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Article

# Enhancing productivity through comprehensive evaluation and contextual analysis: A model for continuous improvement

# Evaluación y mejora integral de la productividad empresarial: Un modelo basado en el análisis del contexto interno y externo

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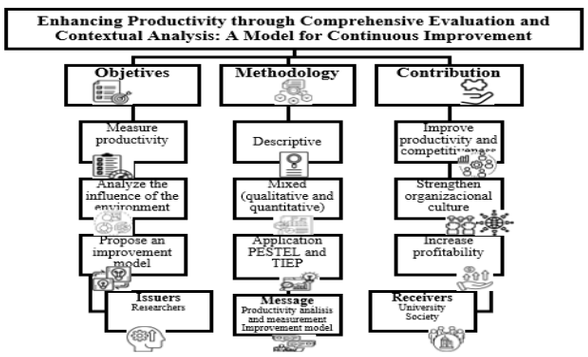
**Abstract**

The main objective of the case study is to measure the productivity of a laboratory dedicated to the development of dermatological products from coconut oil and other natural ingredients, as well as to analyze the influence of the external context on it in order to propose an improvement model that will allow it to improve its competitiveness in the market, strengthen its organizational structure and increase its profitability. This will be done through the application of the PESTEL analysis and the Integral Productivity Evaluation Technique in order to identify areas for improvement. It should be noted that the study is descriptive, with a mixed approach (qualitative and quantitative).




**Science, Technology and Innovation**

**Resumen**

El objetivo principal del caso de estudio es medir la productividad de un laboratorio que se dedica al desarrollo de productos dermatológicos a partir del aceite de coco y de otros ingredientes naturales, asimismo, analizar la influencia del contexto externo en la misma para proponer un modelo de mejora que permita mejorar la competitividad en el mercado, fortalecer su cultura organizacional y aumentar su rentabilidad. Lo anterior, se realizará a través de la aplicación del análisis PESTEL y de la Técnica Integral de Evaluación de la Productividad con la finalidad de identificar las áreas de mejora. Cabe señalar que el estudio es tipo descriptivo, con un enfoque mixto (cualitativo y cuantitativo).


**Ciencia, Tecnología e Innovación**

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**Journal- Industrial Organization** June 2024 Vol.8 No.14 26-35
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## Introduction

Productivity can be defined as " *the art of being able to create, generate or improve goods and services*" (Nemur, 2016). It is a key and important concept in business management, because it is an indicator that is closely related to efficiency and effectiveness, allowing to assess the company's ability to achieve its objectives, goals and the optimisation of its resources.

Productivity is systematic, i.e. it is not determined by a single factor, but by a series of elements that have a significant influence in determining the level of productivity of a company or society. There are internal factors, which are influenced by the organization. Similarly, there are external factors that do not depend on the company, but are essential in determining productivity. It is important to mention that in order to achieve business or organizational success it is necessary to measure and improve productivity continuously, because ignoring these actions can lead to a number of negative consequences, such as decreased competitiveness, stagnation of growth and, in a severe case, bankruptcy. This requires long-term commitment from the management or top management as well as from all employees in general.

In the case study, there is a need to evaluate the productivity of a laboratory located in the state of Tabasco, which is dedicated to the development of a wide range of products derived from coconut oil and other natural ingredients, focused on treating various conditions. For this, it is necessary to analyse the current situation of the external (through the PESTEL method) and internal connection with the application of an instrument called TIEP (Integral Productivity Evaluation Technique), which consists of the study of ten essential elements that every organization or company must consider.

## Theoretical review

Today we live in a dynamic and competitive world. In today's organizations, measurement "*has become a determinant of success, both at the individual and societal level*" (Sabry, 2024), such that strategies alone do not have the capacity to be activated in the organizational environment without recourse to the measurement process and the users at different management levels to execute and measure it.

Therefore, the impact is significantly negative for any type of company, when there is an absence of structuring and management indicators, since this leads to a lack of control and evaluation in the organization causing damage to the internal functioning as well as its performance in the market.

