
Competitiveness of Companies Producing Wood-Based Panels as an Example of the Sustainable Development

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Abstract:

Purpose: The research problem is the identification of areas of competitiveness, competitive strategies, competitive position and competitive instruments of enterprises in the wood-based panels sector in Poland. Despite many publications on competitiveness issues in the global and Polish literature, there is a paucity of research on wood-based panel enterprises.

Design/Methodology/Approach: In the first stage of the research, a Delphi survey method was used. Delphi has been described as a qualitative, quantitative, and mixed-methods. This method attempts to respond to the complex nature of management and quality sciences and their dynamic development. The second stage of the research used a diagnostic survey method and an original online questionnaire conducted among a group of 89 managers employed in wood-based panel companies.

Findings: In enterprises in the wood-based panel sector, the most commonly used competitive strategy is that of price leadership. Most companies in the wood-based panel sector assess their competitive position at a similar level. In terms of the competitiveness of the sector, the quality of the products offered is of great importance. In the future, a better position on the market will be occupied by companies that make greater use of innovative green technologies.

Practical Implications: Any business that aims to achieve market success has to meet the challenges of the market and emerging competition. The results obtained help to contribute to the development of wood-based panel companies and will allow operators to compete more effectively in this market.

Originality/Value: The ecological production of the wood-based panel sector actively contributes to the Sustainable Development Goals (SDGs). It seems that the sector under study has the potential to play an important role in promoting the sustainable development and innovation of the Polish economy. This is why a multi-faceted study of the determinants of development in this sector is becoming so important.

Keywords: Sustainable development, competitiveness, wood-based panel sector.

JEL Codes: D22, D40, Q01.

Paper Type: Research article.

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1. Introduction

In this day and age, when sustainable development and ecology are gaining prominence, wood-based panels are becoming a key material in construction and fitting-out works. It is in fact a light and budget-friendly alternative to solid wood. In Poland there are 22 factories producing almost all types of wood-based panels, from plywood to fibreboard, which constitutes almost 16% of entire European production and puts Poland in second place among the largest producers of wood-based panels in the European Union (B+R Studio Tomasz Wiktorski, 2023).

Sustainable development is an approach that allows the simultaneous fulfillment of economic, social, and environmental goals. This long-term strategy assumes that enterprises should function responsibly and with future generations in mind. It also assumes that economic goals should be fulfilled in an ethical way, with respect for the community in which the firm functions and the natural environment. Whereas environmental goals concern minimalising the negative impact of the firm on natural environment (Akademia Leona Koźmińskiego).

With all certainty, the wood-based panels sector meets these criteria, connecting ecology and technology. Wood-based panels are produced from various types of wood material, such as shavings or fibers, which then are processed and connected with high-pressure and high-temperature resins and glues. Thanks to this process, the panels are characterised by a high level of homogeneity and dimensional stability, which is their advantage over natural wood that can show defects, such as cracks or deformations.

Most importantly, however, wood-based panels, which are a structural element of many homes, can play a significant role in promoting sustainable construction. Through their use, it is possible to significantly reduce the negative impact on the environment, which supports the idea of sustainable development. Above all, the production of wood-based panels allows for the efficient use of wood waste, which is a by-product of the timber industry.

Instead of being incinerated or landfilled, which involves carbon emissions and the occupation of valuable land, this waste is transformed into new, useful products. This means that these boards are an example of upcycling, a process of transforming lower-quality materials into products of higher utility and aesthetic value.

In addition, many wood-based panels have environmental certifications such as FSC - Forest Stewardship Council (<https://fsc.org/en>) and PEFC - Programme for the Endorsement of Forest Certification (<https://www.pefc.org>), which guarantee that the material comes from sustainably managed forests. This means that the felling of trees for the production of these panels takes place with respect for the environment and with care for the regeneration of forests and the maintenance of their biodiversity. It is also worth noting the recyclability of wood-based panels.

