A METHODOLOGY TO EVALUATE ENTERPRISES TO BECOME MEMBERS OF VIRTUAL INDUSTRY CLUSTERS

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Based on the Framework for Global Virtual Business developed by the COSME Network, the partners for a Virtual Enterprise (VE) has to be selected from members of a Virtual Industry Cluster (VIC). This paper describes 1) major issues involved in evaluating possible members of the VIC, i.e. core competencies (products, process, and technologies) and infrastructures (information, social, legal and physical), 2) a methodology to select members for a VIC based on quantitative and qualitative analysis. This methodology integrates a set of benchmarking tools to evaluate enterprise's competencies and infrastructures. A case study was undertaken to create VIC of Metal Mechanical and Plastics Industry in Monterrey, Mexico. A WWW page was created to describe member's key information on competencies and infrastructures.

1. INTRODUCTION

Clusters are geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition. They include, for example, suppliers of specialized inputs such as components, machinery, and services, and providers of specialized infrastructure (Porter, 1998). In a similar manner, Virtual Industry Clusters (VIC) are virtual concentrations of interconnected companies and institutions in any field. The main characteristics to qualify in these clusters are complementary core competencies of entities. Finally, the VIC is supported by information technology infrastructure that overcomes the restriction of geographic proximity (Molina, 1998), (Eversheim, 1998).

For the Small and Medium Enterprises (SME's) advantages of using the Virtual Enterprise Concept are promising, because with this approach SME's can fulfill new opportunities and develop new markets with little or no investments. For this reason the COSME (Cooperation for Small and Medium Enterprises) Network has been

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working in the development of Global Virtual Business and another tools to facilitate the introduction of the VE concept specially in European and Latin American markets.

The framework of Global Virtual Business (Molina, 1998) has three objectives: 1) explain how Global Virtual Business can be conceived using three business entities: Virtual Industry Clusters (VIC), a Virtual Enterprise Broker (VEB) and a Virtual Enterprise (VE), 2) provide a comprehensive set of business entities – defined in terms of core products, core processes, and core competencies – to understand and analyze Global Virtual Business, 3) establish a common framework for future research work on Global Virtual Business.

This research work is related to the creation and formation of VICs. The key issues in the creation of VICs are the following (Molina, 1998):

- How to identify core competencies from enterprises around the world?
- How to select and qualify enterprises around the world for the Virtual Industry Cluster?
- What means should be used to market the Virtual Industry Clusters?
- How to ensure that core competencies of the Virtual Industrial Cluster are maintained and extended?

A methodology is presented in this paper for evaluating and selecting enterprises for Virtual Industry Clusters. The methodology tries to answer the first two questions mentioned above, the others two will be tackled in future research work. The methodology consists of three steps: 1) Evaluation of Enterprise Components (Product, Process and Capabilities), 2) Identification of Core Competencies (Prahalad, 1990) and 3) Evaluation of the Infrastructures Elements of Virtual Enterprise (VE) (Goranson, 1999).

2. METHODOLOGY TO EVALUATE MEMBERS FOR THE VIRTUAL INDUSTRY CLUSTERS

An enterprise is a system of different components; it has defined three main components: Core Competencies, Enterprise Components (Product, Process and Capabilities) and Infrastructures (Figure 1). These components are interconnected and coordinated in certain way to obtain the ultimate goal of any enterprise: to have profitability.

There are few documented cases of VE networks, which had success in selecting partners in a systematic way (e.g. Walden Paddlers (Neuschütz, 1999), Virtual Company (Neuschütz, 1999), VIRTEC (Bremer, 1999), Virtuelle Fabrik (Wüthrich, 1997), Service Provider Cooperation (Erben, 1998), PUMA (Bauernhansl, 1998), (Siemens, 2000). Most of these networks have been successful in selecting partners to fit a business opportunity but this process not always can refer to VIC, some of them have dependence on personal contacts and do not use or have partially implement a structured method for partner selection (Neuschütz, 1999). The methodology proposed here has two objectives: 1) Evaluating main components of possible members: Enterprises components (product, process and capabilities), Core Competence (Prahalad, 1990) and Infrastructures Elements of the Virtual Enterprise (Goranson, 1999) and 2) Selection of the members for the VIC.

