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COMPETITIVE ANALYSIS AND COMPETITIVE ADVANTAGE STRATEGY IN THE SMART HOME WINDOW BLINDS INDUSTRY

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The article presents competition and competitive advantage using the example of intelligent window blinds. Research conducted among manufacturers in Poznań district and Poznań itself revealed that each manufacturer's products may have identical specifications and be limited to standard, relatively simple, intelligent functions. It was demonstrated that there is a lack of innovations such as machine learning and, above all, the ability to display images on blinds. The authors of the article point out that a new user interface, new information about functions, and solutions consistent with current ecological trends can provide a competitive advantage. The smart window blinds industry is open to manufacturers who introduce groundbreaking solutions in blind functionality. In view of how this sector is developing, a strategy for gaining a competitive advantage involves making continuous improvements and identifying potential gaps. This ensures that a product not only stands out from its competitors but, above all, is more useful to potential customers in terms of various features, such as usefulness, usability, and performance.

Keywords: innovation, technology, market analysis, smart product, window blinds

1. INTRODUCTION

The desire for continuous improvement and the growing interest in meeting consumer needs in an optimal and convenient manner have resulted in the emergence of a need for technological development, which in turn has led to the integration of modern and intuitive solutions into human life (Prahalad, Ramaswamy, 2005;

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Chesbrough, 2003). This impetus and desire for change is driving dynamic market growth in many areas of life (Skawińska, 2009). The constantly growing interest in technology, which contributes to easier and more intuitive use of many devices, coupled with aspirations to improve the quality of life, have together led to a greater focus on developing and implementing modern technologies in many industries and production areas (Porter, Heppelmann, 2014). One of the main changes has been in the approach of existing companies and new, emerging startups. In practice, they have begun to implement innovative solutions to a greater extent in both existing and new products and services, which further enables them to maintain a competitive advantage over rivals. Given the growth of this sector, the strategy for gaining a competitive advantage involves making continuous improvement and identifying potential gaps that will not only make the product stand out from the competition but, above all, enhance its attractiveness to potential customers in terms of features such as usefulness, usability, and efficiency (Kotler, Keller, 2016). The aim of this article is to conduct a thorough analysis of the competitive market environment and identify strategies for building a competitive advantage in the smart home window blind industry. This process is illustrated using the example of companies manufacturing products equipped with advanced technology, such as regulating the amount of light in a room through automatic solutions. These companies, which operate in both the city of Poznań and the Poznań District, have their business cards listed on Google Maps.

2. THE IMPACT OF TECHNOLOGY ON THE DEVELOPMENT OF INNOVATIVE SMART HOME PRODUCTS

Innovation is one of the most common concepts in the business world, significantly influencing development. It is characterised by implementing something new, something yet unknown, which has the potential to contribute to the company's market presence and success. This involves introducing a product (goods or services), a process, or also a marketing or organisational method in business practice, workplace organisation, or relationships with the environment. A key requirement, however, is that what is to be implemented must be completely new or significantly improved (Penc, 1999). Innovation can encompass various aspects, and thus, several types of innovation can be distinguished:

- product innovation (refers to the introduction of new or improved products or services to the market) (Schumpeter, 1960);
- process innovation (involves the implementation of a new or improved production or delivery method) (Chesbrough, 2003);
- marketing innovation (refers to the implementation of a new marketing method involving significant changes in the product or its packaging, distribution, promotion or pricing strategy) (Kotler, Keller, 2016);

– organisational innovation (involves the implementation of a new organisational method in the scope of the company's activity or in the organisation of the workplace or in relations with the environment) (Obłój, 2007).

As seen above, the concept of innovation can refer to various stages, giving it wide applicability in business, playing a key role in its development and success. It allows companies to strengthen their competitive advantage, adapt to dynamically changing customer preferences and needs, boost operational efficiency, enhance the company's image and reputation, raise the quality of products and services, increase revenues and profits, attract or retain talented employees, open up to new markets and customer segments, and increase customer satisfaction.

Since the concept of innovation is quite broad, it can also be applied in various industries, which are presented below in Table 1 for illustrative purposes.

Table 1. Examples of innovation in various industries

Industry	Innovation
Technology sector	Artificial intelligence and machine learning
Healthcare	Telemedicine and personalised therapies
Finances	Blockchain technology and mobile payments
Retail	Online shopping and personalised offers
Power engineering	Renewable energy sources and intelligent energy networks

Source: own study.

Innovative smart products are technologically advanced solutions that leverage modern advancements in the Internet of Things (IoT), artificial intelligence (AI), and machine learning to enhance usability, functionality, and user experience. Smart products are characterised by remote control, personalisation, and integration with other devices and systems to create an integrated user experience, which is why a growing number of consumers are choosing to purchase them (Kamiński, 2020).

2.1. Smart technologies in the window blinds industry

Currently, industries utilising modern technologies based on the smart concept are experiencing significant growth. As can be seen in Poland, many new businesses have quickly emerged on the market, offering products with smart solutions. Such products can encompass various functions or areas, from Internet connectivity (e.g., Wi-Fi, Bluetooth) to various algorithms or artificial intelligence enabling the management of product functions via a mobile app or other interface, through

to products that use appropriate technologies to collect usage data for adapting to individual end-user preferences. This technological advancement allows for advanced product personalisation without the need to change product specifications during production (Osterwalder, Pigneur, 2010).

