

Design of an instrument for the productivity of medium-sized companies dedicated to artificial production systems in oil wells in the state of Tabasco

Diseño de un instrumento para la productividad de las medianas empresas dedicadas a sistemas artificiales de producción en pozos petroleros del estado de Tabasco

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Abstract

For an integral growth and continuous development, productivity is a fundamental variable for local, regional, national and international organizations. For the companies dedicated to Artificial Production Systems in Oil Wells in the state of Tabasco, raising their productivity would position them in the global market with a competitive advantage for the current demands, for this, the present study proposes an instrument for the integral measurement of the system, with the purpose of evaluating by means of elements or criteria the general scheme of productivity. The methodology selects the experts of the organization for a pilot test and to evaluate if the elements are adequate to determine productivity, making that the results found allow to establish a definitive instrument to apply it at a macro level and to evaluate the whole region, and to know its actuality.

Resumen

Para un crecimiento integral y un desarrollo continuo, la productividad es una variable fundamental para las organizaciones locales, regionales, nacionales e internacionales. Para las empresas dedicadas a Sistemas Artificiales de Producción en Pozos Petroleros del estado de Tabasco elevar su productividad las posicionaría en el mercado global con una ventaja competitiva para las exigencias actuales, para ello, el presente estudio propone un instrumento para la medición integral del sistema, con el propósito de evaluar por medio de elementos o criterios el esquema general de la productividad. La metodología selecciona a los expertos de la organización para una prueba piloto y evaluar si los elementos son los adecuados para determinar la productividad, haciendo que los resultados encontrados permitan establecer un instrumento definitivo para aplicarlo a un nivel macro y evaluar toda la región, y conocer su actualidad.

Productivity, Integral measurement, Instrument

Productividad, Medición integral, Instrumento

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Introduction

Increasing world population, improving living standards and limited availability of certain material resources are some of the factors indicating the growing interest in the energy sector. Therefore, studying productivity and analysing the macro- and microeconomic circumstances for the energy sector is indispensable for economic growth in the country.

Productivity implies the improvement of all organisational processes as well as those of the production process. Improvement means a favourable comparison between the amount of resources used and the amount of goods and services produced. Productivity is therefore an index that relates what is produced by a system (output or product) and the resources used to generate them (inputs).

The measurement of productivity is sometimes straightforward, for example, when it is measured in labour hours, per tonne of a specific steel product, or as the energy required to generate one KW of electricity. But in other cases there are substantial problems in carrying out this measurement, for example: the product specification may vary while the amount of inputs and outputs remains constant, comparing a current radio set with an old one, only a few can deny that technology has improved.

Therefore, it is very important to use a well-structured productivity measurement instrument to obtain the real scenario of the organisation and to offer accordingly solution strategies to increase productivity.

Theoretical foundation

One of the largest industries in Mexico is the oil industry, which has been for many years a driving force in the country's economy. However, the energy sector is currently operated and dominated by private industry, which has been the subject of several investigations at regional, national and international level.

Part of the research towards this sector, the contributions of Lajous, Morayta and Mabire (2019), emphasise a new technology SESAP (Sistema Experto para Sistemas Artificiales de Producción) developed by the Mexican Petroleum Institute, which is a software tool capable of performing a qualitative selection of the optimal artificial system, based on the minimum necessary information. It also presents present and probable future scenarios to give a technical and economic prediction, with the implementation of a given artificial system without having made an investment. It is reprogrammable to adjust to any type of expert who intends to modify the decision making in the technical determination. The costs introduced can be adjusted to the referents in each contract.

Likewise, Lajous, Morayta and Mabire (2019), demonstrate an analysis through a SWOT study (Strengths, Weaknesses, Opportunities and Threats) of the interventions to a hydrocarbon well, particularly for the intervention by Mechanical Pumping (MB) and injection of flow improver through Capillary Tubing (CT). Both technologies are used in the oil industry for the optimisation of hydrocarbon recovery (Gas-Oil-Water).

In view of this research, it is shown that there are contributions to the sector by means of technology, to improve and increase productivity in the oil industry, and to drive it towards permanent improvement.

Problem statement

The new regulations in terms of sustainability, as well as the increase and the capacity to reuse the greatest amount of materials, oblige medium-sized companies dedicated to artificial production systems to diagnose the current state of the organisation and analyse the environment in order to adapt to it.

These organisations are in a stage of growth and high demand for their services, therefore, it is evident the need to establish administrative and operative changes to face the challenges presented by the current market.

Justification

Currently, medium-sized companies dedicated to artificial production systems in the energy sector are in a stage of development and growth, particularly due to the demand for this type of service.

Due to the age of the oil wells in the state of Tabasco, it is necessary to make the services that attend to production more efficient, through systems that are up to date in technology and production processes.

Maintaining an improvement in productivity in medium-sized companies under efficient production schemes should include satisfying demand through innovative strategies that respond to current times and scenarios.

Methodology

This study proposes a comprehensive productivity measurement instrument, based on ten priority elements in any organisation, either from the intangible or tangible point of view, since both aspects are necessary to consider when measuring productivity.

