission of the organisation	73	71	65	67	71	78	79	82	84
Strategy of the organisation	76	68	64	70	71	70	75	77	78
HR strategy	54	53	51	50	51	53	52	53	54
Code of ethics	58	53	49	51	52	53	52	54	56
Code of social responsibility	31	23	23	24	23	25	24	26	24
Innovation strategy	39	23	26	31	35	36	40	39	42
Organisational culture strategy	**25**	**33**	**29**	**32**	**33**	**37**	**43**	**41**	**49**

Source: own research

Within the research, we were further interested in whether questioned organisations executed organisational culture analysis (Table 6).

Table 16.6. Analysis of organizational culture

Percentage of enterprises performing organizational culture analysis [%]								
2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
26	33	20	23	32	34	33	31	33

Source: own research

We were also searching, in case of negative answers, for reasons why the organisations did not execute culture analysis (Table 7). Organisations answered most frequently, that they solved problems recognizable also without analysis. However,

these organisations probably do not realize the fact that in general, probability of revealing origin of a problem without analysis execution is low, since it often happens that only a secondary reason is revealed, and after its solution the problem is not eliminated but it can even be reflected more significantly and unexpectedly, since there is a presumption in the organisation that the problem had been solved. Such action can be described as non-systemic, since it does not lead to the problem solution but often only to pointing at it.

Table 16.7. Reasons for the absence of organizational culture analysis

Reasons for absence of organizational culture analysis	**Share of companies in %**								
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
We do not consider organizational culture important	17	19	20	13	18	17	16	18	17
We solve problems that are recognizable even without organizational culture analysis	63	66	65	69	67	67	68	65	69
The analysis of organizational culture is very expensive for our company	18	13	14	17	14	15	14	16	12
Other	2	2	1	1	1	1	2	1	2

Source: own research

As the phase of analysis can be considered, for its priority importance, to be key in the creation of required culture in the organisation, we focused on finding whether there exists, and if so to what extend there exists, a different approach in organisations that execute the analysis and so deal actively with creation and maintaining of required organisational culture, and those that do not execute it.

Comparing what individual groups of organisations consider to be an impulse, respectively a significant problem regarding which it is appropriate to execute culture analysis, we found out that in the highest extend, 46 %, organisations executing the analysis considered already organisation´s transformation from one developmental stage to another to be an impulse (Table 8). Majority of organisations not executing the analysis, 35 %, were not able to react to the question, and others most frequently marked consequences of unwanted culture as impulses to analysis execution, in particular ineffective usage of working time in 33 %, inappropriate, respectively insufficient communication among individual organisational units in 31 %, and work productivity decrease equally in 31 % (Table 8).

Table 16.8. Impulses for the execution of organization culture analysis

Impulses for the execution of organization culture analysis	**share of companies in %**								
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Decrease in labor productivity	25	27	18	17	18	20	18	17	16
Inefficient usage of work time	31	26	16	14	15	17	15	14	13
Problematic interpersonal relationships in the workplace	29	16	15	19	18	20	15	20	19
High employee turnover	16	24	28	29	31	33	28	27	25
Poor or insufficient communication between individual organizational units	41	22	26	23	26	28	24	23	24
The discrepancy between the current corporate culture and the strategically necessary organizational culture	27	20	11	9	12	14	11	10	9

Overcoming the character of current organizational culture by changes in the economic, social or technical environment of the company	25	24	21	23	22	24	21	23	22
Transition of the company from one development stage to the next	46	29	34	27	28	30	34	27	25
Significant change in company size	27	24	13	18	22	24	11	17	16
Significant change in business	3	2	0	6	5	7	4	6	5
Change in market position, takeover or merger	21	21	15	20	17	19	15	18	17

Source: own research

Table 16.9. Potential impulses for execution of organizational culture analysis

Potential impulses for execution of organizational culture analysis	**share of companies in %**								
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Decrease in labor productivity	32	29	19	39	37	36	35	37	38
Inefficient usage of work time	33	32	18	30	28	29	31	30	27
Problematic interpersonal relationships in the workplace	30	26	13	17	19	19	26	13	19
High employee turnover	21	27	12	26	28	22	27	11	28
Poor or insufficient communication between individual organizational units	32	25	15	19	17	13	25	15	17
The discrepancy between the current corporate culture and the strategically necessary organizational culture	18	4	4	5	3	7	5	6	4
Overcoming the character of current organizational culture by changes in the economic, social or technical environment of the company	8	3	2	4	3	4	3	2	3
Transition of the company from one development stage to the next	18	13	4	7	5	5	14	4	5
Significant change in company size	17	13	13	12	9	12	13	12	11
Significant change in business	11	11	7	7	10	9	10	7	9
Change in market position, takeover or merger	18	10	5	6	6	7	10	5	6
Could not comment	35	35	57	38	42	39	35	37	39

