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OPTIMIZING TECHNOLOGY TRANSFER: A METHODOLOGY FOR HQ TO SUBSIDIARY IMPLEMENTATION

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Abstract: *This paper delves into the intricate relationship between innovation, competitive advantage, and product development within organizational contexts. It underscores that innovation transcends mere idea generation; it represents a multifaceted journey from conceptualization to execution, demanding entrepreneurial vision and adaptability. Research consistently affirms the pivotal role of innovation in business success, highlighting a robust correlation between innovation, profitability, and performance spanning diverse industries. The aim of this work is to develop a comprehensive research and development process within the headquarters (HQ) and an implementation process within its subsidiary entities.*

Keywords: *product development, technological transfer, competitive advantage.*

1. INTRODUCTION

Innovation is not simply the creation of a new idea; it involves a process of decision-making within an organization that spans from the initial generation of the idea to its final implementation [1]. The idea itself can originate from several sources, including identifying an unmet customer need, discovering a new method of production, or even finding a novel application for existing technology. Once the idea has been generated, the organization must go through a process of gathering information and developing a plan for implementation. This can include evaluating the feasibility of the idea, identifying potential challenges, and determining the resources needed to make it a reality [2]. Throughout this process, it's important for organizations to maintain an entrepreneurial vision and remain open to new ideas and feedback. This can help to ensure that the final product is not only innovative but also practical and useful to customers [3], [4]. Therefore, the purpose of the article is to identify the current product development processes used in the power tools industry and to propose a new one that can respond to the new requirements and that is able to fulfill as quickly as possible the

needs of customers which are in a continuous change.

2. PERFORMANCE INDICATORS OF COMPETITIVE ADVANTAGE

In order to achieve a competitive edge in their industry, manufacturing organizations must prioritize the production of quality products while minimizing costs. Consequently, monitoring performance becomes crucial for organizations to validate the attainment of their goals and objectives. “*Performance management*” serves as a means for organizations to ascertain whether they are on the right track or need to adjust [1].

2.1. Defining competitive advantage

Competitive advantage occurs when an organization develops unique qualities that enable it to outperform competitors. It becomes truly significant when these qualities lead to greater profitability or superiority in critical areas like market share, product quality, or technological advancements [2]. Michael Porter defines competitive advantage as (figure 1):

- **Low cost:** Ensuring the lowest possible product cost.

- **Product uniqueness:** Making products easily distinguishable from competitors' offerings on the market [3], [4].



Fig.1 Competitive advantage definition

2.3. Definition of performance indicators

„Key performance indicators (KPIs)” are vital metrics organizations use to measure and improve their progress toward long-term goals, covering both financial and non-financial aspects. Implementing an effective KPI system relies on well-structured business processes that prioritize customer orientation and adaptability, essential for addressing the challenges of today's global competition [5].

2.4. Performance Indicators for Quality, Innovation, and Competitiveness

Scholars in strategic management have struggled to define competitive advantage, with some concerns about its precision and scientific value. Powell [6] argued that such definitions tend to be tautological and inherently true, offering scientific insight. While Powell's perspective has been debated, some scholars advocate for a more positive approach, exploring the link between competitive advantage and performance. Many studies highlight the importance of innovation in business success. For instance, Hine and Ryan [7] found that innovative small service and consulting firms excel in their domain. Lin and Chen [8] identified administrative innovation as a significant contributor to sales in small and medium-sized enterprises, while Linder [9] observed a positive correlation between innovation and profitability across industries and company sizes [10]. Previous research on innovation and performance has yielded mixed results. Kuei, Madu, and Lin [11] found superior outcomes in supply chain management with high-quality trend systems. Madu, Kuei, and Jacob [12] emphasized the association between organizational performance and factors like employee and customer satisfaction. Prajogo

and Sohal [13] discovered a positive link between Total Quality Management (TQM) and both product quality and innovation performance, with a stronger connection to product quality. Bell and Omachonu [14] demonstrated a direct link between documentation system implementation and overall organizational performance, as measured by return on assets. Conversely, Samson and Terziovski [15] suggested that the intensity of TQM practice is a better predictor of performance. In a study on SMEs in Poland, researchers failed to confirm a significant effect of information technology capability on the relationship between innovation and firm performance. Lastly, Richard, Devinny, Yip, and Johnson [16] define business performance as encompassing financial performance, market performance, and profitability, reflecting an organization's outcomes over time. Table 1 summarizes the concept of competitive advantage and the role of innovation in business performance.

