Scientific Research

Organizational Efficiency in Electric Mexican Enterprise: Luz y Fuerza del Centro (LyFC) as Reason for Extinction

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ABSTRACT

This paper analyzed the internal and external factors that determined the efficiency of LyFC before its extinction, allowing for a comparative assessment of perceptions in which former electrical workers argued the unconstitutionality of this action, and the Federal Government justified under the low efficiency argument that was reflected in the decrease of indicator User Interruption Time (TIU), an indicator in which the Federal Government determines the efficiency of the Agency. The study is correlational, descriptive, transversal and applies a measuring instrument with 93 items to a population of 267. For the analysis of results, we used SPSS and descriptive statistics and inferential. The results allowed us to point out that the budget allocation variables, technology, work organization, material assignment, administrative efficiency, distribution networks, housing growth and external factors mentioned in this research itself directly influenced the efficiency of the Light and Power Center (LyFC) and explanatory variables were terminated. Moreover, the comparison of operating performance and workloads receiving utilities shows that although the Mexican Federal Electricity Commission (CFE) is a very inefficient, labor costs and benefits were higher in LyFC and were certainly a reason, its extinction.

Keywords: Electrical Industry; Efficiency; Utilities; Light and Power of the Center; CFE; Mexico

1. Introduction

Until 2009, Mexico had in electric industry two public companies operating as a monopoly; light and power central region company *Compañia de Luz y Fuerza del Centro* (LyFC) (from now) and the Federal Electricity Commission (CFE from now).

(LyFC), underwent several changes in its structure as a business generator and distributor of electricity, from its creation to its extinction. Among LyFC and CFE, they guaranteed access to electricity to 97% of the Mexican population. Both public companies were decentralized, with legal personality and its own.

The principal problems in LyFC were:

Lack of materials on time was caused by delays in some areas, mainly in the maintenance and construction new power feeders for new services [1].

Human resources management was inefficient. At the time of termination of employment made a loss of 240 billion pesos, only 80 billion corresponded to active employees and 160 billion to retirees [2].

The investment in training, was not reflected in increased productivity.

The rise of position and employees was unrelated to the employee's performance [3].

There was no proper supervision in materials which ultimately led to the delay of the work to be performed, due to the lack of materials [4].

Similarly, the following arguments were put forward by the Mexican federal government (Calderón president 2006-2012 who in 2009 decided its extinction):

... "That since its inception, the decentralized organization has continued to receive substantial budgetary transfers, which far from decrease have been increased in recent years, suffice it to say that from 2001 to 2008, such transfers increased by more than two hundred percent and that for this year such transfers will be around 41.945 million pesos, to continue the same behavior, it is estimated that total could reach 300 billion pesos during

the present administration;

That costs almost double its sales revenue, from 2003 to 2008 recorded sales revenue of 235.738 million pesos, while its costs were $433.290 million pesos (including electricity purchased from the Federal Electricity Commission);

1) The percentage of total energy losses of Luz y Fuerza del Centro is excessive and almost three times higher than the person lodging the Federal Electricity Commission.

In June 2009, Luz y Fuerza lost 30.6% of energy, while that Commission lost 10.9%, almost no utility in the world recorded the percentage of losses that presents LyFC.

2) In 2008, Luz y Fuerza lost 32.5% of the energy generated to buy and sell. The estimated value of these total losses amounted to nearly 25 billion pesos, which represents 52% of total sales revenue of the organism, and

3) In the best case, the unit costs of the works executed Luz y Fuerza del Centro is 176% higher than the costs of the Federal Electricity Commission… [5]." The aim of this paper is to analyze the organizational efficiency of LyFC as extinction ratio by benchmarking perception among various employees of the defunct company. It is organized as follows: In brief, it presents the results of international experience in the efficiency of the electricity industry, describes the most outstanding one and briefly mentions the research methodology, and after comparing the operating performance of the company and stating labor versus CFE LyFC, it finally analyzed 8 variables which measure the perception of efficiency. The determinants of efficiency in an electric utility are: allocation of budget, technology, work organization, material assignment, administrative efficiency, distribution networks, housing growth and external factors.

2. The International Context

After a decade of openness to investment in the electricity markets in the world, there is clear evidence of its success or failure [6].

There are successful experiences that have been made to increase efficiency, power quality and productivity at the same time it has managed to attract capital and reduce prices. There are also experiences less fortunate, in that the continuity and quality of supply have degraded, or prices have skyrocketed. In some cases, the State, it was out, had to intervene directly to prevent further damage to the national or local economy [7].

