
Wyższa Szkoła Bankowa we Wrocławiu

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# Method of Assessing the Technical and Economic Levels of Development within the Model of Protection against Failure (MPF)
# Case study: Decision Making in Libyan Oil Sector 2014_2019
# (PhD Dissertation)

Rozprawa doktorska
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# Preface

The Arab countries have great natural resources. Their population exceeds that of many European countries. Cultural centers have been developing in Arab countries for centuries as a result gaining a lead over many of the world's leading university centers. Here the Al Azhar University in Cairo is worth being mentioned as an example, it was established in 972, while the oldest university in Europe, namely the Sorbonne in Paris, was established in 1200, the Jagiellonian University in Krakow was founded in 1364.

In general, the issue analyzed in the dissertation is not only a problem in Libya as it occurs in most developing countries. The subject investigated here is the state's dominance in shaping the country's development strategy, in the absence of progress in the application of contemporary, dynamic methods of diagnosing and assessing the level of the implementation of tasks planned in the microeconomic macro scale. It follows that the colonial system stopped the economic development of these countries for a long time. Colonialists in the interest of their own capital were developing investments in infrastructure (roads, railways, etc.) in order to facilitate the penetration of a given country.

In this work, I undertake to analyze a significant problem of great scientific and application importance. The scientific value of work is an attempt to construct a method of assessing the effectiveness of the company's functioning that could raise the level of Technical and Economic levels in the petrochemical industry companies in Libya. The application value towards the practical implication of this work is essentially important. The author's ambition, it seems, is to design such an evaluation method that could significantly contribute to the improvement of the Managerial and Operational Functions within the concept of Protection against Failures to assess the current “level of development” in Time Now to increase the competitiveness to achieve the settled goals. It is important to add here, that Management Protection against Failure is treated as a coupling tool to support the process of decision in TN for organization function with controlling. This is important because the studied industry was managed by the end of the 90s of the last century in a prescriptive way, without the use of market competition mechanisms. The question here is whether the assessment and management systems themselves are able to bring economic effects without some support in the form of systemic changes? In the first decade of the 21st century, in the period of the last 5 years, the process of limiting state intervention in business operations was liberalized and Libya is currently experiencing an era of a free market economy, while retaining certain regulatory mechanisms aimed at protecting society.

Also in one respect in the Arab countries there is much to do to overcome delays in the assessment of the company's operations and the level of development of organizational stability.

The issues of organization in the free market sphere are so extensive and are subject to such continuous and multidirectional changes that it is impossible to enumerate the current problems and tendencies. It is therefore necessary to tighten the area of interest.

The field of interest of this doctoral dissertation has been limited to the framework of one industrial sector, and within this industry to one company and to one method of assessing the organizational level. And this last issue constitutes the subject of this doctoral dissertation on the oil industry in Libya.

The fact that Polish petrochemical companies are trying to obtain oil extraction in Libya is also important for the genesis of the doctoral dissertation. These are: PKN Orlen, Nafta Polska, Polskie Górnictwo Naftowe i Gazownictwo (PGNiG), Lotos and Petrobaltic. Companies that provide geological and geophysical services, for example, are also interested in working with Libya. Geofizyka Krakow. The chemical industry, the defense industry and construction companies in Poland also have a chance to establish business contacts.

The intention of the author of the doctoral dissertation is to ensure that part

design and training systems - Management By Fail (MBF) and Crude Oil Companies (COC) in this dissertation was included in the technological documentation provided by the Polish contractor to the Libyan recipient. Hence, the presented doctoral dissertation is written both in English (its main part) and in Arabic.

The **inspiration** for the research problem contained in this work comes down to the search for the most simple and effective methods of supporting decisions, which dominates in the process of assessing the shaping of the development strategy of the oil sector in the combination of dependencies, phenomena, events, states, in order to make and select decisions regarding the adjustment of economic opportunities to Libya's internal and external situation.

## Application of the MBF Method .

The MBF method is designed to recognize the "image" of the stabilization of the company's "functioning" on the basis of the current level of development of the company's organization, which includes three components:
1. Organization of the management system,
2. Organization of the technical system.
3. Organization of the economic system.