Figure 1 – Main components of an enterprise

The methodology to evaluate and select members for the VIC is composed by the following steps (Figure 2). The methodology starts with the company evaluation if it makes a product that is needed in the business opportunity, if this is not possible, the next step is to try to find if the company performs a or set business process to deliver a product, and if also this is not possible the final step is to evaluate the capabilities (human, technology and practices/procedures) for a product. Whether the three conditions above are not possible to find in the enterprise, it is rejected from being a part of the VIC. A set of recommendations will be sent to the enterprise to improve their components, so in the future the enterprise could apply again in the evaluation process. When the product, process or capability is identified, the next step in this methodology is to identify the core competencies and finally make the evaluation of the infrastructures to support the cooperation between enterprises. If an enterprise in none of these steps can fulfill the requirements, then the company will not be rejected completely from the VIC, it will be classified as a potential member (because the company fulfilled the functional aspects: product, process or technology of the business opportunity) of the VIC. This classification of potential member will be used until the enterprise can fulfill the requirements in each required step.

2.1 Definition of an Enterprise

An enterprise has three main components that are essential for their survival and development: (1) a product or a set of products, (2) a set of processes, and (3) a set of capabilities (human, technology and practices/procedures). The three components are related in the following manner, first the set of capabilities are necessary to perform the set of processes and the final result of these processes is a product or a set of products. To evaluate these components the following methodologies are proposed: *Business Process* from European Network for Advanced Performance

Systems (ENAPS). *Benchmarking Methodologies*: Performance Benchmarking Service (PBS), ENAPS and Evaluación de Indicadores de Competitividad from Secretaria de Comercio y Fomento Industrial (SECOFI). *Standard Industrial Classifications*: International Standard Industrial Classification of All Economic Activities (ISIC), Nomenclature Generale des Activites Economiques (NACE), North American Industry Classification System (NAICS) and Classificação Nacional de Atividades Econômicas (CNAE).

Figure 2 – Methodology to evaluate and select members for the VIC

2.1.1 Product

A product is a material or a non-material outcome of a process with both technical and emotional attributes (Terhaag, 1996). To describe a product in a structural way, it is possible to use:

- The Standard Industrial Sector Classification proposed by the NAICS (North American Industry Classification System) this classification was developed by the partners of NAFTA (Canada, United States and Mexico) (INEGI, 1996),
- The Classificação Nacional de Atividades Econômicas (CNAE) developed by Instituto Brasileiro de Geografia e Estatística (IBGE) (IBGE, 1997) which it is based in the ISIC Rev.3 of the United Nations,
- The ISIC Rev. 3 (International Standard Industrial Classification of All Economic Activities) developed by the United Nations (United Nations, 1990),
- And the NACE Rev. 1 (Nomenclature Generale des Activites Economiques) Classification within European countries (NACE, 1990).

But here one question arises, what is the most appropriate standard industrial classification to use in the methodology? The answer is not so easy. The best idea is to use ISIC Rev. 3 since this standard industrial classification is derived from NACE, is related with NAICS and it is the base of the CNAE. Also this standard industrial classification is used in 72 countries. Now, as the standard industrial classification is selected, the next step will be to locate the enterprises in the appropriate branch. This could be done using tabulation categories (17), divisions (60), groups (159) and classes (292). The number in parentheses indicates how many categories, divisions, groups and classes exist in ISIC. For example: one enterprise could belong to category D (Manufacturing), division 17 (Manufacture of textiles), group 17.3 (Weaving) and class 17.31 (Weaving of cotton). To evaluate the characteristics (quality, time, volume and cost) of a product the next indicators are proposed (Table 1). The results of the characteristics of a product evaluation (Table 2) indicated that the enterprise has a good product performance (e.g. all the indicators related with quality and time are above the median, also the indicators related with volume and cost are in lowest level of the comparison group).