Once the structure that uses them has been dismantled, these materials can be recycled and used to produce new panels or other wood-based products. This closed loop of production and consumption reduces the need for new raw materials and minimises the amount of waste going to landfills. The wood-based panels industry plays a significant role in the context of the 3Rs transformation (reduce, reuse and recycle) (Hai, 2020).

Another environmental aspect of wood-based panels relates to air quality. This is because these boards are increasingly manufactured using water-based adhesives and natural resins, which are less harmful than traditional synthetic binders. As a result, these materials emit far fewer VOCs that can adversely affect the health of residents. The use of low-emission boards therefore supports the creation of a healthier microclimate in homes, which has a direct impact on the wellbeing of the occupants.

However, the undoubted attractiveness of the wood-based panel sector is compounded by a number of problems. The year 2022 was, like several previous years, a difficult period for this market in Poland. Rising energy and material costs and galloping inflation did not spare the companies involved in the production and distribution of these products.

Nor can we forget the ongoing war in Ukraine, in which Belarus, until recently one of the most important suppliers of boards to Poland, took the side of the Russian aggressor. The sanctions imposed on this country have forced Polish importers to import discs from other, often more expensive directions (B+R Studio Tomasz Wiktorski, 2023).

These problems are further compounded by the sector's rather difficult domestic market situation. Among the factors that will have a significant impact on the situation of companies in the market are the instability of timber sales rules in Poland, political and economic factors, human resource factors and the increase in the purchase price of carbon rights.

Particularly difficult issues will be the reduction in the supply of wood resulting from national and EU environmental policy, competition in raw material purchases from the power industry, which receives a subsidy for treating wood co-firing as a renewable energy resource, the lack of permits for cross-border waste import and the problem of recruiting qualified staff (Kasprzak, 2024)

The wood-based panel industry is currently undergoing a transformation towards a more sustainable and inclusive growth trajectory. This entails addressing climate change and reducing reliance on fossil raw materials, with the dual objective of enhancing resource efficiency and industrial safety (Antov *et al.*, 2023). Against this background, it is therefore worth examining the competitiveness of wood-based panel companies in Poland.

2. Literature Review

However, there is no single, universally accepted definition of competitiveness, nor are there any universally accepted yardsticks for its assessment in the literature. The concept is elucidated by a multitude of theoretical frameworks, with researchers specialising in disparate aspects of competitiveness striving to establish their own definition and methodologies for measuring it. Nevertheless, there is consensus among scholars that the competitiveness of enterprises is the most important locomotive of the competitiveness of industries and countries, the basis of their development (Falciola, Jansen, and Rollo, 2020).

Competition is a process the study of which is made possible by constantly evolving economic theory. The theoretical research carried out on this topic creates the conditions for understanding the characteristics and behaviour of individual business entities. Competition is a process involving companies operating in the same market but differing in their offerings, which are influenced by price, quality, delivery time and other elements relevant to a potential customer.

A competitive entrepreneur is one who has an advantage in the market through the use of more efficient tools, which directly influences a higher level of quality of products and services than competitors (Ajitabh and Momaya, 2004).

Competitiveness is an inherent element of a market economy. Actions aimed at increasing the competitiveness of locally based enterprises increase the competitiveness of the economy in the long term (Blair, 2004). From an institutional economics perspective, competitiveness refers to the success of a production system, whether local, regional or national, as part of an appropriate institutional context (Cetindamar and Kilitcioglu, 2013).

Competition strategies are crucial for businesses to succeed in industry markets and expand internationally. Strategy is the company's distinct position in comparison to its competitors (Al-Hawajreh and Attiany, 2014). According to the classical approach, three main competitive strategies can be distinguished in companies (Porter, 1980):

- cost leadership - involves gaining an advantage by minimising costs, its aim is to reduce costs based on experience, control and optimisation,
- concentration - involves focusing on a specific segment - a particular group of buyers, product line, or geographic market,
- differentiation - involves producing products that are perceived as unique in the industry, differentiation can take such forms as brand image, features, technology used, customer service and distributor network.