These components are recognized together and related to each other, they constitute the basis for stabilizing the levels Technical and Economic organization. The assessment with the use of MBF is made on the basis of seven components, the so-called "Pyramids of resources and products in the FAM method".". The management system component deals with innovative issues in the field of a dynamic approach to the management of a petrochemical enterprise in the direction of modernization and launching continuous improvement processes, improving the method of oil extraction, transport and distribution. The technical component determines the activities and tasks of the intended mining method improvement project that is actually in
Line with rationalist assumptions (i.e., needs). The economic component is the necessity to strive for the economic development of the company, which means that the cost of modernization is profitable in relation to the oil production targets .

The problem of assessing the organizational and technical level includes complex assessments of all three sides of the production process: management, production organization and work organization. The functional approach to this problem is used to evaluate all activities necessary to achieve the enterprise's goal.
As part of these components, the doctoral dissertation introduces an order that consists in specifying three issues in the field of economics and organization.

The first issue is the problems and questions that can be answered by the chief accountant, that is, an economist in the enterprise.

The second issue is a group of questions that can be answered from the chief engineer.

On the other hand, when there is a difficult question that requires an immediate answer, and when neither the chief accountant nor the chief engineer can give an answer, the director appears with his intuition and gives an answer that may even contradict the suggestions and conditions of "classical" economics.
It is the order of grading the answers to difficult questions, and the director, based on the practical experience gained, has knowledge and intuition, justifies his answers using simple tools such as the MBF method, which would provide quick information about the change in conditions inside and outside the company. Hence, the proposed decision support system called "COC Crude Oil Companies" is so important and must report directly to the CEO. The COC system under the MBF concept is a system based on the analysis of failures and mistakes made in the past, and on this basis, the decision-making process is built to avoid systematic and possible failures.

## GOALS, HYPOTHESIS, THESIS

### Superior goal

Concern the assessing, managing and to follow the productivity actions and performances activities of extraction the “Developing Product" to avoid the Failure.

The main objective of the dissertation is to search for the most simple and effective methods of measuring, assessing and managing the level of functional development of oil companies in Libya and to develop an organizational effectiveness assessment system that would provide quick information for

decision-makers on the level of organizational development, in order to make and select decisions regarding the adjustment of economic opportunities companies to the internal and external situation of Libya.

On the other hand, the general goal of this work is to identify the potential dangers of bad organization and to support and improve the use of procedures in the MBF method, which may perform several different functions.

In order to achieve the formulated goal of the dissertation, the author intends to set up a scientific-research task covering the full research cycle: from searching for an adequate, theoretical model of the problem and its solution to empirical verification of the developed evaluation system in this work.

**Hypotheses**

1. The inevitable transition from a state-controlled economy to limiting State intervention is the need to overcome the expected internal and external economic problems for a new situation in the operations of companies.

2. Lack of specialized scientific-research and development institutions in Libya, undertaking appropriate economic and technical activities, the aim of which is to assess the level of implementation of economic tasks on a micro and macroeconomic scale during the period of economic planning. *Therefore it is absolutely necessary to apply a modern network planning with modern management*.

3. Computerization of management in various sectors of the economy of Libya may encounter high costs of building computing centers and the need to break old, old habits, change existing thinking, change the organizational structure, responsibilities, which may hinder the implementation of current production tasks.

4. Restrictions on the role of the state in the enterprise's activities are met with active resistance of some state-owned decision-makers.

5. The dependence of the activation of the process of economic and social development on income from oil hampers the innovative process of the oil company.

6. The investment strategy of an oil company is to a large extent focused on easier management of personnel, bypassing production projects.

7. The involvement of income obtained from oil production in the country's investment programs is constantly growing, despite the small income of this sector.

8. The deficit of skilled labor has a major impact on the efficiency of this sector.
9. The company's activity in the globalization, liberalization and privatization era of the economy makes it necessary to look for simple, effective methods and systems to support the management and assessment of the level of development of functioning in this industry.

10. Issues related to environmental protection in Libya gained in importance relatively late. Therefore, stable economic development will be a guarantee of making sensible decisions related to the threat of degradation of the natural environment resulting from the development of oil production.
Based on the formulated goal and hypotheses formulated in this way, the following thesis can be put forward as part of the concept of the research process in the dissertation.

