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Constraints to the competitiveness of industrial construction. A case study of the Venezuelan oil and petrochemical sectors

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Abstract

Industrial construction faces important constraints that limit sector competitiveness. Strategies and approaches to face such constraints, and subsequent results, vary from country to country. Through document review and a case study of an industrial construction company working for the oil and petrochemical sectors in Venezuela, some of such constraints and their impact on country competitiveness are identified. Cultural changes and knowledge management are proposed as strategies that may help reverse actual trends in countries affected by similar problems to achieve competitiveness and sustainability goals.

Keywords: Competitiveness, construction, knowledge management, Venezuela

1. Introduction

The challenges of today's world require individuals and companies to improve their performance levels as a mechanism to achieve better living conditions and a coherent economic and social development. Therefore, one of the main objectives of the European Union is to become the world most competitive and dynamic economy based on knowledge, capable of reaching sustainable economic growth with more and better jobs, and greater social cohesion. Commission of the European Communities. (2003).

Nevertheless, even with such a global reference and important examples from international markets, not all local scenarios encompass the conditions needed to achieve the growth, development and adequate use of knowledge.

The Venezuelan case, currently widely discussed due to the contradictory currents that analyze national socio-economic performance is one that, on a pattern that seems opposite to global trends, shows signs of weakening of the productive sector. Therefore, in seeking long-term solutions, it is necessary to analyze the following: What is happening to the Venezuelan competitive performance? Why does its industrial sector present a behavior apparently opposed to global trends? What are the limitations that prevent its own players to develop the maximum potential of the country? How can current trends be corrected?

As in other sectors, competitiveness problems also affect the Venezuelan oil and petrochemical industries, the main source of national income, and are present in construction and maintenance projects. Through a case study of the construction sector for the oil and petrochemical industries, this research aims to identify some factors that limit the competitive performance of the Venezuelan industries, the existence of basic elements that can support knowledge management, and to propose strategies to help improve actual performance.

2. Research Objectives

General: To identify the main elements that affect the competitiveness of the Venezuelan industrial construction industry through a case study of the oil and petrochemical sectors, and to examine whether or not the organization presents the basic elements that underpin knowledge management.

Specific:

- To identify the main constraints affecting the performance of Venezuelan oil and petrochemical industrial construction.

- To determine the impact that those limitations have on industrial construction of the Venezuelan oil and petrochemical sectors.

- To determine the frequency with which these limitations occur in industrial construction of the Venezuelan oil and petrochemical sectors.

- To identify elements of organizational culture, organizational structure and technology that support knowledge management in the case study.

3. Methodology

This research was conducted through the review of documents and field work in a privately-owned Venezuelan industrial construction company (more than 300 workers, levels of sales over US$ 50,000,000 for 2009, more than 40 years of activities).

4. Competitiveness

Creativity, innovation, knowledge management, competitiveness, new market development, social and ecosystem balance and the development of corporate social responsibility, are all part of the basic elements needed for company survival and success in today's world, as they add value to existing processes, develop potential and generate greater prosperity, wealth and employment. Commission of the European Communities (2003).

Whereas academia offers different views of competitiveness, some researchers claim that its study contributes to the understanding of key factors that determine economic growth and opportunities to improve the living conditions of populations. Conversely, as others consider it an unnecessary fixation, it is indisputable that these views provide the references needed to evaluate the factors related to performance indicators, which is particularly valuable for Venezuela. World Economic Forum (2008), Krugman (1996), Lall (2001).

Competitiveness is associated with the events and policies that determine the ability to build and preserve an environment that facilitates the creation of greater value to organizations and prosperity for citizens. The World Economic Forum (2010) defines it as the group of institutions, policies and factors that determine the level of productivity of a country. The elements described on (Table 1) are used as benchmarks to measure the competitive performance of countries. Garelli (2003).