Table 1. Product Indicators (see subsection 2.1.2)

Indicator	Dimension
Percent of units shipped bad or rejected (-)(F)	Quality
Percent on-time deliveries to your customers (+) (F)	Time
Percent change in manufacturing lead time, past 2 years (-) (F)	Time
Typical units per order (v) (B)	Volume
Average unit or piece price (v) (B)	Cost

2.1.2 Business Process

First it is necessary to define what is a Business Process. By “business process”, we mean the closely related decisions and activities required to manage and administer the resources of the business (Kane, 1986). In this definition it is possible to see that a business process involves decisions and activities and both of them need to be supported by a set of indicators. Nowadays the GVE project is considering to use one of these methodologies: European Network for Advanced Performance Systems (ENAPS, 1999), Performance Benchmarking Service (PBS, 1998) and Evaluación de Indicadores de Competitividad from SECOFI (This methodology was developed by CSIM-ITESM for the Mexican Government to evaluate the Mexican SME's) (SECOFI, 1999). In Table 3 an analysis from the three methodologies is presented.

From the analysis made in Table 3 it is concluded that none of the methodologies satisfy with the requirements (business process related with indicators and reliable

database), which means that a combination of methodologies is the best alternative. This research uses the PBS indicators and the ENAPS business process to evaluate the possible members. Table 4 shows the ENAPS Business Process. Each of the ENAPS Business Processes are related with a set of indicators that will help to evaluate the enterprise. The indicators are classified in three categories: *Function (F)*: All the indicators that are related with tangible factors of the enterprise. For example, scrap rate due to errors. *Process (P)*: All the indicators related with practices of an enterprise, in most cases these are indicators are intangible, because most of them are not associated with physical objects. Example, inspection labor hours as a % of total shop labor hours. *Business (B)*: All the indicators related with the business strategy and financial aspects. Example, gross profit rate.

Table 2. Product Indicators (PBS, 1998)

Product Indicators	Top 10%	Top 25%	Median	Bottom 25%	Bottom 10%
% of units shipped bad or rejected (-)(F) <i>Enterprise value: 0.020%</i>	0%	0.04%	0.6%	1%	2%
% on-time deliveries to your customers (+) (F) <i>Enterprise value: 95.65%</i>	99.72%	99.11%	95.65%	93.25%	91%
% change in manufacturing lead time, past 2 years (-)(F) <i>Enterprise value: - 10%</i>	-64.3%	-40%	0%	0%	33.3%
		25% said at least	Median	25% said at below	
Typical units per order () (B) <i>Enterprise value: 20,000</i>		100,000	40,000	20,000	
Average unit or piece price () (B) <i>Enterprise value: 0.04 USD</i>		0.40 USD	0.20 USD	0.07 USD	

Table 3. Analysis of Benchmarking Methodologies

Methodology	ENAPS	PBS	Evaluación de Indicadores de Competitividad
<i>Advantage</i>	A set of business process defined. A set of indicators related with business process defined. Database accessible by Internet.	A set of indicators defined Reliable database. 8 years of experience. Improve year by year. A set of questionnaires and reports defined per industry.	A set of indicators defined. Free of charge.
<i>Disadvantage</i>	Limited companies data. Not historical data.	No business process defined.	No business process defined. Not much experience. Benchmarking service only for Mexican Enterprises. Hybrid methodology from ENAPS, Industry Week and PBS.

Table 4 shows the ENAPS business process with its respective PBS indicators. At the end of each indicator name a symbol (+), (-), or (v) appears, (+) means that the indicator must be always on the top, (-) indicates that the indicator must be always in the bottom, (v) means that the interpretation of indicator depends of the comparison group. All the benchmarks for the indicators will be obtained from the PBS Benchmarking Report (PBS, 1998).

Table 4. ENAPS Business Process with related PBS's indicators.