The California crisis that began when the energy market was liberalized at the state level in 1996, meant that in the summer of 2001 that the state suffered blackouts of between 20 and 200 hours. With the policy of 1996, in which energy prices were no longer under state control, they began to be governed by the laws of supply and demand. The speculation caused prices to soar and they create serious problems for utility companies, which had to pay a lot more for energy generating companies, and could not move the new costs, as the price paid by consumers remained subject to regulation [8].

In Chile the power outages in 2001 *strongly bothered business sectors, especially in the trade and the mining industry, for the economic losses caused by the lack of energy. Concern mining sector concerned court implied that each stop producing hundreds of thousands of tons of copper, mostly. Analysts linked the sector indicated, by way of comparison, in the court on July* 25 *of that year, when the Great Northern was without power for* 15 *hours, the industry lost about $7 million, which means more than $466.000 per hour without producing.*

In Brazil, the current situation of the electricity sector is also critical. The reasons date back to the 1980*s, when a cross-subsidy system was a strong disincentive to efficiency improvements, and budget problems delayed investments. Despite the introduction of new legislation in* 1995 *aimed at enabling and attracting private capital and the power sector, new investments in generation and transmission that were expected until today have not materialized in the amounts needed. While private companies control* 80% *of the country's distribution system, few private investors are willing to take the risk of building new plants, firstly, because of the uncertainty created by the incomplete implementation of the reform and on the other, as a result of the* 1999 *financial crisis, which has increased the country's currency risk. The situation is far from being resolved, since only a few of the fifty or more power stations gas ignition that the government is promoting the Thermoelectric Priority Program can start operating in mid-*2002 [9].

3. State of Art

Efficiency, also known as productivity is generally understood as the relationship between the output obtained by a system of production or services and the resources used to obtain, can also be defined as the relationship between the results and the time used to obtain them: the shorter the time it takes to get the desired result, the more productive the system.

In the area of professional development, efficiency is the economic index that relates production to the resources used for this production, expressed as production/resources [10].

The term global efficiency is a concept that is used to help improve productivity through the study and discussion of the determinants of efficiency and of the elements involved in it [11].

In reviewing the studies on the efficiency in the power

sector were 118 jobs within which are the following: [12] presented an empirical study of the determinants of energy efficiency in the companies during the period 2005-2009, we investigated the relationship between efficiency and productivity change of these companies, the results of the study indicated that low productivity growth is more related to poor performance rather than technological changes.

[13] found that the electrical efficiency and vertical integration in presenting an economic model for the US business.

[14] studied the effect of the quality of performance-based regulation through reward and penalty system design for power distribution companies.

[15] found that the cost Benchmarking depending on the efficiency increases with the use in the regulation of electrical power.

[16] suggests that the efficiency of the electricity distribution companies is evaluated under an efficiency standpoint productive approach. The analysis methodology consists in estimating production costs of border with parametric and nonparametric. Two individual technical efficiency measurements of the activity distribution of these functions are obtained.

The evaluation confirms actions and strategies that result in cost reduction in the distribution companies. An application under the last Chilean regulatory process is illustrated in this paper.

Proposed a new formula to decompose cost efficiency into technical prices and allocative efficiency in an environment characterized by the fact that the input unit prices differ between certain companies. Using a formula to compare returns between Japanese and US electric power companies, and found a significant difference in efficiency based on price. However, insignificant differences were found in the technical and allocative efficiency.

[17] shows in a simple and general, as it is possible to perform mathematical modeling of the behavior of the physical assets of companies engaged in the business of producing electricity. From when companies achieved without some degree of maturity, are able to apply engineering to properly care for their assets, and obtain their best performance in terms of life and improving the rate of return on investment (ROI for its acronym in English). The savings in resources, obtained with the application of these tools allow companies to keep their finances healthy trend, in terms of growth, framed by efficiency.

Additionally Martinez quantified the effects of some of the main factors that have affected the costs of public utilities in Mexico (lost energy, fuel and labor), noted that the impact of rising fuel prices on Total costs of public utilities have been important in recent years. However, it also notes that the cost of energy losses and the "overhead" work are significant and comparable, overall, the impact of increased fuel prices.

4. Research Method

It is a correlational research that examines the association between efficiency and budget allocation, technology, organization of work, allocation of materials, administrative efficiency, distribution networks, housing growth and external factors.