The fundamental premise of the overarching strategic concept is that competitive advantage represents the essential foundation of any strategic approach. In the

empirical research presented in this article, this classic classification of three generic strategies was used for its simplicity, universality and adaptation to the specific characteristics of manufacturing companies in the wood-based panel sector. The implementation of each of the strategies mentioned is associated with specific consequences for the company.

The cost leadership strategy is a key approach for organisations to gain a competitive advantage and improve performance. It involves becoming the low-cost producer in the industry by minimising operating and procurement costs (Nyauncho and Nyamweya, 2015). However, this requires significant investment from the company, for example, the purchase of modern machinery and technology. Reductions in production costs can also be achieved by relocating production areas to lower-wage countries or using an outsourcing or offshoring model.

Cost leadership involves establishing efficient operations and minimizing costs, while differentiation creates unique value through various dimensions like design or technology (Öktem and Canel, 2016). The cost-competitive strategy aims to fill a niche by focusing on a specific client or local market (Wheelen and Hunger, 2017).

By reducing the costs of all activities, the difference between market prices and costs will be greater and the company will achieve a high profit and gain a competitive advantage (Kurt and Zehir, 2016). Nevertheless, despite the advantages associated with the low-cost strategy, its implementation necessitates significant resources, including a secure source of raw materials, low-cost distribution channels, and access to finance to enhance operational efficiency (Nguyen and Adomako, 2021).

The cost leadership strategy emphasises the company's focus on cost reduction and efficiency, while the differentiation strategy focuses on marketing intensity (Micheli and Mura, 2017). A differentiation strategy involves an integrated set of instruments used to produce goods that customers perceive as different in important respects for them (Teeratsirikool *et al.*, 2013).

Successful competitive strategies allow companies to gain an advantage and enable sustainable growth in the national and international market. Competitive strategy concerns the question of how to create a competitive advantage in each of the business units in which a company competes (Salavou, 2015). To select a competitive strategy, it is necessary to recognise the potential for profitability in industry's long-term viability and the factors which influence this; It is important to note that strategies can change to develop a long-lasting competitive capacity (Goetsch and Davis, 2014).

Competitive advantage can be defined as a set of enduring resources and skills that a company has acquired and knows how to implement, with the result that it achieves higher results than its competitors in the sector. The capacity of the firm to spend its resources, cost, differentiation, market features, and product are all factors that

contribute to the competitive advantage (Al-Khawaldah et al., 2022; Hsu and Hu, 2009). Competitive capability is a broader concept, but needs to be complemented by an analysis of the measures of competitive position held, as the set of competitive factors changes with the competitive position achieved (Molendowski, 2017).

The competitiveness of companies means the ability to grow and conquer new markets. It affects a country's competitiveness and its position in the global economy. It is, therefore, of key importance to policy makers and the economic policies pursued (Fagerberg and Srholec, 2017).

It is also worth mentioning that more and more research is now being done into sustainable competitiveness, which is defined as a country's ability to meet the needs and basic requirements of current generations while maintaining or increasing national and individual wealth without diminishing social and natural capital (Herciu and Ogorean, 2014; Urbaniec, 2016).

Due to the production activities of the companies, there is a continuous decline in environmental quality, which implies the use of socially, environmentally and economically viable activities (Diabat, 2013). In its industry, a manufacturing company manages numerous interdependencies across its supplier network, production and assembly units, RandD, marketing, distribution and customer service network. Despite many publications on competitiveness issues in the global and Polish literature, there is a paucity of research on wood-based panel enterprises as a sustainable sector.

3. Research Methodology

In the first stage of the research, a Delphi survey method was used. The second stage of the research used a diagnostic survey method and an original online questionnaire conducted among a group of 89 managers employed in wood-based panel companies. The temporal scope of the study is three years (2021-2023). Non-random sampling using the purposive selection method was used.