**Theoretically** correct and practically useful to develop a method of measuring, assessing and managing the Technical and Economic levels into petrochemical enterprises in the field of productivity and performances basing on a chosen criteria allowing to accept the Technical and Economic levels in which the decision maker choses the highest grades and indicators for both the products and performance of work, in the current time to achieve a sustainable Technical and Economic level of *Developing Product* basing on the plan of productivity, performance and export tasks in a chose period as a new conception of innovation to avoid the Failure (***ex post ,time now ,ex ante***).

The construction of the research (fig.1) corresponds to the subsequent stages of the research process undertaken and consists of three parts:

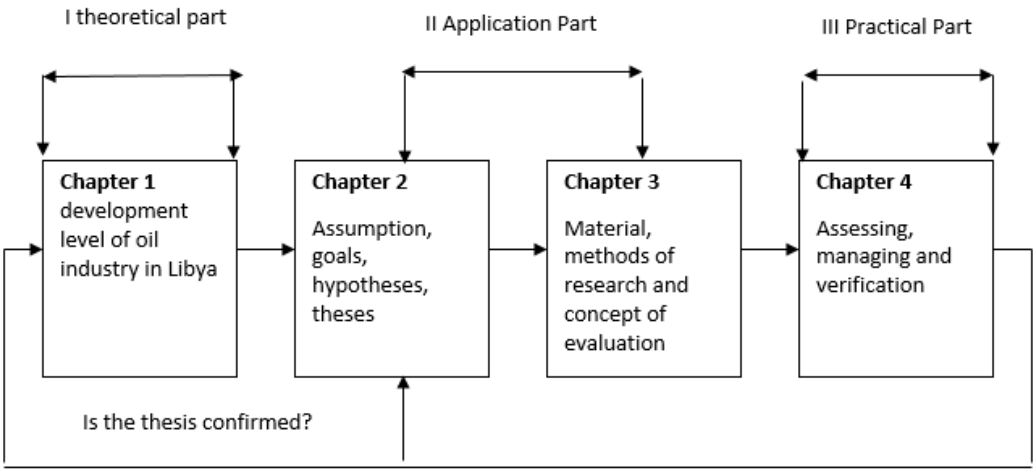



Fig.3. the research structure

I. THEORETICAL PART∗ : CHAPTER 1
∗ Presents the principles of assessing the Technical and Economic levels Of development in the NOC basing on managing the Failure on which the problem of this study is based.

II. APPLICATION PART∗ ∗ : CHAPTER 2 & CHAPTER 3
∗∗ That is the proposal algorithms of putting the theory of chapter 1 to be applied to the practical use of next chapter 4.
III PRACTICAL PART-Implementation ∗∗∗ : CHAPTER 4

**Chapter 1** - the purpose of basic research is to provide general knowledge about the importance of oil production as the main source of income for Libya, and to develop a theory about the level of organizational development of oil companies as a synthesis of technology and economy, using technology to extract a Development Product for Export to meet economic needs and life of society in Libya.

Table 1.1. The sectors in which Libya finances the income from oil

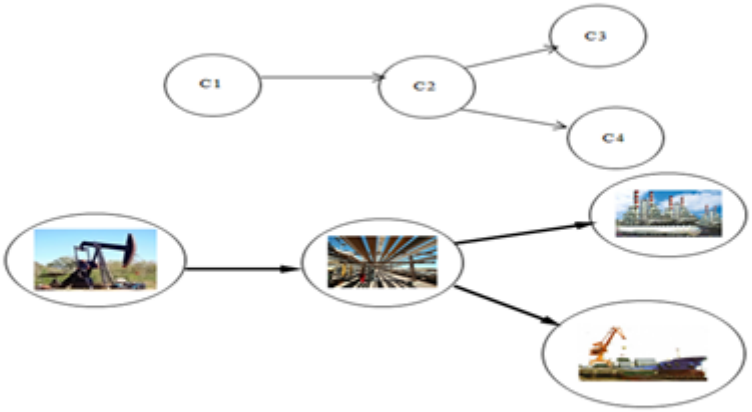
| | Expenses in dinars x · $10^6$ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Period before revolution | | | Period after the revolution | | | | | Economic restrictions | | |
| Years / Sektor | 1955-1959 | 1960-1964 | 1965-1969 | 1970-1974 | 1975-1979 | 1980-1984 | 1985-1989 | 1990-1991 | 1992-1995 | 1996-2000 | 2001-2002 |
| Light Industry | 1,2 | 3,5 | 36,3 | 297,3 | 890,3 | 1951,1 | 499 | 400 | 300 | 280 | 270 |
| Agriculture, feed industry | 0,8 | 2,6 | 35,2 | 316,8 | 960,9 | 1436,7 | 316 | 200 | 150 | 120 | 100 |
| Health services | 0,2 | 0,5 | 10 | 69,1 | 229,1 | 353,4 | 77,2 | 72 | 60 | 54 | 50 |