ENAPS Business Process and PBS Indicators	
Primary	Support
Financial Enterprise Result (FER) 1. Annual Sales (v) (B) 2. Average unit or piece price (v) (B) 3. Typical units per order (v) (B) 4. % of sales per Typology(ETO, Job Shop, MTO, MTS)(v)(B) 5. % of sales per Industry (Auto, Aircraft/Aerospace, Communications/Electronics, Final Consumers, Wholesalers, Military, etc.) (v)(B) 6. % change in sales, past 2 years (+) (B) 7. Gross profit rate (+)(B) 8. Value-added per employee (+)(B) 9. Value-added per FTE (full time equivalent employee) (+)(B) 10. Annual value-added per dollar in machinery value (+)(B) 11. Value-added per dollar of capital and labor expense (+)(B) 12. % of internal costs estimated directly (+)(B) 13. Inventory turns (+)(B) 14. Days of raw material/ parts inventory (-)(B) 15. Days of finished goods inventory (-)(B) 16. Purchased material and parts costs as percent of sales (v) (B) 17. Purchased services as percent of sales (v) (B) 18. Labor costs (v) (B) 19. Shop payroll as a percent of sales (v) (B) 20. Dollar value of machinery per FTE (v) (B)	Human Resource Management (HR) 1. Temporary or contract labor costs as a % of total labor costs (v) (B) 2. % of shop floor workers participating in work teams (+) (P) 3. % of shop workers trained in statistical quality, past 3 years (+) (P) 4. % of shop workers trained in technical areas, past 3 years (+) (P) 5. % of shop workers with >= \$2000 USD in co-paid health premium (v) (P) 6. % of shop employees that are union members (v) (P) 7. Training tuition and fees per employee (v) (P) 8. Training tuition and fees per shop employee (v) (P) 9. Employee turnover rate (-) (P)
Obtaining Customer Commitment (OCC) 1. Percent of sales from products not made 3 years ago (+) (P) 2. Percent of sales to customers not served 3 years ago (+) (P) 3. Percent of sales exported beyond the residence country (+) (P)	Information Management (IM) 1. Number of design/shop keyboards and keypads per employee (v) (P) 2. % of employees using a computer at least weekly (v)(P)
Order Fulfillment (OF) 1. Scrap rate due to errors (-)(F) 2. Percent of units reworked (-)(F) 3. Percent of units shipped bad or rejected (-)(F) 4. Percent of units made right the first time (+)(F) 5. Percent on-time deliveries to your customers (+) (F) 6. Percent of supplier shipments delivered to you on time (+)(F) 7. % of jobs causing other scheduled jobs to be bumped (-)(F) 8. % change in manufacturing lead time, past 2 years (-)(F) 9. Hours idle due to late suppliers as a % of available hours (-)(F) 10. Energy and utility costs as percent of sales (v) (B) 11. Inspection labor hours as a % of total shop labor hours (-) (P) 12. % of shop labor time spent doing assembly, packaging, etc. (v) (P)	Maintenance Management (MM) 1. Available (manned) hrs. As a % of hrs. In a year, avg. Per machine (v) (F) 2. Running hrs as a % of available hrs, regular-use machines (v)(F) 3. Running hrs as a % of hours in a year, regular-use machines (v) (F) 4. Setup hours as a % of available (manned) machine hours (-)(F) 5. Percent of setups caused by bumping scheduled jobs (-)(F) 6. Hours idle due to late suppliers as a % of available hours (-)(F)
After Sales Services (ASS) 1. Percent of units shipped bad or rejected (-)(F) 2. Warranty cost as percent of sales (-) (B)	Environmental Management (EM) 1. Waste disposal costs as percent of sales (v) (B) 2. Gallons of water used per dollar of sales (v) (P) 3. Percent of scrap that is recycled and reused in product (v) (P)
Product Development (PD) 1. Warranty cost as percent of sales (-)(B) 2. % of sales for which you designed the part or assembly (+)(P) 3. Percent of design hours on CAD Terminals (+) (P)	Repair and Maintenance (RM) 1. Setup hours as a % of available (manned) machine hours (-) (F)

Table 5. Evaluation of Resources (PBS, 1998)

Human (Multiple Choice) To what extent do non-supervisory shop floor workers:	
<ul style="list-style-type: none"> • Set production volume standards? • Determine part/product routings? 	<ul style="list-style-type: none"> • Select suppliers/subcontractors? • Decide which jobs to quote? ...
Technology (Yes/ No Questions)	
<ul style="list-style-type: none"> • Used CAD to generate machine instructions (CAD/CAM)? • Sent/received CAD data to/from suppliers/ customers? 	<ul style="list-style-type: none"> • In past year, regularly did statistical quality analysis on parts/machines? ...
Practices/Procedures (Indicators)	
<ul style="list-style-type: none"> • % of sales from products not made 3 years ago • % of scrap that is recycled and reused in product 	<ul style="list-style-type: none"> • Percent of shop workers trained in statistical quality ...