A Delphi survey method was used to identify the key areas of competitiveness in a manufacturing enterprise. The Delphi Method was originally designed to collect data from a panel of experts to aid in decision making in government settings. Delphi has been described as a qualitative, quantitative, and mixed-methods. The approach difficult to situate in a methodological category (Sekayi and Kennedy, 2017).

This method attempts to respond to the complex nature of management and quality sciences and their dynamic development. The study described in this article, therefore, invited 12 experts, which, although not a large number, fits into the methodological conditions for the application of the Delphi method (Paliwoda, 1983). As the study involved 5 academics and 7 practitioners whose subject specialisation was similar, it can be successfully applied in this case (Stitt-Gohdes,

Crews, 2004). It is also worth noting that the results of the study conducted by Brockhoff, Boje, and Murnighan (1982) show that there is no significant relationship between the number of study participants and the effects of using the Delphi method.

In survey research presented in this article, those companies operating in the Polish market whose code, according to the Polish Classification of Activities, refers to the production of veneer sheets and boards made on the basis of wood (16.21.Z) were taken into account. Another criterion of the research was the size of employment. The focus was on those enterprises in the wood-based panels sector with more than 250 employees. In this way, 7 enterprises were selected to become the addressees of the survey.

The survey questionnaire covered many aspects of the operation of the surveyed enterprises. This article presents only part of the research related to the competitiveness of enterprises in the wood-based panels sector in Poland.

A total of 89 survey questionnaires were collected from 7 presidents, 29 directors and 53 managers, employed in seven large companies involved in dry and wet fibreboard production. Participation in the research was anonymous and voluntary.

The questions were in a closed-ended form, the purpose of which was to streamline the indication of the appropriate response option as well as to reduce time taken to complete the entire survey. A five-point Likert scale was used in the survey questionnaire, taking into account its effectiveness during analyses. The Likert scale also takes into account neutral answers, which are also of great importance during the research conducted (Babbie, 2016).

The statistical programme Statsoft Statistica 10 and Microsoft Excel were used to analyse the collected statistical data. The functions of these two programmes provide the possibility to convert the results into graphical form and to give them statistical values derived from statistical formulas.

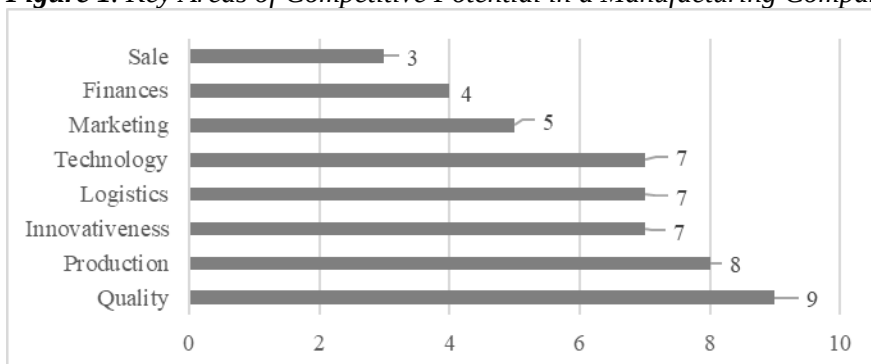
4. Research Results

4.1 Evaluation of Selected Areas of Competitiveness

In the first stage of the research, 12 experts were asked to identify the key areas of competitiveness in a manufacturing enterprise. The results of the experts' indications are presented in Figure 1.

On the basis of the completed questionnaires, a list of the eight most important areas influencing the competitive potential of enterprises was established, which became the basis for the formulation of a question in the survey addressed to managers employed in the seven largest companies in the sector under study.

Figure 1. Key Areas of Competitive Potential in a Manufacturing Company



Source: Authors' calculations.

In the second stage of the research, surveyed managers from wood-based panel companies were asked to assess at what level they thought the various areas of competitiveness in their companies were. A five-point Likert scale was used: 1- very low level, 2- low level, 3- medium level, 4- good level, 5- very good level. The results: the significance coefficient R (arithmetic mean) and standard deviation are presented in Table 1.