*Source: Statistical Handbook of* Libya, Arab Jamahiriya Secretariat of Planning, Tripoli's (year 1980 – 2002).

**Chapter 2** - Research material concerns the description of the research material: The research material is statistical material concerning the production of crude oil in the period 2014-2019

The periods of research on the development of oil production are the periods from 2014-2019 and cover 2 companies, C1 and C2, based on selected criteria for assessing the type of stimulants, stimulants and nominees. The evaluation criteria include: production level, production price, production cost, profit, taxes, etc.

**14. Figure 1 presents the dependence of export on the extraction amount of oil**




The petrochemical company in Libya is an institution consisting of four companies related to each other in this way, which allows them to achieve the most important goal, ie extraction, transport, processing and export of crude oil.

**Chapters 3 and 4** - on the basis of the methods of measuring and assessing the level of development of facilities, I proposed the application of new rules for measuring and assessing the level of organizational development of oil companies. The aim of the research is to identify and diagnose the level of organizational development of oil companies in terms of using the technical and economic potential with the use of a selected measurement and evaluation tool. Evaluation and verification is used to evaluate the implemented changes in practice.

"The assumptions and objectives of the dissertation" are specified in Chapter 2 of the theoretical part.
It was assumed that it is possible to develop a method for measuring and assessing the organizational level of oil companies in Libya and to construct a system for assessing organizational effectiveness, which would provide quick information for decision-makers about the level of organizational development.

## Research methods

I. "Fail Assessment Method", based on:
1. Multivariate analysis
2. Multi-criteria analysis
3. Wrocław taxonomy

- Hellwig's development measure
4. Correlation analysis
5. Econometrics

II. Pilawski's method
- Steinhaus algorithm
- Bellinger's algorithm

III. Economic analysis
- Economic theory (formulation of concepts, hypotheses, economic diagnosis)
- Analysis of the dynamics of phenomena (trend - ex post)
- Statistical analysis

## Scope of research

To achieve the basic goal, an attempt is made to achieve methodological results by answering the following questions:

1. What model of development pattern should I use to study the level of Organization of an enterprise ?

2. What are the most important, the most convenient and the most adequate measures of value and nature in assessing the level of organization development?

3. How to measure relative differences and similarities between individual companies?

4. How to divide (classification) four petrochemical companies that are very Similar to each other, and some show dissimilarity?

5. How to quantify the taxonomic value of the organizational level development meter?

In resolving the above issues (to various degrees of cognitive and practical), the thesis that it is possible to develop a method for assessing the stabilization of the petrochemical company's activity based on selected criteria that allow the assessment of the organization's level of organization and adoption as the best variant of the one in which the level The development of the organization meets the achievement of valuable measures of oil production and natural social expectations in the analyzed period.
It should be emphasized that the elements of assessing the level of development are included in the both system are demonstrated in the appendix.

The new tool is more theoretically appropriate and easier to calculate.

A comparative analysis of the level of development of companies is aimed at assessing the degree of technical and economic development using evaluation systems and includes:

- Classification and ordering of companies in accordance with the results of companies' activities;
- Dividing the companies based on technical and economic indicators.

The analysis and evaluation is aimed at verifying the assumptions of the organizational development model in this work.

**The mathematical side (Model – S )**

The mathematical element consist of the theoretical procedure, and is intended for the IT Specialists in the company.

In the mathematical side, the construction of application a new method MBF aims to settle, that the equivalent of measuring and assessing “the level of development” in the constructed theoretical model contained in the formula S-Simultaneous experimentation (see chapter 3), to enable the descriptions and the estimation the quality of the organization level eventually the economic level in the real world. The mathematical model is used as a tool to evaluate the deviation in organization basing on the current management in action.