According to Zabala Jarami (2005), "*measurement should be planned as a system composed of several factors for the achievement of results, such as: personnel, procedures, facilities and equipment, information, objectives and goals, all according to the needs of each organization*". Acevedo Gamboa, D. (2022) explains that "today managers, specialists and academia seem to affirm that a balanced approach is the best way to measure". Although most organizations have these components in place, the failure to integrate them into a coherent and planned organization-wide system is common. In addition, there is a common lack of formal documentation defining the responsibilities and roles of staff involved in this system.

It should be noted that identification, commitment and involvement are concepts that "*influence worker behaviour and, in turn, have a significant impact on the productivity of their daily activities, either positively or negatively*" (Aguilar et al. 2024). Therefore, it is necessary to consider them when measuring productivity.
Similarly, it should be taken into consideration that "*job performance and productivity have a close relationship in employees, which shows that they perform their tasks efficiently and effectively and contribute to the achievement of goals and use the means efficiently, which implies productivity and organizational success*" (Torres & Córdova 2022, Limaylla 2022, Serpa 2019, Barcia et al. 2019, as cited in Mahoma, 2024).

It is important to know the context of the environment in which the companies are located in order to carry out an adequate measurement; this can be done through the application of the PESTEL Analysis, because it refers to the study of Political, Economic, Social, Technological, Ecological and Legal factors (Murcia Cabra, 2023).

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To identify problems specifically, in order to provide the location of areas of opportunity to improve productivity in a comprehensive manner, it is necessary to measure through the measurement instrument called "*Integral Technique of Evaluation of Productivity*" (TIEP), because it allows "to*integrate the knowledge and development of the organization, these elements are essential for the integral knowledge of the company and integrate a series of general and specific aspects that denote the productive scope of the company*" (López et al., 2021).

According to Eliseo Dántes (2023), the TIEP is based on ten priority elements that cover the essence of organizational functioning in a comprehensive manner:

1. Conceptual approach to the company: This refers to the vision that the members of the organization have, i.e. whether it is partial or systemic.

2. Process knowledge: This element assesses the in-depth understanding of internal processes. It allows to identify areas for improvement and to optimise the use of resources; therefore, if members do not know the processes, it will have a negative impact, because a series of errors and consequences arise.

3. Social sphere of the organization: It is the product of the interaction that exists between its components, where synergy or dysfunction can be identified, which influences productivity.

4. Planning management: The evaluation takes into account the effectiveness of strategic planning management, including objectives, goals, strategies, tactics, policies, values, philosophy, programmes and projects, which is crucial for success.

5. Management involvement: Achieving positive results requires the active involvement of top management in the overall development of the organization, both tangible and intangible, therefore, the involvement of top management in the organization is assessed.

6. Creativity and organizational innovation: During the evaluation, a fundamental value of the company is considered; this is the ability to generate new ideas and apply them to improve processes, products and services, since it is a fundamental driver of productivity and competitiveness.

7. Knowledge of the customer(s): This evaluates the in-depth understanding of the needs, expectations and behaviour of customers, both internal and external. It is essential to guide the organization's actions.

8. Technological development: As mentioned by Jawad & Balázs (2024) "*in the dynamic and changing field of technology and business operations, keeping abreast of recent trends is paramount*". It is therefore important to adopt and adapt appropriate technologies to the needs of the organization, as this is a key factor in optimising processes, increasing efficiency and improving productivity.

9. Macroeconomic knowledge: Understanding economic and political changes at the macro level allows the organization to anticipate trends, make strategic decisions and prepare for challenges and opportunities.

10. Comprehensive human resource development: "*Learning and training refers to the acquisition of knowledge, skills, attitudes and abilities that are used to perform tasks in the workplace*" (Aguilar et al. 2024). Investing in the integral development of human capital, including attitudes, skills and abilities, leads to personal and professional growth, boosting productivity and organizational success.

According to Pérez et al. (2021), the TIEP "*is a tool that gives us the security of being able to evaluate..."*the entire company "*with this we generate a measurement through a qualitative and quantitative analysis*".

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By applying the TIEP, it is possible to have a comprehensive view of productivity, because it allows to evaluate from a holistic perspective, considering tangible and intangible aspects, facilitating the identification of specific areas where actions can be implemented to improve productivity and increase competitiveness. It should be noted that the understanding of external factors is fundamental for the TIEP.