Table 1. Key areas of competitive potential in the wood-based panel sector

Areas of competitive	Average	Standard deviation
Quality	3.57	1.36
Production	2.97	1.43
Innovativeness	3.31	1.25
Logistics	2.84	1.54
Technology	2.74	1.24
Marketing	2.99	1.42
Finances	2.89	1.24
Sale	2.70	1.53

Source: Authors' calculations.

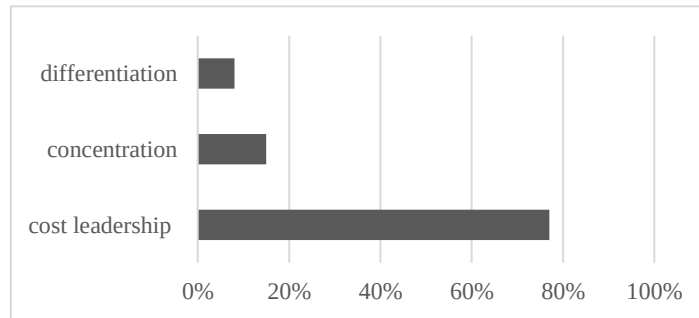
The arithmetic mean for all responses ranged from 2.70 to 3.57, while the standard deviation ranged from 1.24 to 1.54, which can be interpreted as a typical separation of responses, with respondents' indications being similar.

4.2 Identification of Competitive Strategies in the Wood-Based Panel Sector

In the next question of the survey, respondents were asked to select one of three competitive strategies cost leadership, concentration and differentiation. The results are presented in Figure 2.

It is evident from the respondents' answers that the dominant strategy in the wood-based panel sector in Poland is that of price leadership.

Figure 2. *The Competitive Strategies in the Wood-Based Panel Sector*

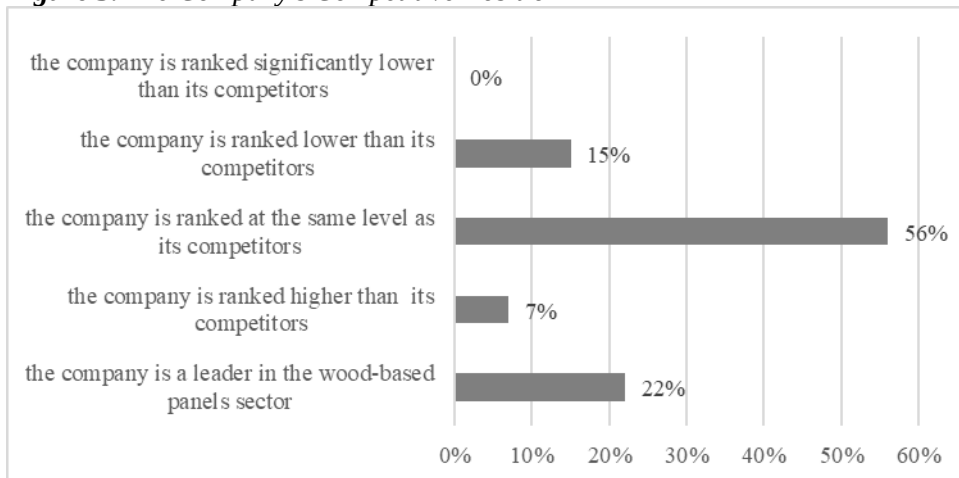


Source: *Authors' calculations.*

4.3 The Company's Competitive Position According to Managers

In order to determine the competitive position of companies in the wood-based panel sector, a question was asked of the surveyed managers. Respondents were given five single-choice answers. The results are presented in Figure 3.