The practical importance of the proposal MBF is to indicate the reasons and relationship btween the features and the factors influencing the level of development of the company during its performance. Also to ensure providing the information on the the level of organization development to decision making and enable the decision maker to go further into the internal and external situation in the company.

The constructed model MBF-DSD provides a background to help the manager to understand the idea of testing the development level (the quality) of the organiztion in the company (ex. Post)

For the author of this research the innovation of the proposed MBF-DSD of evaluation relies on the utilization a dynamic method to answer the questions settled in chapter three. Beside this the goals and the thesis settled in chapter two enables to exam the dynamics that produces or effects to the level of the developmen leaning on the criteria of the assessment of the organization development in the real time which described by the diagnostic features set while the level of the companies similarity calculated on the basis of the factors taking in concern the qualification classess A,B,C,and D.

For studying the **Theoretical description of the MBF-DSD-COC**, the reader should be familiar with the addition to this research in the appendix.

## Implementation of COC-MBF

The COC system is used to assess the current (TN) level of a company level of development in achieving the set goals. This system supports the decision making process and enables the researcher to manage the development level of $M3_{exp.}$ during the productivity in Time Now as an event of supplying to satisfy the Market Demand by using *Management Protection against Failure – MPF*. All this should be done through the prism of cause and effect in deviating from the desired level of development by means of assessing according to the obtained qualification classes

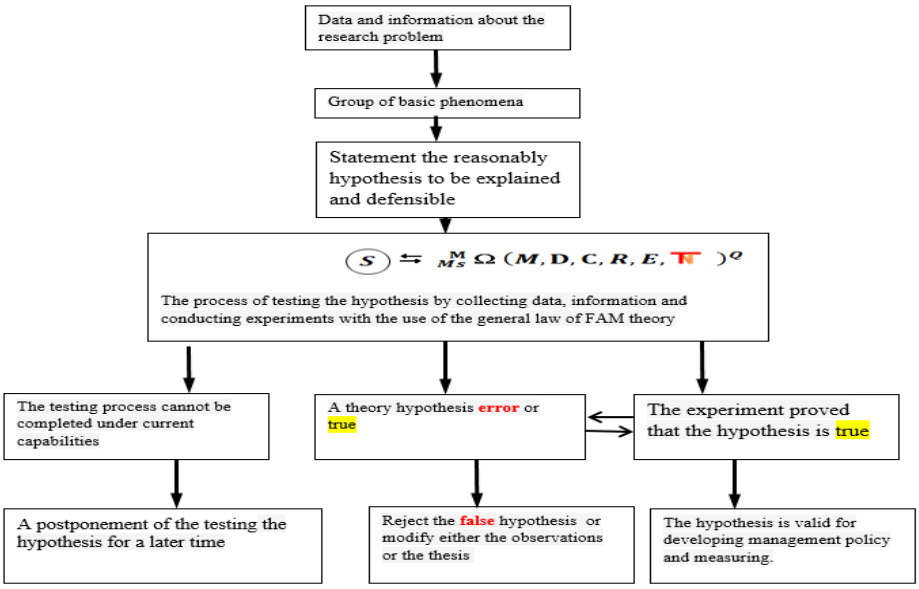



Fig. 3.4. Implementation of COC-MBF

**The Formula of (S) - Simultaneous experimentation"**

The principle of the "**S –Simultaneous experimentation"** (fig.3.4, 3.5) which contains in the **Fail Assessment Method** is a mathematical tool to fix the **Fail** of "Developing Product" level in Time Now:

$$(S) \leftrightarrows {}_{M_S}^{M}\Omega\,(M, D, C, R, E, \overline{N})^{Q}$$

Where:

(S) - System of evaluation S- refers to Simultaneous[1] experimentation (application of the system with practical confirmation & decision making as follow:

**M** – The population included in the experiment,

**$M_s$** – Observations (sample) from the population,

**R** – A set of interdependencies between oil parameters (features),

**D** - Decisive features- denote the level of development

**C**- Conditional factors- denote the similarity level

**E** – Goals and economic effects (cost-effectiveness of costs of performance of the task),

$\overline{N}$ - This symbol refers to Time Now in the experiment as today's date of an event or activity to run the experiment and to choose the duration of the activities and settle the node,