## Methodology

**Box 1**

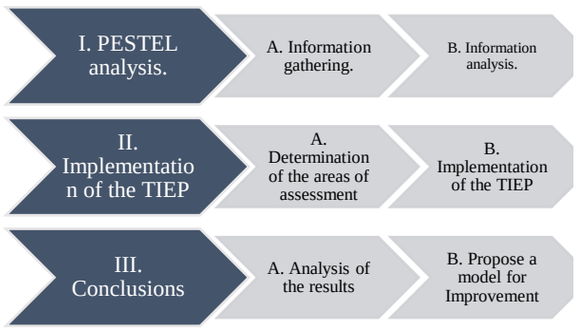


**Figure 1**
Productivity measurement methodology

Figure 1 shows the methodology used to carry out the productivity study of the laboratory, which is a descriptive study with a mixed approach (qualitative and quantitative). It consists of three stages: PESTEL analysis, application of the Integrated Productivity Evaluation Technique.

### I. PESTEL analysis

A. Information gathering

- Political factors: Review of the political panorama of the state of Tabasco and identification of possible changes in government policies.
- Economic factors: Analysis of the economic situation in the state of Tabasco, consideration of the impact of global economic conditions and assessment of economic trends in the sector.
- Socio-cultural factors: Examination of demographic and social trends in the state of Tabasco, identification of cultural values and consumer preferences, and consideration of the impact of social trends on the workforce.
- Technological factors: Assessment of the level of technological development in the state of Tabasco, identification of new technologies relevant to the laboratory and consideration of the impact of technological changes.
- Ecological factors: Analysis of existing environmental regulations, assessment of the impact of environmental concerns and consideration of opportunities for sustainable practices.
- Legal factors: Review of laws and regulations affecting the laboratory, identification of possible legal changes, and seeking opportunities to take advantage of existing laws.

B. Information analysis

- Careful analysis of information to identify the most relevant factors.

### II. Application of the Integrated Productivity Evaluation Technique (IPET)

A. Determination of the areas of evaluation.

- Division of the laboratory into three areas:

Area 1: R&D and Production.
Area 2: Accounting, Purchasing and Warehouse.
Area 3: Quality and Administration.

Reasons for the division into areas:
- Greater specialisation and depth of analysis.
- Integral and systemic vision of productivity.
- More efficient and complete evaluation.
- Simplification of implementation and monitoring.
- Greater employee participation and commitment.
- Encouragement of communication and collaboration.

B. Application of the TIEP.

- Understanding of contextual variables.
- Involvement of representatives from all three areas.
- Regular 60-90 minute meetings.
- Interviews to gather information.
- Application of the TIEP for each area.
- Assignment of assessments and weights to elements.

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- Calculation of simple average per item.
- Calculation of the composite average.
- Application of the formulas to each element.
- Calculation of the simple average and composite average by variable.
- Elaboration of graphs to analyse the impact.

## III. Conclusions

- Analysis of the results obtained.
- Identification of areas of opportunity to improve productivity.
- Propose a model for improvement.

## Results

According to the PESTEL analysis, opportunities and threats that impact the laboratory were identified (Table 1. Summary of the PESTEL analysis).

**Box 2**

**Table 1**

Summary of the PESTEL analysis

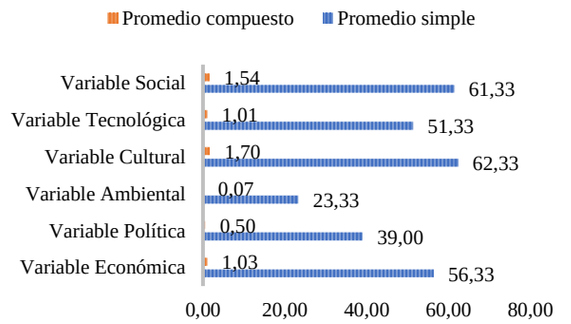
| Factor | Opportunities | Amenazas |
|---|---|---|
| **Politics** | Access to finance, tax incentives, intellectual property protection. | Policy changes, expropriations, political instability, unfair competition. |
| **Economic** | New markets, generic products, cost reduction, access to finance. | Competition, low prices, economic recession, currency devaluation. |
| **Sociocultural** | New market segments, customized products, customer loyalty. | Changes in preferences, cultural competition, loss of customers. |
| **Technological** | New products, efficient processes, cost reduction, access to new markets. | Technological obsolescence, technological competition, lack of access to technology. |
| **Ecological** | Sustainable products, reduced environmental footprint, access to green markets. | Environmental costs, stricter regulations, loss of markets, damage to public image. |
| **Legal** | Intellectual property protection, access to new markets, legal compliance. | Changes in laws, strict labour laws, environmental regulations, lawsuits. |