Figure 3. *The Company's Competitive Position*



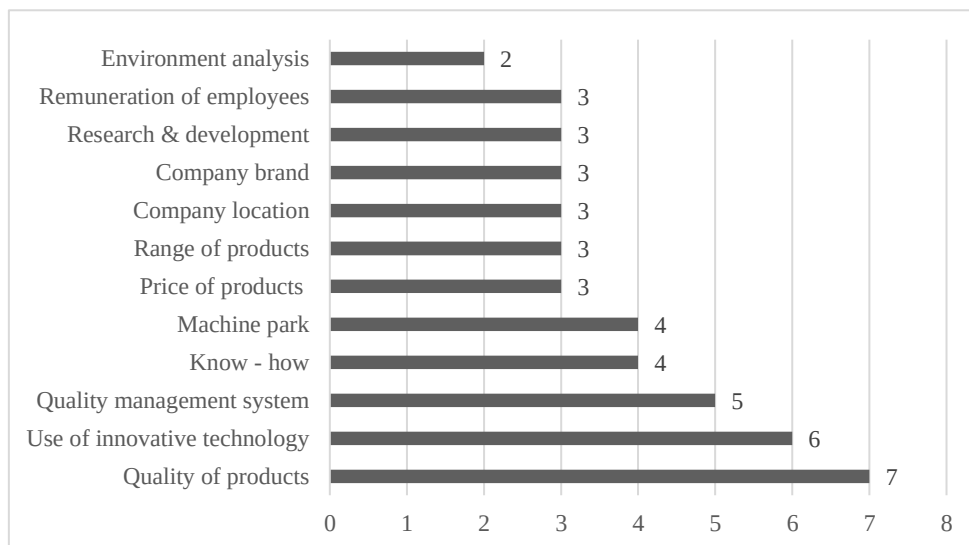
Source: *Authors' calculations.*

The figure shows that most companies in the wood-based panel sector assess their competitive position at a similar level.

4.4 Evaluation of the Main Instruments of Competition

Instruments of competition are measures consciously created by a company in order to attract customers. Experts in the Delphi study were asked to identify the 5 most important of the 12 competitive instruments given. The results are presented in Figure 4.

Figure 4. *The Competitive Instruments in a Manufacturing Company*



Source: *Authors' calculations.*

In the second stage of the study, managers from the wood-based panel sector were asked to evaluate the use of five selected competitive instruments in relation to the largest competitor in the market. In this case, a five-point Likert scale was used. The ranks were marked as follows: 1 - very poor conviction, 2 - poor conviction, 3 - medium conviction, 4 - good conviction, 5 - very good conviction. Respondents' indications are shown in Table 2.

Table 2. *Use of competitive instruments in the wood-based panel sector - evaluation by managers*

A competitive instrument	Average	Standard deviation
Quality of products	3.18	1.53
Use of innovative technology	2.88	1.45
Quality management system	2.43	1.53
Know - how	2.36	1.36
Machine park	2.24	1.53

Source: *Authors' calculations.*

Managers employed in the wood-based panel sector like the experts in the Delphi study considered product quality to be the most important competitive instrument. The value of the standard deviation is between 1.36 and 1.53 can be interpreted as a typical separation of responses in the context of statistical analysis.

5. Discussion

Any business that aims to achieve market success has to meet the challenges of the

market and emerging competition. A Delphi study on the key areas of competitiveness for manufacturing companies showed that experts consider areas such as quality and production to be the most important, and sales the least important. These findings are confirmed by a number of studies. The effectiveness of the production method used to create the company's environmentally friendly products is one of its competitive advantages (Santoso *et al.*, 2022).

The analysis of the evaluation of the areas of competitiveness in the surveyed companies in the wood-based panels sector clearly shows that the highest arithmetic mean was given to the quality area with a score of 3.57. The analysed manufacturing companies in the wood-based panels sector are characterised by serial production, i.e., one in which the quality aspect is extremely important. The surveyed managers ranked individual quality elements in relation to market competitors.

Among other things, they took into account material certifications and quality management systems. It can therefore be concluded that the quality department plays a very important role in the sector described. Poor product quality generates increased costs when it comes to finding defective products internally, as well as at the end customer. Managers have recognised that it is through good product quality that they are able to gain competitive advantage in the market and thus become a leader in the sector.