Table 1. The 12 pillars of competitiveness

Basic Requirements
Institutions
Infrastructure
Macroeconomic stability
Health and Primary education
Efficiency enhancers
Higher education and training
Goods market efficiency
Labor market efficiency
Financial market sophistication
Technological readiness
Market Size
Innovation and sophistication factors
Business sophistication
Innovation

Source: The global competitiveness report 2009-2010

4.1. Competitive policies for developing countries

To achieve competitiveness, some elements are required to support an adequate performance from individuals and organizations, with mechanisms to ensure prompt attention to business, standards, policies, training and general conditions to strengthen small and medium entrepreneurs. Comisión de las Comunidades Europeas (2003). Therefore, overcoming poverty in developing countries requires policy reforms, strengthening the legal system, creating new businesses, and improving existing ones. UNDP (2004).

Singh (2002) indicates that due to their internal realities, the policies of developed countries do not face the particular challenges of developing nations requiring new competitive policies oriented to offer goods and value-added services. Such new policies should be based on a multilateral approach, including issues of corporate governance, corporate management, labor laws, institutional structures, and knowledge. Garelli (2003) considers that their development must come from the social underpinnings, history and national values, as a support base to achieve sustainability goals.

Among the conditions that may guide the competitive performance of nations are the proposed by IMD as the golden rules of competitiveness (Table 2).

Table 2. The golden rules of competitiveness

What is that countries must do in order to become or remain competitive?
I. Create a stable and predictable legislative environment.
II. Work on a flexible and resilient economic structure.
III. Invest in traditional and technological infrastructure.
IV. Promote private savings and domestic investment.
V. Develop aggressiveness on the international markets as well as the attractiveness for foreign direct investment.
VI. Focus on quality, speed and transparency in government and administration.
VII. Maintain a relationship between wage levels, productivity and taxation.
VIII. Preserve the social fabric, reducing wage disparity and strengthening the middle class.
IX. Invest heavily in education, especially at the secondary level and in the long-life training of the labor force.
X. Balance the economies of proximity and globality to ensure substantial wealth creation, while preserving the value systems that citizens desire.

Source: Garelli, S. 2003. The Competitiveness of Nations. IMD

With a world economy still suffering from the effects of the recession caused by the financial crisis of 2008 and the consequences of natural disasters, the need to build the foundations of competitiveness as the elements on which nations can sustain their recovery oriented towards prosperity, sustainable development and long-term improvement is becoming increasingly evident. The Global Competitiveness Report (2010). Therefore, the golden rules of competitiveness listed above can serve as reference guides for the creation of valuable competitive policies for developing countries. Pietrosemoli (2009).

4.2. Knowledge management as an element to support competitive performance of construction companies

Knowledge management is described by Takeuchi and Nonaka (2004) as the continuous process of creation and transmission of new knowledge throughout the organization, allowing the incorporation of new products, services and technologies that facilitate organizational change and confronting the new challenges presented by the environment. Thanks to knowledge management, using tools and technologies, individuals and organizations can provide explicit and tacit knowledge that facilitates the growth of the organization and improve decision making in a timely manner. del Moral et al. (2007).

Construction is one of the most representative industrial sectors worldwide by creating jobs and growth, and because of the importance of the services offered to communities. Therefore, the value of knowledge management transcends all construction activities, facilitating innovation, maximizing intellectual capital, providing answers to customer requirements, increasing effectiveness and efficiency, knowledge transfer, offering customers value-added products, and reducing levels of uncertainty. This permits performance improvement processes and supports competitiveness. Kamara et al. (2002), Egbu et al. (2004).

To obtain these benefits, Anumba et al. (2005) and Egbu et al. (2004) indicated that construction companies need production and dissemination, and the use of these intangible resources using databases, technologies, tools, strategies, best management practices and encouraging research, especially for the sharing of knowledge aimed at achieving sustainable construction. CIB (2002).

5. Competitiveness in Venezuela

In developing countries, the lack of a level of internal rivalry that encourages innovation, improvement and competition is prominent, in addition to the existence of high levels of intervention by governments in national economies, which often become a major constraint to economic development. Enright et al. (1994).

These ideas remain highly relevant in the Venezuela of the twenty-first century because the country displays contradictory messages in its performance levels, with obvious signs of decline in several indicators, contrary to what happens in other nations, even in those with less resource. In this research, we aim to identify some of the factors limiting the country competitiveness through what is perceived by part of the productive sector.