Given the above, the following is recommended:

- Political: Monitor the political environment, diversify markets, build relationships with government.
- Economic: Diversify products, optimise costs, seek alternative financing, protect against inflation.
- Sociocultural: Adapt products, strengthen brand, offer customised products, build community relationships.
- Technological: Invest in R&D, adopt new technologies, protect intellectual property, form strategic alliances.
- Ecological: Implement sustainable practices, comply with regulations, develop sustainable products, communicate environmental initiatives.
- Legal: Monitor legal changes, comply with laws, seek legal advice, establish compliance programmes.

On the other hand, Graph 1 represents the result of the application of the TIEP, which shows the impact of each of the variables:

**Box 3**




**Graph 1**

Impact of variables on laboratory productivity Source: Author's perspective, 2024

- The economic variable has a simple average of 56.33 and a composite average of 1.03. This indicates that the laboratory has an average performance in economic terms.
- The political variable has a simple average of 39.00 and a composite average of 0.50. This indicates that the laboratory has a poor average in political terms.
- The environmental variable has a simple average of 23.33 and a compound average of 0.07. This indicates that the laboratory performs efficiently in environmental terms, as it implements actions of optimal use of resources and waste minimisation.

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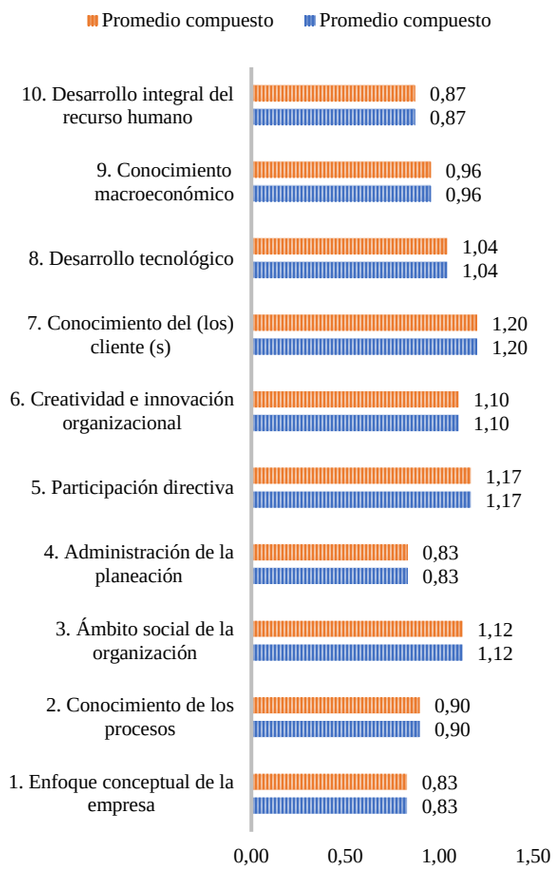
- The cultural variable has a simple average of 62.33 and a compound average of 1.70. This indicates a fair performance, and opens up areas for improvement.
- The technology variable has a simple average of 51.33 and a composite average of 1.01. This indicates fair performance.
- The social variable has a simple average of 61.33 and a composite average of 1.54. This indicates good performance.