Table 1
Competitive advantage concept and innovation role in business performance

Topic	Findings
Conceptual challenges of competitive advantage research	Lack of clear definition and tautological hypotheses
Innovation and business success	Critical factor in determining success, positively correlated with profitability and high performance
Relationship between innovation and performance	Critical factor in determining success, positively correlated with profitability and high performance
Organizational performance	Comprises financial performance, market performance, and profitability, and reflects outcomes achieved over time

3. IDENTIFICATION OF THE CURRENT DEVELOPMENT PROCESS OF INNOVATIVE PRODUCTS

One of the most frequent questions arising after an intense debate in the field of strategic management is "how do organizations obtain a competitive advantage?".

Therefore, special importance is given to the methodologies used to research and develop

innovative products or services that can satisfy the constantly changing demands of customers.

3.1. Applying the content analysis method to identify the development process of an innovative product within the headquarters

The typical steps that a headquarter (HQ) of a power tool company follows to develop an innovative product and implement it within their subsidiaries are [17]–[23]:

Identifying Needs: HQ identifies customer requirements and market gaps.

Concept Development: HQ generates product concepts and creates prototypes.

Research and Development: HQ refines the product design.

Creating a business plan: HQ creates a business plan outlining objectives, target market, and pricing.

Develop an implementation plan: HQ develops a plan for rolling out the product, identifying necessary resources and training.

Product testing and rollout: HQ begins testing and implementing the product in selected subsidiaries.

Monitoring and evaluating the results achieved: HQ monitors customer feedback and sales performance to ensure the product meets expectations.

3.2. Application of the content analysis method to identify the development process of a product within the subsidiaries

The common steps a power tool subsidiary follows to develop an innovative product are [17]–[23]:

Idea development: Generate and evaluate new product ideas through methods like brainstorming, market research, customer feedback, and competitor analysis.

Research and Development: Create a detailed plan for the product, including features, specifications, and design.

Testing: Ensure product quality and safety by conducting tests for durability, performance, usability, and regulatory compliance.

Release: Develop a marketing and sales plan for product promotion, including advertising, social media campaigns, and demonstrations.

Post Launch: Monitor product performance, gather customer feedback, analyze sales data, and make necessary adjustments to the product or marketing strategy.

3.3. Conclusions - Development Process of an Innovative Product: Headquarters vs. Subsidiaries

When comparing the development of innovative products in the headquarters and a subsidiary, several key points emerge:

Similar Processes: Both the headquarters and subsidiary follow a similar process, including opportunity identification, research and development, pitching, approval, and result evaluation.

Subsidiary Challenges: Subsidiaries may face unique challenges such as identifying local market opportunities and meeting headquarters' expectations.

Importance of Collaboration: Effective collaboration between the headquarters and subsidiary is crucial for success, ensuring alignment with local market needs and overall company goals.

Subsidiary Agility: Proximity to the local market allows subsidiaries to respond quickly to evolving customer preferences.

Resource Leveraging: Subsidiaries can tap into the headquarters' additional resources and expertise for product development.

In summary, the development process for innovative products in both the headquarters and subsidiary presents distinct challenges and advantages.

4. DEVELOPING A NEW R&D AND IMPLEMENTATION PROCESS FOR AN INNOVATIVE PRODUCT: FROM HQ TO SUBSIDIARIES

This chapter outlines the proposed research and development process for a new product, starting from its inception at the headquarters and extending to its implementation within the subsidiary.

4.1. The new research and development process of an innovative product by headquarters

The development of a new product must follow a logical sequence of steps to achieve the desired outcome.

1. Studying the External Environment for Customer Needs: The organization conducts an analysis of the external environment to identify evolving market trends and customer needs.

2. Prioritizing Identified Needs: The organization selects the most frequent and valid customer needs for further consideration.

3. Idea Generation and Selection: Based on the identified needs, the organization generates ideas and selects the most viable one that aligns with its capabilities.

4. Basic Research: Fundamental research is conducted to develop concepts that meet the requirements of the selected idea, along with performing technical-economic analyses.

5. Applied Research - Planning and Documentation: Different plans are developed, and documentation related to products and technologies is created.

6. Applied Research - Design and Testing: Experimental or functional model testing is carried out as part of the applied research phase.

7. Applied Research - Model Validation: If the experimental or functional model meets all requirements, it is approved and progresses to the next development phase.

8. Technological Development - Prototype Design and Testing: A prototype is designed and subjected to various tests.

9. Technological Development - Prototype Validation: Prototype validation occurs once it meets all technical requirements.