The concept of innovation – which means the ability to create and implement new or significantly improved solutions that bring added value in various fields such as technology, business, science or everyday life – may refer to products, services, processes, business models, as well as methods of organisation or management (Bocken et al., 2014).

The smart home technology sector, i.e., the interior design industry, and more specifically, the market for automatic window blinds, is developing dynamically in Poland, with consumer interest in these products steadily increasing. Products equipped with IoT technology create a network of internet-connected devices that can communicate with each other and with users to collect data and perform specific functions automatically or on demand (Chesbrough, 2003).

Adaptive facade technologies are based on four key pillars: intelligent materials, geometric adaptation, real-time control algorithms, and a human-centric approach (Norouziasas, Attia, Lima, 2023).

IoT devices are typically equipped with sensors, software and technologies enabling information exchange. Electric motor drives in blind systems provide convenient and precise control, and their integration with smart home systems improves the quality of use. This technology allows for automatic control of blinds via mobile apps, contributing to greater comfort and freedom in using the device, while saving time and increasing user convenience.

The main differences between modern window blinds and traditional ones primarily relate to the automatic darkening or brightening of the room using built-in functions that allow for the adjustment of light using a remote control without the physical effort of opening and closing the blinds. There is also no need to approach the windows, as built-in sensors in modern products allow for remote control from other rooms, thus providing the user with greater flexibility in everyday use. Furthermore, thanks to their minimalist design, smart window blinds may prove to be a more attractive choice for customers from an interior aesthetic perspective, where the lack of visible controls adds elegance to the space (Pine, Gilmore, 1999). When evaluating smart window coverings, it is important to consider the balance between thermal comfort, access to daylight, glare, and quality of view (Yeo, Kim, 2024).

Although traditional window blinds are a cheaper solution and easier to install, remote control smart blinds allow users to save time and enjoy the moment without having to leave their seat.

Table 2 below presents examples of the functions that smart window blinds can have.

Table 2. Example functions of smart window blinds

Function	Examples
Remote control	Control by mobile application, service voice, remote control
Automation and schedules	Programmed opening and closing, holiday modes (simulation presence)
Integration with the smart home system	IoT-compatible, automatic reactions to changes in the environment
Sensors and personalisation	Light sensors (automatic adjustment level blackouts), temperature sensors (regulation of roller blinds to optimise temperature), personalisation settings
Aesthetics and comfort	Minimalist design, quiet operation level (low-power engines), providing user comfort
Security functions	Closing by lack of presence, detecting obstacles (stopping roller blinds in the event of obstacles being encountered)
Control group	Possibility of controlling multiple roller blinds simultaneously

Source: own study.

3. COMPETITION ANALYSIS IN THE SECTOR OF ENTERPRISES MANUFACTURING SMART WINDOW BLINDS

The growing interest in smart home solutions has directly translated into intensified competition in the smart window blinds industry. Competition in this context means competing for access to resources, customers, and technological advantage, which, if achieved, allows for increased market share (Świtalski, 2005). Modern companies compete not only on price and quality, but above all on their ability to innovate and adapt quickly to dynamically changing market conditions (Skawińska, 2009).

3.1. Introduction to competitive analysis in the window blinds industry sector

Understanding competition in the modern economy goes beyond the classic approach based on price competition. Competition is now viewed as a complex process of strategic competition, encompassing companies' efforts to achieve a sustainable

advantage through innovation, quality customer service, responsiveness to market changes, and effective resource management (Świtalski, 2005; Porter, 1992).

Competition in this sector is becoming a multidimensional phenomenon. On the one hand, there is classic competition for market share, and on the other, the need to adapt to megatrends such as digitisation, sustainable development, and integration with the Internet of Things ecosystems. Companies are competing not only on product but, above all, on the experience they offer their customers (Pine, Gilmore, 1999).

The literature emphasises the importance of competitiveness as a function of a firm's organisational potential, which consists of both tangible and intangible resources. Stankiewicz (2000) presents a model in which competitive advantage results from the effective use of resources, organisational capabilities, and adaptation to external conditions (fig. 1).

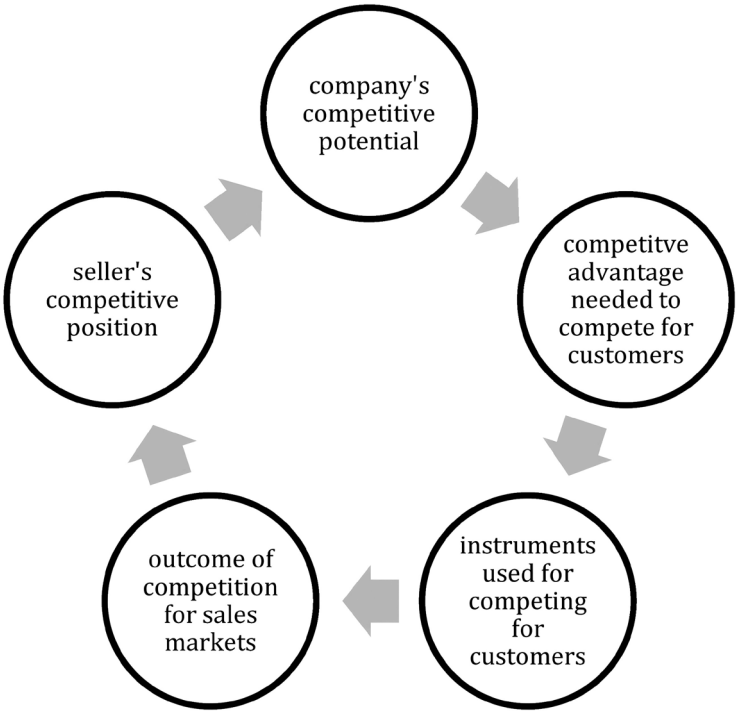

Fig. 1. Competitiveness and the ability to compete (Stankiewicz, 2000, p. 97)