**Q** – Fulfillment of the task, i.e. optimal, quality of the obtained results- decision making that is a balanced decision to be reached after comparing all arguments by choosing DF & CF (according to the flowchart – input -process –output),

**Ω** - Mapping sign, i.e. experimental test and the application of the system in the same time and task execution according to the proposed algorithm

Fig. 3.5. The principle of the "S –Simultaneous experimentation"

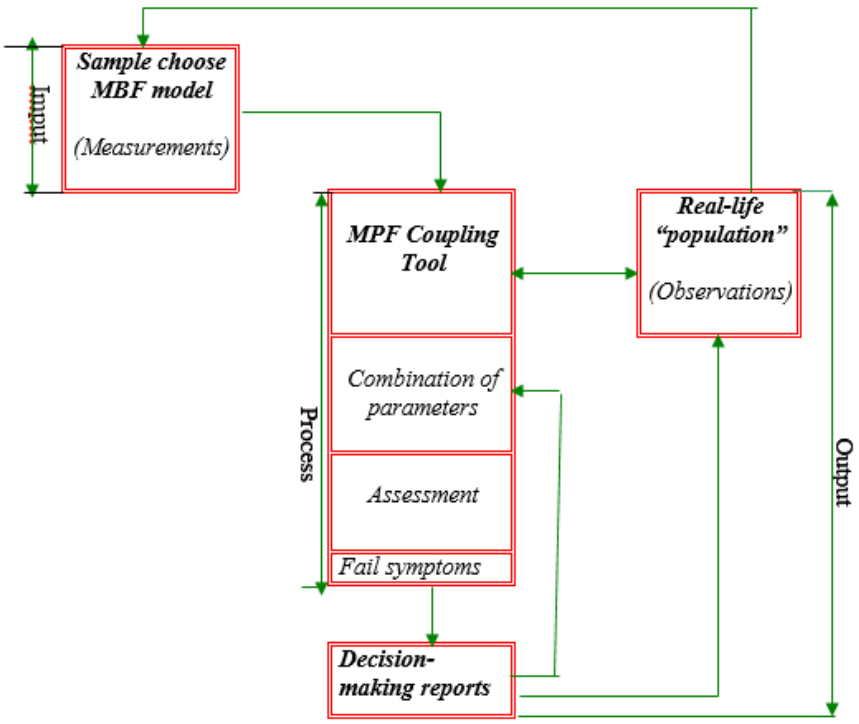



Fig 3.6. The coupling tool as the processing-decision

The MBF's supporting system (coupling tool –Fig.3.6) to measure, assess and manage the observations in Time Now for the chosen doses, and for looking forward to improve the doses to correct the action in TN. This creates a new situation in the issues to ensure proper remedial action before the complete "fail". This new opportunity to compete with conventional testing methods of effectiveness of medicine and creates new opportunities to apply modern techniques of control level 0of health in the current time, with a direct computer-assisted. An important issue is the simplicity and ease of use in practice the concept of statistics and multivariate analysis, which are cumbersome in traditional systems. Anyone possessing basic knowledge in this field can easily apply this method to his problem.

Therefore the control with "FAM-MPF" provides opportunities for continuous detection the level of health with a new medicine.

## BIBLIOGRAPHY

The bibliography includes literature in Arabic, English and Polish. In particular, the selection concerned those items in the literature that deal with innovative issues in the field of dynamic approach to the problem of assessing the level of development of facilities.

The items of literature were used which, in the opinion of the author of the dissertation, are the most characteristic of the issues discussed. Choosing these items, the author highlighted the themes that constitute the basis for specifying the thesis of the doctoral dissertation.

Selected items in the literature dealing with innovative problems in the field of dynamic approach to measuring and assessing the level of development of objects . In this part, I presented the assumptions, genesis and essence of the Deviation Estimation Method, emphasizing the role and merits of the author of this method in its development, combining individual elements of Multivariate Comparative Analysis (WAP) and Multi-criteria Analysis into one coherent method for solving specific research problems.

In-depth knowledge of the theoretical foundations of this method, originally developed as research tools in the science of enterprise management (for continuous monitoring of the company's activity in order to detect, explain and prevent possible deterioration of its condition), allowed for the creation of an algorithm and a computer program enabling the application of this methods in evaluating the level of organizational development in oil companies.