10. Technological Development - Technical Documentation: The headquarters (HQ) prepares technical documentation to be sent to the subsidiary.

11. Technological Transfer - Documentation Transmission: The HQ transmits the technical documentation for the product and associated equipment to the subsidiary.

12. Results Valorization Within the Subsidiary - Supplier Selection and Equipment Production: The subsidiary compiles a list of potential suppliers and

establishes collaboration contracts. After producing the acquisition equipment, the supplier creates initial samples for correctness verification.

13. Results Valorization Within the Subsidiary - Mass Production Testing, Final Validation, and Series Orders Issuance: After conducting mass testing, if the product meets all criteria, the customer conducts final validation. Subsequently, the customer and supplier collaborate to finalize compliance documentation, and the customer places a series of orders with the supplier.

4.2. The implementation process of the product developed in the subsidiary

The implementation process steps for a new product developed at the organization's headquarters and transferred to the subsidiary involve several stages:

1. Creation of Technical Documentation: The HQ prepares the technical documentation for the product and its manufacturing equipment.

2. Transmitting Documentation to the Subsidiary: The HQ sends the technical documentation to the subsidiary.

3. Supplier Selection and Contracting: The subsidiary compiles a list of potential suppliers and establishes a collaboration contract. The supplier then creates initial samples for correctness verification after producing the acquisition equipment.

4. Transmitting Supplier's Documentation: The subsidiary (the client) shares essential technical documentation with the supplier, excluding confidential information.

5. Elaboration and Approval of Product Compliance: The supplier suggests necessary changes to the product to enable its manufacturing. Both supplier and subsidiary work together to approve the changes.

6. Equipment Manufacturing and Sample Production: The supplier manufactures a set of samples to check their correctness before sending them to the customer. If they meet the requirements, they are sent to the subsidiary.

7. Sample Reception and Inspection: The subsidiary inspects the received samples to ensure they meet all requirements.

8. Feedback to Supplier and Correction: If technical discrepancies are found during inspection, the customer notifies the supplier for necessary corrections and requests a new delivery date for improved samples.

9. Equipment Correction and New Sample Set: After making final equipment adjustments, the supplier manufactures a new set of samples, performs a final inspection, and delivers them to the customer.

10. Reinspection of Corrected Samples: The subsidiary re-inspects the samples to verify if previously identified issues have been resolved.

11. Initial Validation and Test Batch Request: Following initial sample validation, the customer requests a test batch from the supplier for mass production testing.

12. Test Batch Manufacturing and Delivery: The supplier produces the requested number of products and delivers them to the customer.

13. Sample Receipt and Visual Inspection: The subsidiary performs a visual inspection to ensure compliance with specifications.

14. Mass Production Testing and Final Validation: After testing under mass production conditions, if the product meets all criteria, the customer conducts the final validation.

15. Compliance Document Review: The subsidiary and supplier collaborate to finalize the compliance documentation, materials, heat treatments, and other technical aspects validated during the final sample validation phase.

16. Series Orders Issuance: Once all technical aspects, terms, and conditions have been resolved, the customer issues series orders to the supplier.

5. MOTIVATION AND CRITERIA FOR THE CREATION OF A NEW DEVELOPMENT AND IMPLEMENTATION PROCESS OF NEW PRODUCTS

Considering rapid market developments and ever-changing customer needs, the need for a more efficient and innovation-oriented product development process was identified. This change was guided by clear criteria, which were

the basis for the development of the new process (figure 2):

5.1. Flexibility and Adaptability: The new process must be adaptable to rapid changes in the market and able to respond quickly to changing customer requirements.

5.2. Permanent Innovation: Promoting innovation in all phases of the process, from initial identification of needs to implementation in subsidiaries, to remain leaders in the introduction of innovative products.

5.3. Effective Communication and Collaboration: Focus on improving communication and collaboration between headquarters and subsidiaries, for a rapid exchange of information and ideas.

5.4. Operational Efficiency: The new process was designed to be efficient, eliminating redundancies and optimizing resources to reduce costs and maximize their use.

5.5. Customer Orientation: Rapid implementation of new products to meet the constantly changing demands of customers.

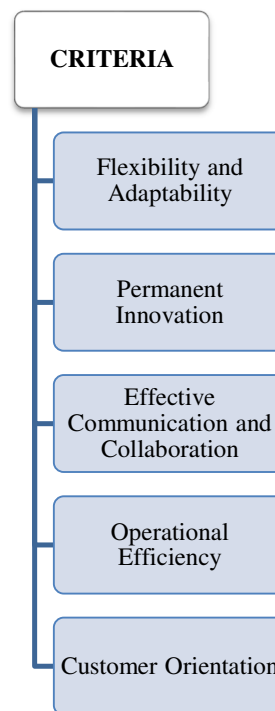


Fig.2 Criteria for the creation of a new development and implementation process.