Regarding their application, which encompasses invisible (intangible) assets, such as know-how, customer relationships, market reputation, and organisational culture, Skawińska (2009) classifies these resources as difficult to map and transfer, which makes them the foundation of sustainable competitive advantage. Their importance is illustrated in the diagram below (fig. 2).

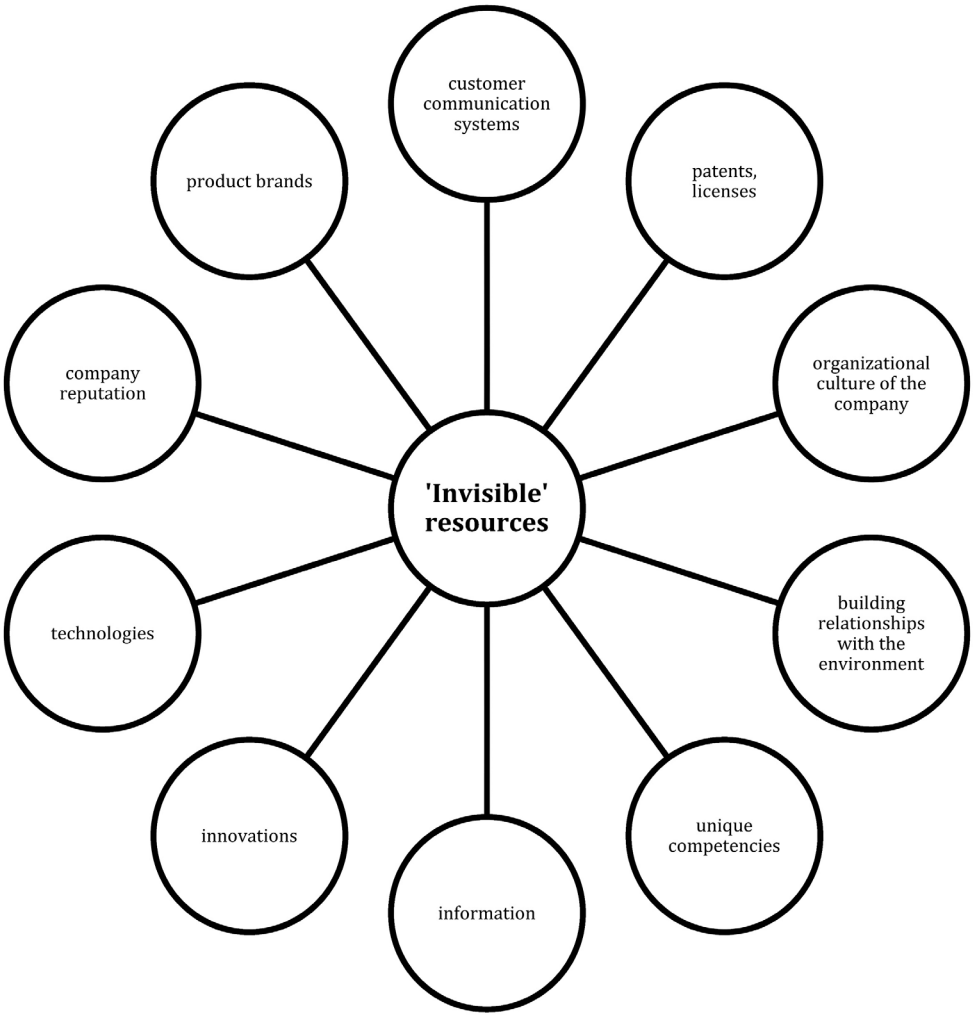

Fig. 2. Invisible resources of competitive advantage (based on Skawińska, 2009, p. 56)

Managing competitiveness requires integrating multiple facets of a company's operations, ranging from operations and marketing to strategic. Mantura (2001) emphasises that a significant external factor is the operating conditions of enterprises, including both the microenvironment and the influence of the institutional, social, and media environments.

In practice, companies operating in the smart blinds market must monitor not only competitive activity but also consumer needs, complementary technologies (e.g., smart home systems, AI, energy management), and sustainability expectations. This approach enables not only market survival but also growth by identifying strategic gaps and leveraging unseen sources of advantage (Faulkner, Bowman, 1996).

3.2. Competition analysis in the smart window blinds sector

To examine how modern technologies impact on competitiveness in the smart window blinds sector, a case study was conducted encompassing companies operating in both Poznań city and Poznań County, consisting of seventeen municipalities surrounding the city of Poznań. The main goal of the study was to assess the functionality of the products offered, in particular, the availability of solutions classified as smart technology, which constitute a key element of competitive advantage in the modern knowledge-based economy (Porter, Heppelmann, 2014; Chesbrough, 2003).