5.1. Indicators of competitiveness

The state and changes in Venezuelan competitiveness are presented by the World Economic Forum, highlighting the fall of Venezuela to the position 113 for the period 2009-2010, in a sustained downward trend in recent years despite high oil revenues (Table 3).

Table 3. Venezuelan competitiveness indexes

Venezuelan competitiveness indicators evolution					
Global competitiveness Index. Ranking from 1 to 133	**GCI 2009-10 Rank**	**GCI 2008-09 Rank**	**GCI 2007-08 Rank**	**GCI 2006-07 Rank**	**GCI 2005-06 Rank**
Switzerland (Best position in Europe)	**1**	**2**	**2**	**1**	**4**
Chile (Best position in Latin America)	**30**	**28**	**26**	**27**	**27**
Venezuela	**113**	**105**	**98**	**88**	**84**

Source: World Economic Forum. The global Competitiveness Report, 2009-10, 2008-09, 2007-08. Compilation Pietrosemoli, 2010

Such behavior is attributed to factors such as the macroeconomic environment, the expansionary fiscal policy, discretionary administrative measures, the weak institutional environment, the lack of equity and efficiency in government operations and strategies, and high levels of violence and crime. World Economic Forum (2010).

With similar vision, competitiveness indicators presented by the IMD business school in Switzerland, rank Venezuela in the last place out of 57 countries evaluated for the year 2009, with deterioration from position no. 55 occupied in 2008. IMD (2010).

5.2. Venezuelan oil sector and basic industries competitiveness

Añez (2005) and Cámara Petrolera de Venezuela (2006) maintain than although the Venezuelan oil sector has an undeniable growth potential because of the importance of its oil as the main source of oil worldwide, Venezuela is a country where, despite the abundance of resources, the industrial sector supplier of goods and services has not achieved expected competitive levels.

Following the changes that occurred in recent years, the oil industry faces problems such as the loss of expertise because of qualified personnel that has left the industry, the low level of development of oil reserves, the amount of inactive wells, the low levels of research in oil and gas exploration, the policies to sell oil at discount prices or in exchange for goods and services. In addition, the use of the oil revenue as a resource to develop political or social policies has led to decreased oil and gas production levels. González (2009).

Other problems of competitiveness of the Venezuelan oil industry are associated with the "Law which gives the state the right to goods and services related to oil activities", adopted in May 2009. Under such law, different private sector assets were declared public utility and

expropriated, including drilling holes, water, steam or gas injection equipment, docks, boats, barges, tugs and other goods that provided services to the oil sector. Pietrosemoli (2009).

Due to the combination of the above-mentioned factors, Venezuela is beset by the impact of labor protests that take place more frequently in the oil, iron and aluminum industries, thus affecting maintenance activities and oil services, the operation of drilling holes, and the activities to support oil extraction and production of iron, aluminum and related products. Pietrosemoli (2009).

These protests are associated with requirements for the renewal of collective agreements, payment of labor liabilities associated with expropriations or compliance of safety requirements, and contractual terms. Reuters (2009). Similar problems in other productive sectors have meant that the protests have spread to the automotive, health, education and popular sectors, which protest lack of security, lack of work, educational problems or lack of basic services, creating a level of national conflict that affects the quality of life of people and the performance levels of small, medium and large enterprises. Pietrosemoli (2009).

Even without precise quantification, the direct consequences of these policies and social conflicts are beginning to manifest themselves in the level of Venezuelan oil production, which went from 3,239,000 barrels per day in 2000 to 2,566,000 barrels per day in 2008. Analysts estimate a production in the order of 2,000,000 barrels per day or less by early 2010, confirming that the country is facing a general weakening of basic industries. BP (2009), González (2010).

5.3. Orientation of national policies of the productive sector

The policy of socialist transformation of the production model, which attempts to centralize production activities in strategic sectors such as the production and distribution of food, iron, steel, aluminum and communications in an effort designed to reach the centralization and nationalization of the economy, looks contrary to Venezuelan productivity, competitiveness and entrepreneurship. This change in policy is especially apparent when framed in a whole nationalization effort that in last years has severely affected the food, telecommunications, electricity, oil, chemical and petrochemical industries. Tal Cual (2009), Index of Economic Freedom (2009).