## Box 4




**Graphic 2**
Results of the impact of variables on the elements

- There is a low level of knowledge of the conceptual approach to business. This means that they do not have a systemic and integral approach. The laboratory has a medium level of knowledge of the processes. However, there is no formalisation of process management.
- In terms of the social scope of the organization, there is a basic understanding of social responsibilities.
- In planning management, there is no basic system in place to establish objectives, strategies, among other elements.
- There is a high level of managerial participation.
- There is a medium level of creativity and organizational innovation, due to the operations that the laboratory executes, it is encouraged, however, the ideas that the collaborators propose are not managed.
- The level of knowledge of the client(s) is high. This means that employees have a clear understanding of customer needs and expectations.
- In technological development, the laboratory is at a medium level, because this area concentrates most of the technology, leaving aside the other areas.
- There is a medium level in the macroeconomic knowledge element. This means that there is a basic and superficial understanding of the economic factors affecting the business level.
- There is a low level of comprehensive human resource development, as there is no investment in training and development.

According to the results obtained in the application of the PESTEL method and the Integrated Productivity Evaluation Technique, an improvement model is proposed, which is mainly based on four pillars:

1. Homeostasis theory: Homeostasis is a regulatory process in organisms to maintain their equilibrium. This principle applies to organizations, which must be able to adapt to new market conditions in order to maintain their success.

2. Continuous improvement: Continuous improvement seeks to permanently improve processes by employing strict discipline in quality, productivity, customer satisfaction, cycle times and costs. It is based on a feedback loop to identify problems, implement solutions and monitor the results.

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RENIECYT-CONAHCYT: 1702902

3. Context variables: It is necessary to monitor the external context in which the company operates in order to know the situation of the variables that impact the internal environment, thus being able to take action in the face of changes in the external environment.
4. The 10 elements of the TIEP provide us with a framework to assess our current productivity and identify areas of opportunity for improvement.

The objective of the model is to help you improve your productivity in a comprehensive way, addressing all aspects of the organization that affect productivity, from internal processes to the external context, and to achieve sustainable improvement through the implementation of a continuous improvement approach that allows the company to adapt to changes in the environment and maintain its productivity in the long term.

## Box 5

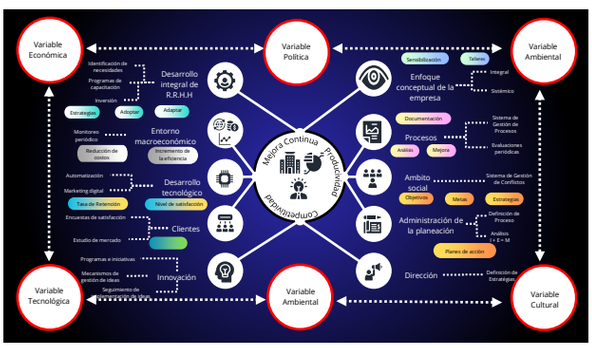


**Figure 2**
Productivity measurement methodology Source: Author's perspective, 2024

External Context: Interpretation of each variable.

a. Economic Factors: Economic market conditions, such as inflation, interest rates and the exchange rate, can affect production costs, product demand and the profitability of the company.
b. Political Factors: Government policies, regulations and the political stability of the country can influence the firm's operating environment, affecting aspects such as hiring of personnel, access to financing and ease of doing business.
c. Social and Cultural Factors: The values, customs and expectations of the society in which the enterprise operates can influence the availability of labour, work ethic and the acceptability of the enterprise's products or services.
d. Environmental Factors: Environmental regulations, the availability of natural resources and the environmental impact of the company's operations can affect production costs, public image and long-term sustainability.
e. Technological Factors: Technological advances in related industries may generate new market opportunities, create challenges for existing products or services, and require constant upgrading of the company's technological capabilities.

Internal Context: Interpretation of each element.

1. Conceptual approach of the company:

- Strategy: Foster a systemic and holistic view of the organization among all members, through awareness raising, workshops, trainings and effective communication.
- Indicators: Measure the alignment of individual actions with the overall vision of the company through surveys and interviews.

2. Processes:

- Strategy: Implement a process management system that documents, analyses and continuously improves internal processes. Periodically evaluate process knowledge.
- Indicators: Reduce cycle time, eliminate waste and improve the quality of the processes.