In the first stage of the study, based on a detailed analysis of the local market and verification of data from Google Maps regarding location and business profile, as well as online information, nine of the most recognizable manufacturers of smart blinds located in the city of Poznań and Poznań County were identified. The sample selection was purposive (non-random) and was conducted based on clearly defined criteria: market presence (company visibility in the selected search engine), local market share (declared scale of operations in the region), and the level of smart technology implementation (assessed based on content available on websites, promotional materials, and customer reviews). Only manufacturers were qualified for the study, thereby excluding companies solely engaged in distribution, sales, or installation. A quantitative research methodology was employed, based on a survey questionnaire containing 65 closed-ended dichotomous questions (yes/no, where Y denotes yes and N denotes no), enabling the identification of the scope of smart solutions used in the analysed products.

The questionnaire focused on key technological aspects, such as the presence of sensors (light, temperature, motion, air quality), the level of integration with IoT platforms, personalisation capabilities, remote control options (mobile apps, voice control), and the use of adaptive algorithms and autonomous system response mechanisms. This approach aligns with contemporary assumptions of process and product innovation, which are the foundation for building a sustainable competitive position (Schumpeter, 1960; Obłój, 2007).

Table 3. Results of surveys – part I

No.	Question	A	B	C	D	E	F	G	H	I
1	Does the roller blind have built-in temperature sensors?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Does the roller blind have built-in light sensors?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Does the roller blind software receive regular updates?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	Do the roller blinds adapt to the situation based on collected	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	Can the roller blind be purchased by individual customers?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Can the roller blind be purchased by business customers?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	Do smart roller blinds automatically adjust to the time of day?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	Can the roller blinds learn user habits (for example, "fixed" opening/closing times)?	No	No	No	No	No	No	No	No	No
9	Do the roller blinds automatically close at high temperatures	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	Can the roller blinds be programmed to operate on a schedule with minute-by-minute accuracy?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	Is it possible to control the roller blinds using the user's GPS	No	No	No	No	No	No	No	No	No
12	Can the roller blinds operate in "presence simulation" mode to deter burglars?	No	No	No	No	No	No	No	No	No
13	Do the roller blinds have built-in obstacle detection?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14	Do the roller blinds work with indoor air quality sensors?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
15	Can the roller blinds self-calibrate their mechanism?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16	Do the roller blinds automatically change position depending on the season?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
17	Does the roller blind system save usage history and share it with the user?	No	No	No	No	No	No	No	No	No
18	Do the roller blinds automatically synchronize with other smart devices at home?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
19	Can the roller blinds be controlled from a smart watch?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
20	Can the roller blinds automatically switch to energy-saving	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
21	Can the roller blinds automatically send fault information?	No	No	No	No	No	No	No	No	No
22	Can the roller blinds be controlled based on weather	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
23	Can the roller blinds be integrated with a BMS (Building Management System)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
24	Is the roller blind automated?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
25	Can the image from a projector be displayed on the roller	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
26	Can the roller blinds be voice-controlled?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
27	Does the roller blind system allow control from outside the	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
28	Are the roller blinds regularly developed in-house?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
29	Can the roller blinds be controlled using a mobile app?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
30	Can the blinds be connected to an alarm system or motion	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
31	Can the blinds be managed using proprietary software?	No	No	No	No	No	No	No	No	No
32	Can the blinds be controlled manually?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
33	Can the blinds be integrated with smart lighting systems?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: own study.

Table 4. Results of surveys – part II

No.	Question	A	B	C	D	E	F	G	H	I
34	Can the blinds be controlled with a wireless remote?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
35	Can all the blinds in the building be centrally controlled?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
36	Can the system share blind control with multiple users?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
37	Does the blind system support support automatic opening upon alarm?	No	No	No	No	No	No	No	No	No
38	Do the blinds automatically close after sunset based on	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
39	Can the blinds be operated in the event of a power outage?	No	No	No	No	No	No	No	No	No
40	Are the blinds equipped with an emergency rolling and unrolling system?	No	No	No	No	No	No	No	No	No
41	Can scenarios be added based on a specific user?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
42	Do the blinds have a built-in, automatically charged battery?	No	No	No	No	No	No	No	No	No
43	Can the blinds be moved from one place to another?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
44	Are the smart blinds available in an easily expandable	No	No	No	No	No	No	No	No	No
45	Can the blinds be solar-powered?	No	No	No	No	No	No	No	No	No
46	Is there 24/7 technical support available?	No	No	No	No	No	No	No	No	No
47	Can users remotely report roller shutter failures via the app?	No	No	No	No	No	No	No	No	No
48	Are free software updates available after purchase?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
49	Is the response time to a service request less than 24 hours?	No	No	No	No	No	No	No	No	No
50	Is there access to video instructions or online configuration for the end user?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
51	Is remote configuration by a technician possible, for example, via remote access?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
52	Is communication between app and roller shutter encrypted, for example, AES-256?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
53	Does the system require two-factor autenthication for the	No	No	No	No	No	No	No	No	No
54	Does the system collect location data only with the user's	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
55	Is user data stored on European (or national) servers?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
56	Does the app comply with GDPR or other local data protection regulations?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
57	Can user data be completely deleted from the system upon	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
58	Can opaque roller shutters be purchased?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
59	Is it possible to environmentally-friendly material for the	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
60	Is the roller blind packaging made of biodegradable or recycled materials?	No	No	No	No	No	No	No	No	No
61	Does the smart system enable energy saving through automatic light and temperature management?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
62	Are the roller blinds manufactured using renewable energy?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
63	Is it possible to retrofit older roller blind models instead of replacing them?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
64	Is it possible to recycle old roller blinds?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
65	Has a carbon footprint been determined, for example, for the expected duration of use?	No	No	No	No	No	No	No	No	No

Source: own study.