As a general hypothesis is to study if there is a positive association between:

Budget allocation, technology, work organization, allocation of materials, administrative efficiency, distribution networks, the housing sprawl, external factors were the main variables that determined the Mexican electricity sector efficiency.

Given a confidence level of 90%, with an error level of 10% a chance of success of 50%, as the probability of failure and a population of 35,000 elements, which are LyFC employees. 267 effective surveys were conducted to achieve the purposes set forth in correlational research.

The population used for lifting workers surveys were Western Zone of the sectors that shaped western metropolitan management pertaining to the distribution sub both administrative, technical or operational as: linemen, engineers, clerks, draftsmen, secretaries , reading makers, operators, foremen, etc.

Addition, we studied the calculation of the confidence interval based on the Student t estimating the standard deviation of the data S and calculate the standard error of the mean $= S/$(square root of n), then the confidence interval for the mean $x =$ average $+ -t$ (alpha/2) times ($S/$(square root of n)). Since the difference of the means of samples from two normal distributions are also normally distributed, the distribución can be used to examine whether the difference can be reasonably assumed zero.

For practical purposes the expected value and variance are:

$$E(t(n)) = 0 \text{ and } Var(t(n-1)) = n/(n-2) > 3$$

5. Results

5.1. Comparison Operating Performance and Working CFE and LFC

As a result, we have constructed **Table 1** to compare operating performance between the two power companies that existed until December 2009. L and FC and CFE. Following six variables: global energy loss, nonconformity per 1000, connection time, productivity per worker, penalties for improper collection and PROFECO poor service, sales revenues versus costs 2003-2008.

The productivity per worker in Productivity per worker in France, 4900 MWH, Productivity per worker in Spain,

Table 1. Comparison of operating performance.

Operating performance variable	L y F C	CFE
Global energylosses	29%	10.3%
Complaints per 1000 users	5.08 (2008)	2.01 (2008)
Connection time	6.5 día	1 day
Productivity per worker LFC (Mexico)	751 MWH	Productivity per worker CFE (Mexico) 2494 MWH (1)
Penalty for illegal charges and poor service PROFECO	$9,000,000 last three years (LFC) was serving 25% of the country's population	$ 1,247,896
Sales revenue versus costs 2003-2008	It recorded sales revenue of 235,738,000 The costs were $433.290 million pesos	

Sources: Government IV report Presidency of the Republic, (Rodríguez 2004 Reform, 16/09/04). The Universal, October 19, 2009 citing PROFECO. Retrieved: http://sdpnoticias.com/sdp/contenido/nacional/2009/10/19/1003/515532. Extinction Act 2009.

6900 MWH, Productivity per worker in Australia 8950 MWH.

As observed without CFE operating performance is an example of global efficiency in all areas LyFC performance was inferior. One of the basic arguments of the reasons for the extinction of LyFC it is their lack of efficiency and low productivity is checked against the available evidence. Although workers have been identified as deestaloscausantes incompetence is evident that despite enormous influence wing had the Mexican Electricians Union (SME) throughout the management of the company, he was not managing the undertaking, so this lack of competitiveness actually was incubating over the years.

Historical studies that have been done have shown that SME did not direct although the company was responsible for its lack of flexibility and decision-making structure that by making agreements complicated assemblies highly participatory and democratic immense that favored the radicalization and the development of a policy of negotiation based on the premise that no union achievement is reversed. Unlike other parastatals also have strong collective bargaining agreements such as the Telephone Workers Union or PEMEX and SUTERM himself who agreed at the time to give up some gains in the interest of management flexibility. SME in this case did not occur. There was a period during the administration of President Salinas that were made certain concessions in exchange for this leader had national prominence by leading Labour Congress. Its management concluded however, between serious questions of corruption, was finally working base unknown [18].