The area of competitiveness that received the second score of 3.31 was innovation. Undoubtedly, innovation in the area of production and technology provides an opportunity to improve product quality and increase production efficiency, thus increasing the amount of products produced on a daily basis.

Among other things, the following were taken into account in this area, the introduction of new solutions or the improvement of existing ones in the production process, which increase quality and production efficiency. The manufacturing companies analysed have production lines in their machinery, which are undoubtedly, dependent on each other, so any innovative method that improves one element will have a positive impact on the entire production line.

The third score of 2.99 concerned the area of marketing. All analysed manufacturing companies in the wood-based panel sector have similar products in their product range, it is important for the marketing department to be able to present their product as unique and provide guarantees of the highest quality. Managers also took into account how to find a new customer and methods of establishing and maintaining a relationship with the customer.

Undoubtedly, the effective application of 4P marketing (product, price, distribution, promotion) in the manufacturing companies analysed is a prerequisite for building a sustainable competitive advantage. Other areas show the following results: 2.89 - finance, 2.97 - production, 2.74 - technology, 2.84 - logistics, 2.70 - sales.

The surveyed companies, after analysing the areas of competitiveness, are faced with the choice of an appropriate competitive strategy in order to be able to maintain their position, as well as build a competitive advantage over their market competitors. Choosing the right competitive strategy will consequently contribute to the achievement of the set short-term and long-term goals.

The managers surveyed predominantly indicated that a cost leadership strategy is used in the company; this was 77% of the responses. This was followed by a focus strategy with a score of 15%, and in last place was a differentiation strategy with 8%. The businesses analysed focus on cost aspects.

Manufacturing companies in the wood-based panel sector explicitly choose cost leadership strategies due to the characteristics of production and having experienced managers at different levels of organisational management. By applying a cost leadership strategy, the company seeks to gain an advantage in its negotiating position with suppliers, primarily in the timber market. Ordering more raw materials is often associated with obtaining lower purchase prices.

For any business entity, an important objective is to create an organisation that is competitive in the market and, at a later stage, to operate in such a way as to gain a sustainable and established competitive advantage in the target market.

None of the respondents indicated the answer, 'the company is ranked significantly lower than its competitors'. It can be considered that if respondents indicated this answer, it would mean that the business is unprofitable, and therefore, there is a fear of business closure. The predominant indication was, 'the company is ranked the same as the competing companies, so it must be assumed that there is a lot of competition in the sector and each of the surveyed companies is at a similar level of competitiveness.

The experts participating in the Delphi survey identified product quality as the most important instrument for competing in a manufacturing company. This was recognised by 58% of the survey participants. The second most important instrument of competition, in the experts' opinion, was the use of innovative technologies (50% of indications). Technological innovations are changes in the manufacturing methods used by an organisation, as well as in the ways in which the product reaches customers.

These methods may consist of changes in equipment or in the organisation of production, or they may be a combination of the two or be the result of the use of new knowledge. They may aim to produce or deliver new or improved products that could not be produced or delivered by conventional methods. The third instrument mentioned by respondents was found to be a quality management system (42%). Implementing this type of system is a popular and often effective method of competing and achieving organisational goals.

Companies conclude that quality systems not only improve overall profitability, but significantly strengthen their position in the market and increase customer confidence. The development and successful implementation of a quality system depends on the size of the company and the commitment of the employees. It can mean huge and long-term benefits for the company and customers. Furthermore, research shows that a cost leadership strategy has a significant positive effect on Cost of Quality (Dimitrantzou *et al.*, 2023).

Of the competitive instruments in the sector, managers from the surveyed companies rated product quality as the highest. The surveyed manufacturing companies build a competitive advantage through the quality of the products they offer. They are also aware that customers demand an appropriate price/quality ratio. The second highest average rating was given to the use of innovative technologies. Respondents took into account, among other things, such elements as technological development and changes to the production process in their assessment.