Based on empirical research conducted in the form of a survey (tab. 3 and 4), in which nine independent companies responded to a standardised questionnaire consisting of 65 binary questions, full consistency was found between the surveyed entities. The results indicate that the smart window blinds systems they offer are characterised by a similar range of functionality. This may indicate the use of similar technological solutions or even a common design platform, which reduces differentiation between offers and limits the scope for differentiation from the competition (Chesbrough, 2003).

All analysed companies offer products that meet only the basic criteria for smart solutions. Integrating shading systems with night ventilation can reduce thermal discomfort by up to 70% and energy consumption by 30% (Haghani, Mohammadkari, Fayaz, 2023). These include the presence of light, temperature, motion, and air quality sensors, as well as remote and voice control systems. From a sustainability perspective, all companies declared the use of recycled fabrics as one of their material

options, which can be considered a minimum environmental standard. At the same time, the products are designed for self-installation, which can improve their accessibility for the end user.

The analysis reveals significant importance in terms of functional autonomy and after-sales service. It also shows that the use of predictive thermal comfort control using smart blinds allows for significant energy savings in eco-friendly buildings (Merabet et al., 2021). No manufacturer has implemented machine learning-based systems that could enable adaptive device behaviour or self-diagnosis of faults (Kamiński, 2020). Responses to failures require human intervention, and the availability of technical support is limited both in time and procedures, which constitutes a significant barrier to building a positive user experience.

The lack of automated maintenance procedures and integration with other smart home components further limits the utility of the analysed solutions. The lack of renewable energy implementation is also noteworthy: none of the companies offer solar-powered products or self-charging battery systems. Passively controlled smart windows with infrared radiation control can reduce heat transfer by up to 30% without the need for an active power supply (Wu, Xue, Chen, 2022). Similarly, no outstanding initiatives were noted in terms of environmentally friendly production and logistics, such as the use of biodegradable packaging or reducing the carbon footprint (Bocken et al., 2014).

3.3. Conclusions from the conducted competition analysis in the intelligent window blinds sector

In summary, the product offering of all the companies surveyed is consistent. This analysis revealed that the main areas of competitiveness include lower prices, shorter lead times, and higher quality customer service and service delivery.

The surveyed companies offer products that meet only basic user requirements. There are no solutions that significantly add value, allowing the product to "intelligently" co-create everyday home experiences, consistent with the experience economy (Pine, Gilmore, 1999). A ten-year literature review shows that intelligent shading strategies significantly improve building energy efficiency (Deng, Jiang, 2022). Table 5 below presents the questions to which all companies provided negative responses, along with brief conclusions.

Table 5. Questions and answers negative and analysis potential possibilities implementation

Question	**Answer**	**Chances that companies would decide on their implementation**
Can roller blinds learn and adapt to user habits (for example, "fixed" hours for opening / closing)?	NO	An opportunity to build incredible services and a key to creating value in the customer-oriented model. This is a niche that easy to develop and which will strongly emphasise the company image in its marketing strategy.
Is there a possibility to control roller blinds from the user's GPS location?	NO	Prospective niche – greater user control over the product. It is possible that such freedom will boost product attractiveness, comfort and the "modernity" of the solution.
Can roller blinds operate in "simulation" mode to deter burglars?	NO	The lack of a presence simulation function can be seen as an oversight, especially since a roller blind can serve not only as a window covering, but also as an element that increases the sense of security in the home. Such a feature would provide greater flexibility and make it possible to use the blind more effectively as part of a smart protection system. At the same time, it would strengthen the perception of the brand as modern, aware of users' needs, and genuinely concerned about the safety of its customers.
Does the roller blind system record the usage history and allow the user to access this data?	NO	This feature has strong market potential. Providing users with data and insights into blind operation would enable better control and optimization of settings based on individual preferences. A product that "thinks for the user" would clearly differentiate itself from competitors.
Can the roller blinds independently send information about a fault?	NO	The ability of roller blinds to independently detect and report faults would be a unique feature and an important step toward maintenance-free technology. Such a solution could lead to time savings, reduced user frustration, and lower service costs.
Does management of the roller blinds take place using their own software?	NO	The brand's own technology is a fundamental element of being "strong" and "constant" competition – offering a dedicated application allowing full experience of the brand, giving users a sense of consistency, quality and professionalism.

Question	Answer	Chances that companies would decide on their implementation
Can roller blinds be opened automatic by an alarm clock?	NO	Interesting market potential for raising quality of life – a small change, and substantial effect in marketing (comfort, style life, intelligent morning).
Can the blinds be operated in case of a power failure?	NO	Functional gap and possible niche substitution – guaranteed operational continuity in emergency situations will increase trust in the system and might be a key factor in consumers' choice of this product.
Are the roller blinds equipped with an emergency retraction system and developing?	NO	An idea worth considering – independent of the power supply, the service will emphasise reliability solutions and improve user perceptions.
Can roller blinds feature a built-in, automatically charged battery?	NO	The additional factor of competitive advantage– self-charging batteries and operation during power outages increases system reliability and user comfort.
Are intelligent roller blinds available as an easy-expandable version?	NO	Product potential and need–possibility of integrating with other gadgets allows unlimited product functionality and being up to date with trends.
Can the roller blinds be powered by solar energy?	NO	This is a solution with a lot of potential. It can help the company establish a significant competitive advantage. Growing ecological awareness and an increasingly popular lifestyle centred on sustainable development are conducive to acquiring new customers.
Is there a possibility for 24/7 technical support (24/7)?	NO	Providing 24-hour support would increase customer trust and enable the system to be positioned in the industrial segment. A company that prioritizes external factors will enjoy market recognition. By standing out from competitors, we strengthen our own position on the market.