5.4. Index of economic freedom and annual index of good governance

According to Index of Economic Freedom (2009), Venezuela occupied position no. 174 out of 179 countries, because of factors negatively affecting economic activity, hindering productivity, competitiveness and entrepreneurship. Among them are: business conditions, trade, monetary, financial, investment, and fiscal freedom, the size of government, property rights, corruption and labor freedom problems. Governance Index (2009) indicates that Venezuela was ranked no. 192 out of a group of 212 countries due to governance problems, failure of constitutional laws, crime rate, lack of separation of powers and institutions, violent takeover of private businesses, shortages and inflation. Veneconomía (2009).

5.5. Performance of the industrial and commercial sectors

Figure 1 shows the Venezuelan industrial and trade performance based on the number of industries active on recent years that for 2007 showed a decrease of 36%.

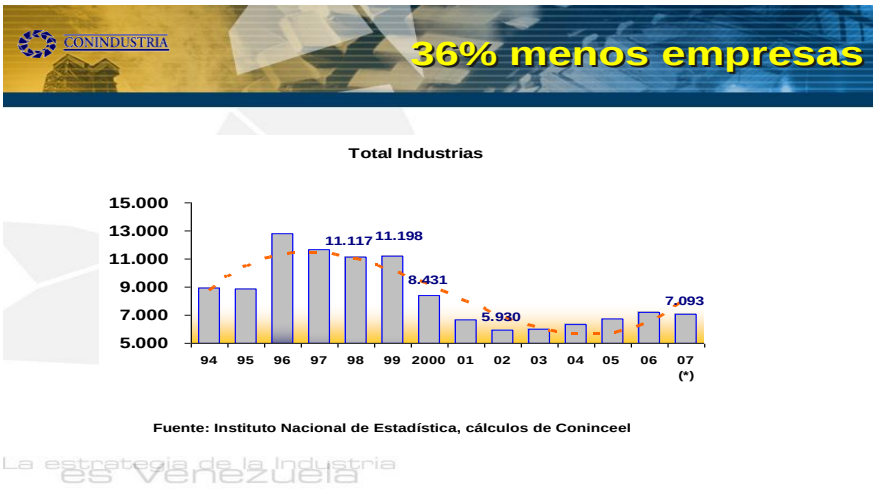

Figure 1. Decrease in the number of industries in Venezuela 1994-2007 (Conindustria, 2009)

Which factors explain the deterioration of the Venezuelan productive infrastructure, living conditions and governance in a global economic context that in recent years (up to 2008 due to the financial crisis) saw a steady growth in many countries? How do you account for this in a country with an abundance of resources? Figure 2 provides a reference for what Conindustria (Confederación Venezolana de Industriales) details as some of the adverse factors that affect the Venezuelan productive sector.

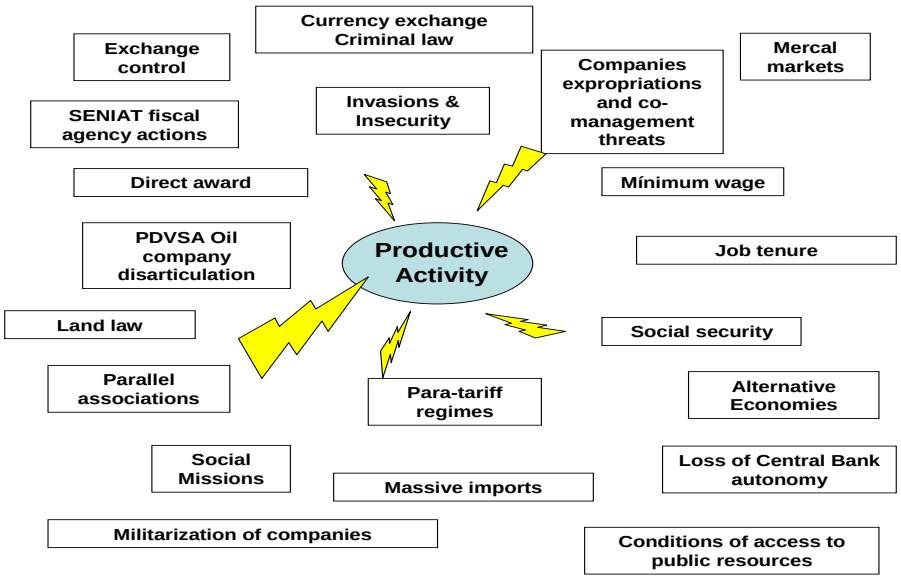

Figure 2. The siege of the Venezuelan productive activity (Conindustria, 2005)