6. BENEFITS AND DISCUSSIONS

The benefits of this new innovative product development and implementation process are numerous and can bring significant improvements in efficiency and quality in product development (figure 3).



Fig..3 Benefits of the new process

1. Rapid response to customer needs: The newly proposed process enables the rapid identification of customer needs and the adaptation of products to meet them. This can lead to increased customer satisfaction and customer loyalty.

2. Operational efficiency: The process is well structured and follows a logical sequence of steps. This can lead to the elimination of redundancies, optimization of resources and reduction of operational costs.

3. Continuous innovation: The model encourages innovation in all phases of the process, from initial identification of needs to implementation. This can keep the organization at the forefront of introducing innovative products to the market.

4. Effective communication and collaboration: A focus on improving communication and collaboration between headquarters and subsidiaries enables a rapid

exchange of information and ideas, contributing to smoother product development.

5. Customer Centricity: The process is designed to quickly respond to ever-changing customer requirements. This can help maintain customer loyalty and increase market share.

6. Capitalizing on results in subsidiaries: The process facilitates an efficient implementation of products in subsidiaries, with special attention paid to supplier selection and mass testing. This can lead to faster development of local markets.

7. Clarity and documentation: Each step of the process is well documented, which ensures accurate tracking of progress and efficient management of technical information.

7. LIMITATIONS OF THE RESEARCH

The limitations of the research are presented in figure 4.

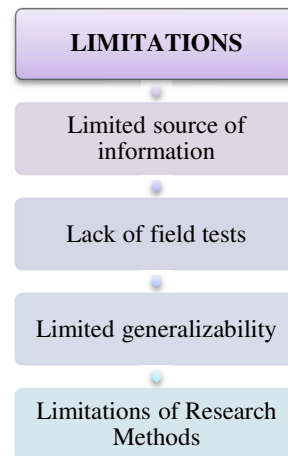


Fig.4. Limitations of the research

1. Limited Source of Information: One of the main limitations of the research was that all information was based on open-source literature. This means that the results and conclusions are based on publicly available information and may be influenced by limitations or biases presented in that literature.

2. Lack of Field Tests: Due to the theoretical nature of the research, it could not be the new model in a factory or real production environment. This may limit the direct applicability of results in a practical context, and

there may be significant differences between theory and actual implementation.

3. Limited Generalizability: Results may have more limited applicability outside of the specific context of the power tools company or industry. Different sectors and fields may have different requirements and challenges in developing innovative products.

4. Limitations of Research Methods: Any research method has its own limitations. For example, the content analysis method may be influenced by the subjectivity of the researcher in interpreting the data.

8. CONCLUSIONS AND FUTURE RESEARCH PLAN

The article recognizes the paramount importance of innovation and its efficient implementation in meeting the ever-evolving needs of customers. The current product development processes in the power tools industry may not be sufficient to respond quickly to changing market demands. This necessitates the exploration of a new method that can adapt rapidly to customer requirements while maintaining quality and cost-effectiveness.

The contribution consists in proposing a new theoretical model for the implementation of innovative products, extending from the initial idea generation at the headquarters to the final stages of implementation within subsidiaries. This model addresses the limitations of existing processes and aims to streamline product development while ensuring adaptability and customer-centricity.

Future research endeavors should focus on the practical application and testing of this new model in a factory or real production environment. This is essential to bridge the gap between theory and actual implementation and to evaluate the model's effectiveness in delivering innovative products efficiently.

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Optimizarea transferului de tehnologie: o metodologie pentru implementarea în entitățile subsidiare

Această lucrare analizează relația complicată dintre inovare, avantaj competitiv și dezvoltarea produsului în contexte organizaționale. Subliniază faptul că inovația transcende simpla generare de idei; reprezintă o călătorie cu mai multe fațete de la conceptualizare la execuție, care necesită viziune antreprenorială și adaptabilitate. Cercetarea afirmă în mod constant rolul esențial al inovației în succesul afacerii, evidențiind o corelație solidă între inovație, profitabilitate și performanță în diverse industrii. Scopul acestei lucrări este de a dezvolta un proces cuprinzător de cercetare și dezvoltare în sediul central (HQ) și un proces de implementare în cadrul entităților sale subsidiare.

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