Question	Answer	Chances that companies would decide on their implementation
Can the user to report a blind malfunction remotely using the application?	NO	A patent combining two solutions in one: taking care of customer relations and functionality own product. Simplifying service contacts and reducing reaction times would improve user experience and strengthen positive brand perception.
Is the response time after informing the service less than 24 hours?	NO	Fast and effective after-sales service would be a key feature distinguishing the product from competitors, as well as conducive to building customer loyalty. Since brand reputation depends on the customer, we need to prioritize them.
Does the system require login two-factor authentication via the mobile application?	NO	Security function potential: – increasing the digital security level meet users' expectations and strengthen trust in the system.
Is the packaging for the blinds made of biodegradable or recyclable materials?	NO	Strengthening the perception of the company as eco-friendly with a unique competitive advantage by– using materials biodegradable and providing information about our carbon footprint could bolster the brand's image as responsible and future-oriented.
Has the carbon footprint been determined for the planned use time?	NO	Environmental transparency would boost customers' trust and strengthen the brand's image.

Source: own study.

The above analysis shows that none of the surveyed companies currently demonstrates a strategic approach to designing innovations focused on the user, the environment, or system collaboration within a broader technological ecosystem (Osterwalder, Pigneur, 2010). Therefore, none of the companies is currently considered a market leader. Their offerings remain at the stage of basic automation, and further development of the industry requires a decisive shift towards increasing system autonomy, implementing pro-ecological innovations across the entire value chain, and improving customer service quality, especially in the after-sales phase. These actions can provide the foundation for a sustainable competitive advantage in the smart home solutions sector (Porter, Heppelmann, 2014; Kotler, Keller, 2016).

4. COMPETITIVE ADVANTAGE STRATEGY IN TERMS OF INNOVATION OF SMART WINDOW ROLLERS

Based on competitive analysis and observations of the impact of dynamic technological developments within the industry 4.0 concept, it can be concluded that companies operating in the smart window blinds sector should adopt strategies focused on innovation and technological integration. Contemporary technological progress leads to ever deeper connections between products and user needs, often without the need for direct interaction with the device (Porter, Heppelmann, 2014).

Although solutions such as remote control, scheduling, and automatic adjustment of solar radiation levels are already standard in the smart home industry, they do not inherently guarantee a sustainable competitive advantage. While dynamic facade typologies significantly improve efficiency, the lack of uniform control strategies limits their market potential (Sun, Chen Zhou, 2024). The smart technology industry is characterised by strong dynamics of change and short innovation life cycles, which forces companies to constantly monitor the market, implement flexible management, and implement solutions based on data analysis and personalisation of the customer experience (Kotler, Keller, 2016; Osterwalder, Pigneur, 2010).

To truly leverage their market position, companies should focus on identifying niches and unmet end-user needs. Adopting a digital-first approach that integrates multiple functions into a single product – e.g., lighting, security, media, and energy management – allows not only for enhanced functionality but also for a stronger customer-product bond (Chesbrough, 2003).

In this context, strategies based on innovative business models that involve continuous testing and adapting offerings to changing consumer expectations are particularly important. Only such an approach will enable companies to become established and survive in the dynamically developing smart home market, thereby reaping the long-term benefits of innovation (Prahalad, Ramaswamy, 2005; Schumpeter, 1960).

4.1. Description of innovative roller blinds in terms of functionality

In response to the need to stand out from the competition and increase the value of the product offered, companies propose developing innovative window blinds that integrate the functions of classic sunshades with multimedia display technology. The project involves the use of flexible liquid crystal screens that, when unrolled, would act as a projection surface for videos, photos, and other visual media, thus eliminating the need for additional equipment such as projectors or televisions.

The product's primary function remains regulating the intensity of natural light in the room, but its utility value is expanded to include interactive and visual features. Thanks to the use of flexible screen technology, the blinds can be freely rolled up and down, ensuring their high functionality and ergonomic use (fig. 3).

Fig. 3. Visualisation of roller blinds enabling content to be displayed (authors)

The proposed solution stands out not only for its unique design but also for its range of modern features, such as voice control, personalisation of displayed content (e.g., mood-matching themes, motivational quotes), and the implementation of energy-saving technologies. Adapting the product to various sizes and types of interiors further increases its adaptability and market appeal (fig. 4). Optimal design of shading systems – both static and dynamic – requires a balance between energy efficiency, implementation costs, and user comfort (Lee, Brown, 2024).