**Results**

Contains an overview of the adaptation of the proposed method to solve the problems outlined in the previous chapters regarding the measurement of the organizational level in an enterprise . I have characterized very precisely the basics of the method of assessing the level of organizational development and the usefulness of the system for assessing the activities of oil companies in their

classification from the point of view of a specific criterion based on the characteristics of the classified companies. The proposed method is aimed at detecting the state of development in the analyzed period on the basis of indicators that are to signal the reasons for such a low or high level in relation to the ex-post plans and the need for the decision-maker to intervene.

**Table 4.8. Allocation of companies to classes-Technical and Economic Links**

| Technical Links | | | | | Economic Links | | | |
|---|---|---|---|---|---|---|---|---|
| DF | | | | | CF | | | |
| No Com. | EA | Cl.No.LIN | Range | | No Com. | EA | Cl.No.LIN | Range |
| 3 | 0.8906 | CL1 | 0.6678-0.9500 | | 10 | 0.6271 | CL1 | 0.6271 |
| 4 | 0.9500 | | | | 1 | 0.0000 | CL2 | 0.0000 0.5236 |
| 5 | 0.9264 | | | | 6 | 0.0908 | | |
| 10 | 0.6678 | | | | 7 | 0.3835 | | |
| 14 | 0.8475 | | | | 9 | 0.4041 | | |
| 15 | 0.7819 | | | | 11 | 0.2948 | | |
| 1 | 0.0000 | CL2 | 0.0000-0.6094 | | 12 | 0.4660 | | |
| 2 | 0.3997 | | | | 16 | 0.2473 | | |
| 6 | 0.0611 | | | | 17 | 0.5236 | | |
| 7 | 0.3419 | | | | 18 | 0.4338 | | |
| 8 | 0.4092 | | | | 19 | 0.5227 | | |
| 9 | 0.4264 | | | | 2 | 0.4402 | CL3 | 0.4402 0.8809 |
| 11 | 0.2450 | | | | 3 | 0.8303 | | |
| 12 | 0.4019 | | | | 4 | 0.8809 | | |
| 13 | 0.5800 | | | | 5 | 08568 | | |
| 16 | 0.1844 | | | | 8 | 0.4745 | | |
| 17 | 0.5389 | | | | 13 | 0.4944 | | |
| 18 | 0.5675 | | | | 14 | 0.6769 | | |
| 19 | 0.6094 | | | | 15 | 0.7038 | | |
| 20 | 0.7275 | CL3 | 0.7275 | | 20 | 0.8538 | | |
| Technical Development level: Managing basing on Y01 to Y07 | | | | | Economic Development level: Controlling basing on F01, F02, F03 | | | |

Implementation of Management By Fail in the evaluation of the level of technical and economic development and practical verification “includes the concept of systems for assessing the effectiveness of the petrochemical company in Libya. It measures and assesses the dynamics of the level of development of the company's activity depending on the **selected reference system**, namely in **the time system**, i.e. the period from 2014-2019, in the **normative system**, where the benchmark for comparisons is the assessment of the level of plan implementation, and finally in the spatial system, where the pattern of development is a certain amount achieved by the oil **companies** at that time. Examples of measures in which various determinants (parameters) of crude oil production are assessed . Obtaining such a level of the development index would correspond, on the one hand, to the development of the company's functional level in a given period, and, on the other hand, to the assessment of profit for the state for **satisfying social needs.**

The indicators of the development level according to groups of individual’s states of their levels as follow:

1. state to 0,24 ( *unstable state*, that is not likely to fail and not to improve),

2. state 0,49 (*un stabilized state*, that is not stabilized yet),

3. *stabilized state* in TN 0,50- 0,75 (stability),

As earlier mentioned, the qualification classes serve the decision maker for the purpose of investigation the interconnection between the Characteristics Values, namely Decisive Features to assess the productivity “Technical Level” in the companies, and the impact of the Conditional Factors on the level of productivity to be fully aware of the problem of Economic level, that is the quality of the products to be accepted by the market.

The work contains the **conclusion and conclusions** from the developed systems.

Also **system attachments** and instructions for use and interpretation of results .