Although the CFE shines as an example of efficiency in the decree of suppression, far from it, **Figure 1** shows that the largest electric company in France (EDF SA), is two times more productive than the CFE from the point of view of electricity vs. number of workers, the domin-
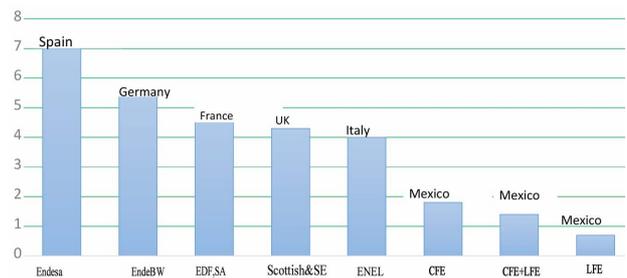

Figure 1. Comparison of labor productivity in electrical companies. Source: F. Hernández, 2006.

ant parastatal France (EDF SA) and said of Italy (ENEL), Germany (EnBW) and the UK (Scottish & SE) are one and half times more productive. The CFE is—by far—the most efficient of the Mexican power parastatal. Once added workers and generating LFC, productivity Mexican parastatal further sinks (one third of the productivity of its French counterpart EDF). The low labor productivity Mexican electricity sector will be further disadvantaged if likened to electricity companies that have ventured into the gas business. For example the German BW more than doubles its labor productivity when adding the energy produced by the gas business with the same workforce (5.58 GWh to 10.15 GWh per worker per worker in 2004.

Drawing on data from other countries, CFE could produce and sell the same electricity at a fraction of workers currently occupied, although there are other factors that make it difficult to compare the productivity of electric companies in several countries (e.g., technologies generation used).

Even if these comparisons are internationally valid is important to note that in the case of LyFC this comparison is somewhat questionable for two respects.

The first is that LyFC installed capacity represented 2.0 percent of the national total, 85.0 percent is CFE and

the remaining 13.0 percent to private licensees. In fact, to get the demand for electricity in the central region, LyFC acquired about 96.5 percent of total supply genereted by Power CFE. Actually more than a power generating company LyFC by clear decision that ruled authorities and perhaps for lack of vision of their union, the company was actually a distributor and marketer of energy who sold the CFE.

The second question relates to the labor dimension with which efficiency is calculated, which as stated in the case of CFE can try to compare that dimension with fewer workers as in European countries are three contraction shapes as in the case of Mexico. (Time given, and given work indefinitely).

5.2. Comparison of Benefits and Labor Liabilities and CFE LyFC

One of the biggest surprises of this work is to realize that actually benefits between the two companies do not vary considerably and that the treatment actually given to electrical workers in Mexico is very similar in 11 variables studied were the following: christmas box, energy assistance, savings fund, retirement, monthly support for transportation, rental assistance, help with pantry, overtime, benefits covering transportation, utility and income, labor liabilities increased salaries 2007 and 2000 and a retiree in relation to assets. This comparison is summarized in the following **Table 2**.

The result of the comparative analysis thus proves that even if the privileges enjoyed by workers in the CFE, the

LyFC were superior and undoubtedly contributed to the efficiency medar company which determined its extinction.

6. Result of Research Sovereign Efficacy Perceptions

Below mentioned research questions that guided the research:

PG. What are the internal and external factors that led to the Mexican electricity sector efficiency in its distribution phase Luz y Fuerza del Centro in fighting to improve customer service?

HG budget allocation, technology, organization, allocation of materials, administrative efficiency, distribution networks, housing sprawl & external factors.	
Student's t test with all variables.	1.69E−28

Specific Research Questions

Q.1: What influence budget allocation in the Mexican electricity sector productivity in distribution phase Distribution Branch LyFC in extinction?

Q.2: How did technology impact on the Mexican electricity sector productivity in distribution phase Distribution Branch LyFC in extinction.

Q.3: How influenced the organization of work in the Mexican electricity sector productivity in the distribution phase Distribution Branch LyFC in extinction?

Q.4: How influenced the allocation of materials in the Mexican electricity sector productivity in the distribution

Table 2. Performance of workers L y FC y CFE.

PERFORMANCE	LyFC	CFE
Christmas box	54 days of Christmas	54 days of Christmas
Energy assistance	350 kilowatt hours per month free	350 kilowatt hours per month free
Savings fund	11% of his salary, paid by the company	28% onwages and overtime.
Retirement	27 years of service or age 55 with the total performance of an active worker	25 years of service and 55 years old, or 30 years services regardless of age, women 25 years of service regardless of age
Monthly help transportation	14.5% tabulateddailywage	12.5% of their tabulated daily wage
Help for rent	39% of rentalassistance;	37% of yoursalarytabulated
Help for pantry	24.3% of thewages	Retirees 19.3%
Overtime	paid twice and an additional 40% if it is Sunday or holiday days	2% more paid twice and an additional 40% if it is Sunday or holiday days
Benefits covering transport, utility and rent	81.5% of the wages of workers	77.8% of the wages of workers
Increased labor liabilities 2000 and 2007	from 51% to 69%	53% to 62%. (Representing labor liabilities, at the end of December 2007, 62.4% of the total liabilities of the company and 31.6% of total assets).
Salary of a pensioner in relation to assets	26% higher	21% higher