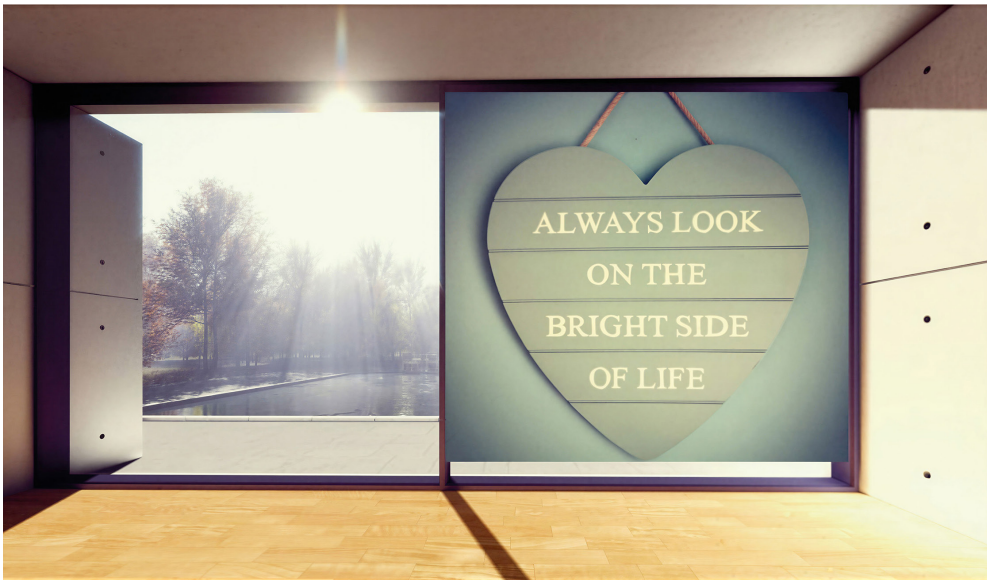

Fig. 4. Roller blind with visual content personalisation function adapted to the mood and user preferences (authors)

This type of product addresses the needs of modern consumers who expect technology to integrate into their daily lives in a functional, aesthetic and seamless way. Integrating utility and entertainment functions into a single, compact solution responds to the global trend of simplifying living spaces and maximising their usability (Kotler, Keller, 2016; Pine, Gilmore, 1999).

By combining advanced technology with a user-centric approach, the product in question has the potential to become a groundbreaking innovation in the smart home appliance segment, redefining the way humans interact with their living spaces.

4.2. Description of innovative roller blinds for potential customers

The product addresses contemporary consumer expectations related to the personalisation of living spaces and the desire to improve the quality of life in the home. In an era of growing demand for personalised entertainment, privacy, and functionality, innovative roller blinds with multimedia display capabilities address the need to integrate multiple functions into a single, compact solution (Pine, Gilmore, 1999).

This technology allows users to enjoy high-quality images and sound without the need to install additional devices such as televisions or projectors. This solution eliminates the need to purchase separate equipment, thus reducing the number of devices and cables, which positively impacts the aesthetics and ergonomics of the living space.

A particularly significant advantage of the proposed concept is space efficiency, a key factor in limited-space apartments. In such circumstances, users seek multifunctional solutions that combine comfort, design, and space efficiency (Kotler, Keller, 2016). Innovative roller blinds meet these requirements by combining sun protection, multimedia content, and aesthetic design elements (fig. 5).

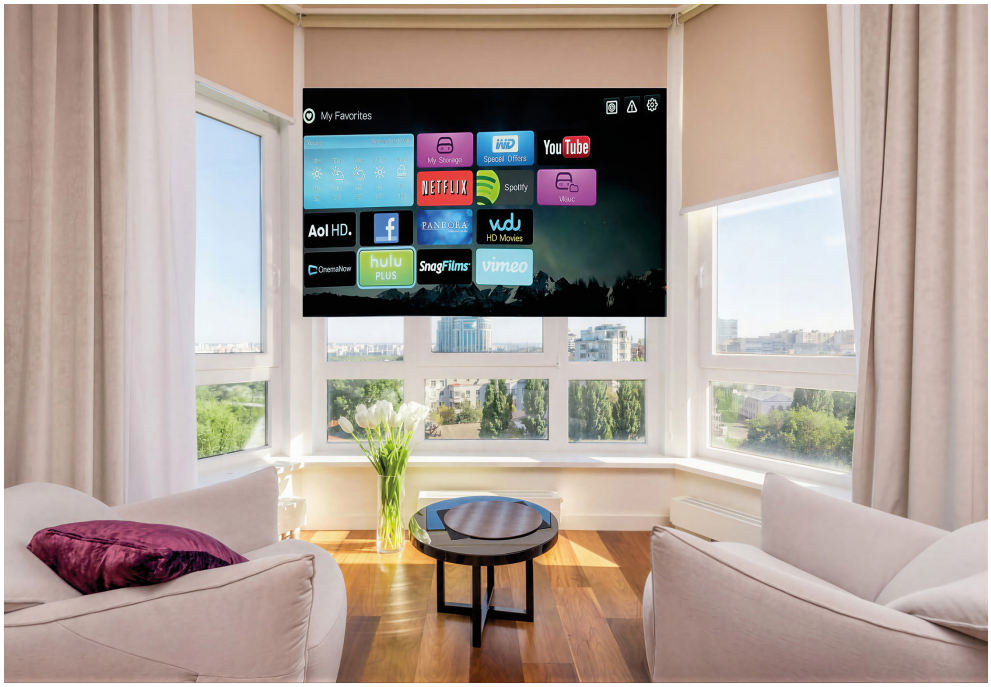

Fig. 5. Multimedia roller blind as a sunscreen, window covering, and carrier of digital content in interior design (authors)

As a result, the proposed solution has the potential to respond to the key needs of modern users: comfort, aesthetics, personalisation and functionality in the context of limited spatial resources.