3. Social:

- Strategy: Foster a culture of collaboration, teamwork and open communication through integration activities, recognition of teamwork and conflict resolution. Establish a conflict management system.
- Indicators: Measure the level of job satisfaction, team cohesion and participation in collaborative activities.

ISSN: 2524-2105
RENIECYT-CONAHCYT: 1702902

4. Planning management:

- Strategy: Implement a robust strategic planning process that defines clear objectives, measurable goals, achievable strategies and concrete action plans. Periodically analyse the internal and external context in order to improve. - Indicators: Achieve set objectives, meet targets and deadlines, and evaluate the effectiveness of implemented strategies.

5. Leadership:

- Strategy: Actively involve senior management in strategy setting, decision making and performance monitoring.
- Indicators: Frequency of senior management communication with employees, participation in organizational activities and support for improvement initiatives.

6. Innovation:

- Strategy: Create an environment that fosters creativity and innovation, through idea competitions, training programmes in creative thinking, idea management mechanisms, spaces for experimentation and follow-up on the implementation of ideas.
- Indicators: Number of new ideas proposed, implementation of new ideas and innovative products or services.

7. Clients:

- Strategy: Conduct market research, satisfaction surveys and data analysis to understand customer needs, expectations and behaviours.
- Indicators: Level of customer satisfaction, customer loyalty and customer retention rate.
-

8. Technology development:

- Strategy: Implement technologies appropriate to the needs of the organization (automation, digital marketing), continuously evaluate new technologies and train staff in their use.
- Indicators: Cost reduction, increased efficiency, improved quality and development of new products or services.

9. Macroeconomic environment:

- Strategy: Monitor macro-level economic and political changes, analyse their impact on the organization and develop strategies to adapt to changes.
- Indicators: Ability to anticipate trends, make timely strategic decisions and address challenges and opportunities in the macroeconomic environment.

10. Integral development of human resources:

- Strategy: Invest in staff training, education and skills development, both technical and soft.
- Indicators: Level of staff training, individual and team performance, and job satisfaction.

Influence of External Variables on Internal Elements

External variables can influence the internal elements of the productivity improvement model in several ways. For example:

a. Economic factors: A period of economic recession may reduce demand for the laboratory's products, which may force it to reduce production and lay off employees, negatively affecting training, motivation and organizational culture.
b. Political factors: New government regulations on product safety or environmental protection may require investment in technology and processes to comply with such regulations, which may affect production costs and efficiency.
c. Social and cultural factors: Changes in consumer preferences towards healthier or more environmentally friendly products may require you to modify your product or service offering, which may involve changes in staff training, technology used and company infrastructure.

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d. Environmental factors: New technologies for renewable energy production or waste reduction may represent an opportunity to improve environmental efficiency and reduce costs, which may improve the company's public image and increase employee satisfaction.

e. Technological factors: The emergence of new production or distribution technologies may require upgrading your systems and processes to remain competitive, which may involve investments in training, technology and infrastructure.

## Conclusions

Productivity is a complex phenomenon that is influenced by a variety of factors. It is important to understand how the different variables interact with each other in order to develop effective strategies to improve productivity in a specific organization.

The Productivity Improvement Model is a valuable tool to help a company achieve its productivity goals. The model is based on sound principles.

Successful implementation of the productivity improvement model for Quiper® Laboratories will require a joint effort from top management, employees and all stakeholders. With strong commitment and dedication, the model has the potential to help the company achieve its productivity goals and improve its overall performance.

## Declarations

### Conflict of interest

The authors declare no conflict of interest. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

### Author contribution

*Toledo-Magaña, Rosa Lissette*: The main contribution was the search for information, fieldwork and the design of the proposal.

*De León- De los Santos, Brissa Roxana*: Analysis of the external environment and suggested recommendations.

*Guerra-Que, Zenaida*: Analysis of the external environment from an ecological approach and suggested recommendations.

*Eliseo-Dantés, Hortensia*: Provided information on the Integrated Productivity Assessment Technique,

### Availability of data and materials

Data were obtained by applying instruments directly to the study subjects.

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## Abbreviations

PESTEL Political, Economic, Socio-Cultural, Technological, Ecological and Legal
TIEP Comprehensive Productivity Evaluation Technique

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