Here, it is worth bearing in mind that this competitive instrument is closely linked to the machinery park. These two competitive instruments form the basis for the production area. They influence each other to form a whole. In series production, undoubtedly, the above instruments of competition are very important, all the more so because in the companies studied, production sequences are used during the production process that interact with the individual machines, as well as the technology used to create the products.

Despite the increase in investment in technological eco-innovation in EU countries, capital investment in this type of investment in Poland is still not very high. (Burzyńska and Hajdys, 2021). In the wood-based panel sector, it seems worth increasing outlays for this purpose.

Another important competitive instrument in the sector is the quality management system. As the seven manufacturing companies are among the large business entities, the systematisation of certain activities in the individual areas of operation is necessary to maintain organisational order. This is the function of the quality management system, among others. It is also worth noting that all seven companies have an implemented quality management system.

6. Limitation of the Study

Conducting empirical research in companies active in the Polish market is associated with certain difficulties. Enterprises are rather reluctant to accept proposals to conduct analyses on them due to commercial confidentiality. Many business owners are reluctant to provide sensitive data, which undoubtedly includes information on sales, finances, personnel policy, as well as the technology they have at their disposal thanks to which they are competitive in the market.

The Delphi method and questionnaire surveys used in this article have certain limitations. Using a survey questionnaire as the key research tool, one has to take into account the risk of respondents not understanding the questions and the variability of their involvement. Sometimes the results obtained may be falsified or affected by an error.

The inclusion in the research of companies whose code according to the Polish Classification of Activities relates to the production of veneer sheets and wood-based panels (16.21.Z), while assuming an employment level of more than 250 persons, results in the fact that the results for the entire sector cannot be analysed and thus generalised.

Furthermore, the research covered only companies operating on the Polish market in the selected sector. A limitation may be the applicability of the conclusions to manufacturing companies in other sectors of the economy than wood-based panels and to companies in other countries.

7. Conclusions

The ecological production of the wood-based panel sector actively contributes to the Sustainable Development Goals (SDGs). This is why a multi-faceted study of the determinants of development in this sector is becoming so important.

A competitive strategy based on low prices is quite popular in traditional economic sectors. It is hardly surprising that companies in the wood-based panel sector use such a strategy. In the future, however, companies that make greater use of innovative green technologies will be in a better position on the market. The uniqueness of the products will become more important and will lead companies to apply a greater degree of differentiation strategy.

Managers employed in the surveyed sector seem to be aware of this phenomenon. Although the vast majority of respondents (77%) described the competitive strategy used as price leadership, quality and innovation dominated among the important areas of competitiveness. An individual approach to customers and meeting their expectations could result in a leading position in the wood-based panel sector in the future.

In addition, the cost leadership strategy comes with risks. This is because it requires keeping costs low, which can be difficult in a situation of inflation and rising raw material prices on the wood market in Poland and restrictions on imports. The accelerated growth in the price of petroleum-based fuels and products is exerting a significant influence on the production and distribution of wood-based panel products. This has resulted in a notable increase in the cost of raw materials and transportation, contributing to a rise in inflationary pressures.

The cost of energy-intensive plastic, metal, and fiberglass substitutes is becoming increasingly competitive in comparison to wood-based panels (Wood Based Panel Market).

In the context of contemporary business and consumer trends, there is a growing emphasis on green practices and energy-efficient products, alongside a search for methods to enhance production efficiency. For example, concerns have recently been raised regarding the potential health impacts of formaldehyde emissions during the production of wood-based panels.

It is anticipated that technological advancements will facilitate the resolution of this issue in the future (Wood Based Panel Market). The process of developing a competitive advantage for wood-based panel companies should be based on an increase in investment in eco-innovation.

The concept of sustainable development aims to prevent negative processes with regard to the environment. It seems that the wood-based panel sector also has a chance to play an important role in promoting sustainable development and innovation in the Polish economy, thanks to the developed domestic wood market in Poland (Drózd, 2022).

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