4.3. Plan to introduce innovative roller blinds to the market

The launch of innovative window blinds should be based on a multi-channel strategy that combines direct sales, through distributors, and popular e-commerce platforms. Direct sales can include opening a brick-and-mortar store, allowing customers to see the products in person and build a relationship with the brand. Additionally, launching a dedicated, intuitive online store would be crucial. A suitable e-commerce platform should be selected following a thorough analysis of functionality and costs. The website should be optimised for mobile devices, integrated

with payment gateways and marketing tools, and feature extensive product descriptions and high-quality images. This should be complemented by regular participation in trade fairs and exhibitions related to the construction and interior design industries, allowing direct access to potential customers and increasing brand awareness. Simultaneously, the product should enter the online market, leveraging the existing infrastructure of popular e-commerce platforms such as Allegro, Amazon, and eBay. The company should create seller accounts on these platforms, and product offerings should be optimised for search engines, using relevant keywords and visually appealing materials. The next step in the strategy should involve distribution through proven partners. This process must begin with identifying and selecting distributors with an established market position. After negotiating the terms of cooperation and signing the distribution agreement, partners should receive full support in the form of marketing materials, product training, and joint promotional activities.

5. CONCLUDING REMARKS

An analysis of the smart window blinds market indicates that this industry is still in its maturing phase, which facilitates the implementation of innovative technologies and product concepts. The current offerings available in the Poznań market are characterised by a high degree of standardisation: companies provide products that are nearly identical in terms of functionality, application, and technology, suggesting a lack of a clear leader in this sector. This situation means low competitive diversity, but it also creates opportunities for innovative entities. This opens up real space for new companies and startups that by introducing unique features, a higher level of integration with smart home systems and a better user experience, can quickly gain a market advantage.

Smart blinds technology is still in a phase of intensive development, which presents a significant opportunity for companies ready to invest in innovation. The development of functions based on machine learning algorithms, user behaviour prediction, integration with renewable energy sources, and automatic system diagnostics could represent a significant breakthrough and a competitive advantage.

Furthermore, after-sales service remains a key area in need of improvement. Currently, companies offer limited technical support, with slow response times, difficult contact with sales staff, and a lack of remote service systems. A properly designed customer relationship model – incorporating fast service, intuitive remote support, and personalised communication – could constitute one of the most important sources of competitive advantage across the entire sector.

The smart window blinds market remains open and unsaturated. Its further development will largely depend on companies' ability to offer distinctive solutions, both technologically and practically. The industry leaders will be those that combine

advanced technology, environmental responsibility, and high-quality customer service, not only at the point of sale but also throughout the product's lifecycle.

The conclusions from the research are clear and alarming. Companies present in the smart blinds market in Poznań and Poznań County not only fail to offer real innovation but are also stuck at the stage of basic automation. Their declared smart functions are limited to the bare minimum – remote control or app control – without any advanced data analysis, machine learning, renewable power, or integration with IoT ecosystems. All the companies surveyed present nearly identical offerings, which indicates technological stagnation and a lack of strategic vision for development.

The smart blinds industry, while formally dynamic, in practice shows signs of stagnation and a lack of ambition. This means that the leader will not be a company that matches its competitors, but one that completely outclasses them, through a radical approach to innovation, system integration, energy efficiency, and building relationships with users. At this stage, no company meets these criteria, which opens up enormous opportunities for new players capable of setting new standards in quality and functionality in the smart home sector.

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ANALIZA KONKURENCJI ORAZ STRATEGIA PRZEWAGI KONKURENCYJNEJ W BRANŻY SMART HOME DOTYCZĄCEJ ROLET OKIENNYCH

Streszczenie

W artykule omówiono zagadnienie konkurencji i przewag konkurencyjnych na przykładzie wewnętrznych inteligentnych rolet okiennych. Badania przeprowadzone wśród producentów w Poznaniu i powiecie poznańskim udowodniły, że produkty każdego z nich mogą mieć niemal identyczną specyfikację i ograniczać się do standardowych, stosunkowo prostych, inteligentnych funkcji. Wykazano, że brakuje innowacji, takich jak uczenie maszynowe, a przede wszystkim możliwości wyświetlania obrazów na roletach. Autorzy artykułu wskazali, że nowy interfejs użytkownika, innowacyjne funkcje oraz rozwiązania zgodne z obecnym trendem ekologicznym mogą zapewnić przewagę konkurencyjną. Branża inteligentnych rolet okiennych jest otwarta na producentów, którzy mogliby wprowadzić

przełomowe rozwiązania w zakresie funkcjonalności rolet. Strategia przewagi nad innymi firmami z uwagi na rozwój tego sektora polega na nieustannym doskonaleniu i szukaniu ewentualnych luk, które przyczynią się do tego, że produkt nie tylko będzie wyróżniał się na tle konkurencji, ale przede wszystkim będzie bardziej atrakcyjnym wyborem dla potencjalnego klienta pod względem różnych funkcji, np. przydatności, użyteczności czy wydajności.

Słowa kluczowe: technologia, innowacyjność, analiza rynku, produkt SMART, rolety okienne