Sources: Mexican Electricians Union, releases various federal agency, Center for Economic Studies of the Private Sector, consultation with various national media. Excerpted from: http://www.desdelared.com.mx/2009/notas/091012-luz-y-fuerza.html October 13, 2009 Bank of Mexico 2008, 2008-2010 CST, the Trade Union of Workers Electrical Industry. Excelsior March 7, 2008.

phase Branch LyFC in extinction?

Q.5: How influenced Response administrative efficiency research questions?

Q.6: De qué manera contribuyeron las redes de distribución en la productividad del sector eléctrico Mexicano en su fase de distribución de la Subdirección de Distribución de Luz y Fuerza delCentro en extinción?

Q.7: Qué incidencia tuvo el crecimiento de la vivienda en la productividad del sector eléctrico mexicano en su fase de distribución de la Subdirección de Distribución de Luz y Fuerza del Centro en extinción?

7. Correlation Tests

Q.1: VS Budget Allocation Technology −0.056831

The correlation coefficient r product moment equals −0.056831, therefore there is not a strong correlation or linear dependence between the increase in the budget allocation VS Technology, this indicates that the use of technology does not depend on budget but on other factors.

Q.2: VS Technology Organization at work −0.028622

The correlation coefficient r product moment is equal to −0.028622, therefore not a strong correlation and linear dependence between the increase in VS Technology Organization at work. This indicates that the organization of work depends on the technology to be had according to their planned objectives.

Q.3: VS material allocation Administrative Efficiency 0.1675746

The correlation coefficient r product moment is equal to 0.1675746, therefore there is a strong correlation or linear dependence between the increase in the allocation of administrative efficiency VS materials. This represents a greater allocation of materials attached to quality standards and will increase administrative efficiency.

Q.4: Increased capacity distribution housing VS −0.090811

The correlation coefficient r product moment equals −0.090811, therefore there is not a strong correlation or linear dependence between VS Capacity Increase housing distribution. This indicates that the increase was not considered housing according to the distribution capacity of the entity.

Q.5: Knowledge externalities 0.116399 VS Technology

The correlation coefficient r product moment is equal to 0.116399, therefore there is a strong correlation or linear dependence between the increase in the development of Knowledge Technology VS External Factors. Knowledge of the external factors permit an increase in the use of technology commensurate with the growth of user needs.

Q.6: Increase Administrative Efficiency housing VS

0.0883898

The correlation coefficient r product moment is equal to 0.0883898, therefore there is a strong correlation or linear dependence between the increase in development in administrative efficiency Increase housing VS. This indicates that greater administrative efficiency increased in a disorderly house no impact on the administrative processes of the organization.

Q.7: Budget allocation 0.5473626 VS administrative efficiency

The correlation coefficient r product moment is equal to 0.5473626, therefore there is a strong correlation or linear dependence between the increase in development budget Assigned Administrative Efficiency VS. This indicates that greater budget allocation will increase administrative efficiency as they used new technologies and strategies for increasing the same.

8. Conclusions

International experience is not conclusive about the benefits of privatization action utilities.

The comparison of operating performance and workloads receiving Mexican utilities shows that CFE is very inefficient, and labor charges and benefits were higher in LyFC and were certainly one reason for its extinction.

The findings with the available empirical evidence allow us to point out that the budget allocation variables, technology, work organization, material assignment, administrative efficiency, distribution networks, housing growth and other external factors mentioned directly influence the efficiency of L y F extinct.

On the other hand, the association tests performed show that no budget allocation fueled technological improvement, and the technology is not positively associated with the organization of work; allocation of materials not associated with administrative efficiency; distribution capacity not expanded to the extent that increases housing in the downtown area, and the external factors impact on the improvement of technology. The efficiency did not address the housing growth that was generated and the only positive assessment was budget allocation allowing him to survive on the deficit that was operated by Light and Power of the Center in the last years of his administration. The great social lesson for unions is that at the same time fighting for the benefits and conditions of its members should monitor aspects such as investment and technology, expansion of productive capacity and overall efficiency, as this determines the survival of the company.

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