Source: own research

However, the most significant difference was identified in comparison of approaches of individual groups of organisations to whether organisational culture made human resources management in individual functional spheres easier for them. Organisations dealing with culture indicated ten out of twelve given spheres in higher percentage (spheres where they felt “completely” positive impact of organisational culture), compared to two with lower percentage (spheres where they did not feel positive impact of organisational culture “at all”). Regarding organisations not dealing with culture analysis, this usefulness ratio was exactly opposite, since in 23 % to 63 % they stated in ten spheres that organisational culture did not have positive impact on the given sphere “at all”, and in only two spheres they stated in percentage ratio 21 % - 23 % that culture had positive impact on making human resources management easier (see Table 10).

Table 16.10. Impact of organizational culture on human resources management

Impact of organizational culture on human resources management	share of companies in %								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
personal planning	51	40	48	47	50	45	48	51	47
work analysis	42	34	33	34	41	34	35	41	34
recruitment	48	37	36	33	48	37	36	48	34
selection of employees	52	47	45	45	51	48	45	51	45
adaptation of employees	41	29	30	31	41	28	31	40	28
outplacement	7	3	3	3	5	4	3	2	4
employee training	52	37	51	51	52	37	51	52	37
employee evaluation	55	52	49	53	54	52	53	54	52
employee compensation	51	39	42	41	54	41	42	56	41
work relations	50	37	44	45	50	37	45	50	36
employees' communication	58	55	48	47	57	52	48	56	52
work conditions	48	34	29	37	41	34	39	36	32

Note: Only companies filling out an organizational culture analysis responded
Source: own research

Table 16.11. Impact of organizational culture on human resources management

Impact of organizational culture on human resources management	share of companies in %								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
personal planning	35	27	25	28	26	25	34	27	26
work analysis	29	23	13	22	22	13	28	23	22
recruitment	32	25	21	26	25	21	31	25	24
selection of employees	42	36	28	34	35	28	42	36	35
adaptation of employees	32	24	17	25	24	15	32	24	25
outplacement	2	1	2	3	1	2	2	1	1
employee training	38	27	26	24	25	23	37	27	24
employee evaluation	40	39	31	34	37	31	37	34	37
employee compensation	40	40	30	31	35	38	40	28	34
work relations	41	37	38	33	35	35	42	37	35
employees' communication	39	34	37	33	32	34	39	31	32
work conditions	35	27	25	26	27	25	35	27	26

Note: Only companies filling out an organizational culture analysis responded
Source: own research

16.4. CONCLUSION

On the basis of executed research in organisations operating in Slovakia, focused on finding out whether the organisations realize the importance of organisational culture, and whether they deal with its creation and maintaining in practice we can formulate the following summary. In spite of the fact that up to 95 % of organisations stated that they realized the need to deal with creation and maintaining of appropriate culture, only 49% of them have defined organisational values within corporate strategy in writing, only 34% of them have executed, respectively execute regularly,

organisational culture analysis. In comparison, what individual groups of companies consider as an impulse or a significant problem in which it is appropriate to carry out a culture analysis, we have found that the analysts consider the transition from one development stage to the next to be the strongest impulse. On the other hand, the non-analyzing enterprises were largely described as impulse to carry out the analysis up to the consequences of an unwanted organizational culture such as inefficient use of working time; insufficient communication between individual organizational units and a decrease in labor productivity. When comparing the views of individual groups of companies on whether organizational culture facilitates human resources management in each functional area, cultural enterprises have identified a higher percentage of all of the twelve areas, which unequivocally confirms that: "Human resources management activities serve as a tool for the creation and promotion of organizational culture, which in turn, through its elements, supports individual human resources management activities "(Kachaňáková, 2010). Although the group of companies focusing on organizational culture is more complex, this link is more aware of this connection, we do not consider this to be sufficient.

Here can be seen the validity of the given research for practice, when organisational managements have an opportunity to compare current status of their organisational culture with the status declared by questioned organisations, and on this basis to think about possibilities of its improvement. We assume that it is important to continue in this research, so that individual organisational culture theories can be developed on the basis of new information gathered from questioned organisations. With regard to continuous advancement of social as well as natural sciences, it is necessary to assume that values, norms and artefacts in organisations will gradually change, and thus will change also the way and impact of culture´s content and power on their performance. It is therefore crucial, also from the theoretical point of view, to analyse continuously status, level and content of organisational culture in organisations.

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