Pilot testing

In order to determine and establish a proven instrument, it was decided to design and pilot test it, evaluating a medium-sized company specialised in Artificial Production Systems in Oil Wells.

The instrument in Figure 1 has the following elements described below:

- Element 1: Conceptual approach of the company. This refers to how the organisation is viewed, either partially or systemically, as the approach will determine how the organisation is organised and structured.

- Element 2: Process knowledge. This is the decisive complement to understanding the contexts, as the person being evaluated may have the techniques or instruments, but if he/she does not understand the processes into which the company being measured is divided, due to the absence of knowledge, this will trigger a series of errors as he/she will not be able to interrelate with the sources of information and therefore not carry out the comprehensive evaluation that is required.

- Element 3: Social environment of the organisation. This element considers the organisational environment as a result of the relationship between the different elements that make up the organisation. For example, management-middle management, machine-worker, union-management, etc.

- Element 4: Planning management. Here the management of all elements involved in strategic planning are considered. The focus is on how objectives, goals, strategies, tactics, policies, stated values, business philosophy, programmes and projects are being realised. And the results that are being achieved.

- Element 5: Management involvement. It is important to assess the involvement of top management in the overall development of both the tangible and intangible elements of the organisation, as without this impetus it would be impossible to consider positive and quality results in any organisation.

- Element 6: Organisational creativity and innovation. Always and with greater emphasis in the current times, of greater requirements from customers or demanders, it is crucial that there is creativity in the organisation and therefore innovation on the part of the people who make up the system, at all levels, since the increase in productivity and competitiveness will depend on it.

- Element 7: Knowledge of the client(s). It is crucial that the people in the organisation know who their internal and external clients are, as on many occasions there is no idea that within the company, due to the relationship that is established, there are also clients, and on the other hand, the mistake is also made of considering that only certain elements of the organisation should know the external clients.
- Element 8: Technological development. This is another decisive element in the current era, as the circumstances in the context have forced all organisations, whether small, medium or large, to invest or innovate through creativity.
- Element 9: Macroeconomic knowledge. The organisation, and above all its top management, must be very well informed about economic and political issues at the macro level, as many aspects that can have a significant impact on the company and generate a setback or stagnation depend on it.
- Element 10: Integral development of human resources. Nowadays, the organisation must be very clear that the development of human resources is not limited exclusively to training, but must evolve integrally, that is, in attitudes, skills and abilities. It is therefore very important to work on both the tangible and intangible aspects of the same, so that the corresponding stages arise in the people who make up the organisation, until they reach intellectual capital.

Element	Comprehensive Productivity Assessment Instrument					
	Economic Variable	Political Variable	Environmental Variable	Cultural Variable	Technological Variable	Social Variable
1. Conceptual approach to the company	P E	P E	P E	P E	P E	P E
2. Knowledge of the processes	P E	P E	P E	P E	P E	P E
3. Social scope of the organisation	P E	P E	P E	P E	P E	P E
4. Planning management	P E	P E	P E	P E	P E	P E
5. Management participation	P E	P E	P E	P E	P E	P E
6. Organisational creativity and innovation	P E	P E	P E	P E	P E	P E
7. Knowledge of the client(s)	P E	P E	P E	P E	P E	P E
8. Technological development	P E	P E	P E	P E	P E	P E
9. Macroeconomic knowledge	P E	P E	P E	P E	P E	P E
10. Comprehensive human resource development	P E	P E	P E	P E	P E	P E

P = Weighting	$\sum P = 1$
E = Quantitative Evaluation	Range E = 1 - 10

Figure 1 Comprehensive Productivity Assessment Tool
Source: Own elaboration

The instrument brings together fundamental elements for the generation of productivity, which is based on the analysis of each element according to the criteria of each expert in the organisation. This, in turn, places a weighting and a quantifiable evaluation to determine the degree of productivity of each element with respect to each of the economic, social, political, environmental, technological and cultural variables.

It is intended to schedule interview sessions with the experts and managers of the organisation for the application of the pilot test.

Results

The research project is currently in the process of being carried out, so two specific objectives have been met:

1. To determine elements that impact on the productivity of medium-sized companies specialised in Artificial Production Systems in Oil Wells.

2. To construct and design an integral instrument for the evaluation of productivity in medium-sized companies specialised in Artificial Production Systems in Oil Wells.

In the pilot phase, a non-probabilistic sampling by convenience will be applied. Since the personnel who will participate in the application of the instrument have little time available, these actors are very often involved in different activities.

These objectives have been fulfilled and dictate a partial conclusion of the research.

Conclusions

Today, all organisations are focused on continuous improvement and increasing their productivity in order to compete in the global market. The constant challenges faced by the energy industry due to environmental, economic, social, political, cultural and technological changes and movements are of utmost importance to adopt a systemic, holistic and continuous improvement approach.

It is expected that this research will have a positive impact on the company to be evaluated, in order to adjust the measurement instrument and apply it on a larger scale, addressing the needs of the oil industry and attacking areas of opportunity.

With the above, and the study of the scenarios, the application of the instrument will facilitate the analysis and study of the factors involved to ensure an increase in productivity.

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