5.6. Field work results

The field work was conducted through a questionnaire distributed to 78 company employees working as board of director members, department managers, project managers, resident engineers, project and department supervisors as well as 12 external advisors in the fiscal, accounting and legal areas. The questionnaires were processed through SPSS version 10.0 and Excel. Fifty-six out of 90 questionnaires were returned, corresponding to 62,22%. The following results were found:

- Identify the main constraints affecting the performance of Venezuelan oil and petrochemical industrial construction and the impact that those limitations have on the construction of the Venezuelan oil and petrochemical sectors.

Main constraints	Cases Impact No. 1	%
Financial	20	35,71%
Resources availability	12	21,43%
Contractuals/Relation with clients	11	19,64%
Labor	7	12,50%
Technical-Constructive	4	7,14%
Safety and public order	2	3,57%
Social	0	0,00%
Total responses	56	100,00%

- Determine the frequency with which these limitations occur in the construction of the Venezuelan oil and petrochemical sectors.

Main constraints	Very Frequent & Frequent Cases No.	%
Resources availability	28	22,05%
Financial	25	19,69%
Labor	22	17,32%
Contractuals/Relation with clients	20	15,75%
Technical-Constructive	19	14,96%
Safety and public order	8	6,30%
Social	5	3,94%
Total responses	127	100,00%

- How are the actual working conditions of the oil and petrochemical sectors viewed compared with previous years?

Main constraints	How are perceived actual working conditions Cases No.	%
Better	3	5,56%
A little better	7	12,96%
Same	9	16,67%
Worse	30	55,56%
Much worse	5	9,26%
Total	54	100,00%

- Identify elements of organizational culture, organizational structure and technology that support knowledge management in the case study.

Cultural aspects	% Very frequent	% Frequent	Total
a. Knowledge is formally recognized as company asset	29,1%	25,5%	54,6%
b. There are formal guidelines to support knowledge generation, diffusion, reuse and transfer	9,1%	27,3%	36,4%
c. New knowledge contributions are recognized and rewarded	12,7%	20,0%	32,7%
Organizational aspects	**% Very frequent**	**% Frequent**	**Total**
a. There is a specific structure to manage knowledge	10,9%	16,4%	27,3%
b. There are specific processes to identify, transfer, structure, store and distribute knowledge	12,7%	32,7%	45,4%
c. Organizational learning and research withing the organization are emphasized	8,9%	26,8%	35,7%
d. Project hits and misses are revised at project ending	18,5%	7,4%	25,9%
e. Hits, misses, and decisions are documented and made available to be reused on following projects	11,10%	9,30%	20,4%
Technological aspects	**% Very frequent**	**% Frequent**	**Total**
a. There are programs or technological tools to manage knowledge.	21,8%	18,2%	40,0%
c. There are mechanisms of information preservation and protection	41,1%	37,5%	78,6%
d. Audits are conducted to validate the compliance and security controls to prevent loss of information and knowledge	26,8%	37,5%	64,3%
e. Specific trainings are provided to staff to make better use of technological resources	10,9%	18,2%	29,1%
f. There have been events of loss of intangible assets of organization in electronic or physical form	0,0%	12,7%	12,7%

6. Conclusions

As this is a preliminary research project with field work limited to the vision of one Venezuelan oil and petrochemical construction company and its external advisors, conclusions are not intended to pretend presenting a overall view of competitiveness constraints affecting the country's performance, but to highlight the existence of some conditions that limit the performance of industrial construction. Keeping in mind those limitations, based on the referenced documents and field research findings, it is palpable that:

- Despite of the abundance of mineral and agricultural resources, the Venezuelan productive sector in general operates in an environment characterized by physical and legal insecurity, financial, social, contractual, inflation and labor problems, public policy discretionary, loss of knowledge and high levels of conflicts.

- These factors are perceived by many of the actors of the production processes as obstacles that weaken national competitiveness and affect the quality of life of the population.

- Those problems may affect other developing countries, so it is important to realize that globalization can offer an important source of knowledge that should be followed as guidelines to improve local performance.

- To reverse the negative trends affecting countries in terms of competitiveness, it is required to initiate a cultural change oriented to sustainable development based on ethical foundations, principles and values, investments, employment, and the improvement of performance levels for small, medium and large enterprises.

- This requires the development of competitive policies with a long-term view, based on learning from past experiences. To reach this goal, knowledge management plays a very

important role, because knowledge management makes available resources that can contribute to solving the problems of national competitiveness and support sustainability.

- Company studied present some of the cultural, organizational and technological elements needed for knowledge management, with improvement opportunities for each one.

- As one of the major competitive policies necessary for developing countries and for construction companies involved in the oil and petrochemical sectors, it is suggested that governments and organizations initiate actions to provide appropriate knowledge management as a strategy that may lead to profound managerial changes to achieve sustainable development that includes a social component.

References

Añez, C. (2005). Caracterización de empresas e instituciones en la perspectiva de fortalecimiento de clusters energéticos en los países andinos. Espacio Abierto v.15 n.4 Maracaibo Dic. 2006/// Lima, Junio 2005

BP (2009). Statistical review of world Energy. June 2009. Pp. 28

CIB. International Council for Research and Innovation in Building and Construction. (2002). Agenda 21 for Sustainable Construction in Developing Countries. A discussion document. CIB Publication. Pp. 91

Comisión de las comunidades Europeas. (2003). Libro Verde El Espíritu empresarial en Europa. Bruselas. Pp. 28

Conindustria. (2005). Situación actual y perspectivas del sector industrial. Caracas.

Conindustria. (2008). Encuesta de coyuntura industrial. Situación II Trimestre 2008. Perspectivas II Trimestre 2008. Agosto 2008. Venezuela. Pp. 40.

Egbu, C. et al. (2004). Knowledge management for sustainable construction competitiveness. Final Report. July 2004. ISBN-1-9033661-63-3. BNE Report. pp. 20

Garelli, S. (2003). Competitiveness of Nations. The Fundamentals. IMD World Competitiveness yearbook 2003. Pp. 702-713.

González D. (2010). Escenarios petroleros para Venezuela. Revista Barriles de Papel. N. 43. 8 Enero 2010. www.analitica.com

IMD. (2010). World Competitiveness Yearbook 2009. www.imd.ch/research/publications

Kamara, J.; Anumba, C.; Carrillo P. (2002). A CLEVER approach to selecting a knowledge management strategy. International Journal of Project Management. Volume 20 Issue 3, April 2002, pp. 205-211

Krugman, P. (1996). Making sense of the competitive debate. Oxford review of economic policy. Vol 12. N. 3. MIT.

Lall, S. (2001). Competitiveness Indices and developing countries: An economic evaluation of the global competitiveness report. World Development. Vol 29. N. 9. Pp. 1501-1525.

Miller, T.; Holmes, K. (2009). The index of economic freedom. The Heritage Foundation. The Wall Street journal. USA. Pp. 455

Pietrosemoli, L. (2009). Knowledge Management. Strategy to face construction challenges. Situation in Venezuela. CIB. 5th conference information and knowledge management in building. Rio de Janeiro. June 17-19, 2009. Pp. 72-83.

Singh, A. (2002). Competition and Competition Policy in Emerging Markets: International and Developmental Dimensions. G-24 Discussion Paper Series. UN and Center for International Development Harvard University. N. 18, September 2002. Pp. 33

World Economic Forum. (2009). The Global Competitiveness Report 2009-2010. Geneva. Switzerland. Pp. 492

Newspaper articles:

A punto de colapsar Petróleos de Venezuela y la CVG. Entorno Inteligente. 22 Abril 2009.

Guayana en pie de protestas. Tal cual 17 Julio 2009.

Otros indicios del estado caótico de PDVSA. Reporte diario de la economía. 22 Abril 2009.

Tormenta en la industria petroquímica. Tal Cual Digital. Venezuela. 03 de Julio 2009.