2.1.3 Capabilities

Human is the most important asset of the enterprise, because humans are the source of knowledge and experience about the processes and products. Technology is the practical use of knowledge to perform a specific task in a determined area or specialty. Practices/ procedures are methods or techniques that are used to make one step of the process. Practices/ procedures describe how a step inside of process is done. The success of practice/ procedure is evaluated with a set of indicators. To evaluate these capabilities (human, technology and practices/procedures) a set of multiple choices or yes/no questions and a set of indicators of the PBS Methodology are used. The benchmarks are obtained from PBS report. In Table 5 some of these questions and indicators are shown.

2.2 Core Competencies

Core process is a process that is given an above average ranking in terms of the criteria inferred from the company objectives and strategies (Terhaag, 1996). Core competencies are the collective learning in the organization, especially how to coordinate diverse production skills, harmonizing streams of technology, the organization of work and the delivery of value. The core competencies have three characteristics: (1) difficult to imitate, (2) impact into a wide range of products, and (3) give a value added to the final customer (Prahalad, 1990). The tool to evaluate the core processes and core competencies of the possible members has the following parts: 1) Identification of Core Processes, 2) Identification of the skills and capabilities of Core Process (Human resources, practices and technology) (Molina, 1999), and 3) Identification of possible Core Competencies (Ramirez, 1998).

Identification of Core Processes. The identification of the Core Processes of the company can be done with the results obtained from the Benchmarking Report from PBS (PBS, 1998). A set of indicators is related with the ENAPS Business Process (Table 4). To identify the core processes it is only necessary to check the process performance (Table 6). The Order Fulfillment process has defined 12 indicators, 9 of them are more related to the function performance and the rest (Energy and utility costs as % of sales, Inspection labor hours as a % of total shop labor hours and Percent of Shop Labor Time Spent Doing Assembly, Packaging, etc.) are related to the first one with the cost profile (business) and the other two with practices (process) for this reason if it is no possible to define what is "good". The

interpretation of these three indicators is related to the comparison group. The results from Table 6 shows that the Order Fulfillment process is a core process.

Table 6. Order Fulfillment (OF) Process Performance (PBS, 1998)

Order Fulfillment (OF) Indicators	Top 10%	Top 25%	Median	Bottom 25%	Bottom 10%
Scrap rate due to errors (-) (F) <i>Enterprise value: 0.13%</i>	0%	0.40%	1%	3%	3.75%
% of units reworked (-)(F) <i>Enterprise value: 0.5 %</i>	0%	0.2%	1%	3%	5%
% of units shipped bad or rejected (-)(F) <i>Enterprise value: 0.020%</i>	0%	0.04%	0.6%	1%	2%
% of units made right the first time (+)(F) <i>Enterprise value: 95.65%</i>	99.72%	99.11%	96.5%	93.25%	91%
% on-time deliveries to your customers (+)(F) <i>Enterprise value: 97.9%</i>	99.7%	97.9%	93.3%	88%	85%
% of supplier shipments delivered to you on time (+)(F) <i>Enterprise value: 88.6%</i>	98%	95%	90%	85%	80%
% of jobs causing other scheduled jobs to be bumped (-)(F) <i>Enterprise value: 1.8 %</i>	0.7%	1.8%	2.7%	10%	25%
% change in manufacturing lead time, past 2 years (-)(F) <i>Enterprise value: - 10%</i>	-64.3%	-40%	0%	0%	33.3%
Hours idle due to late suppliers as a % of available hours (-)(F) <i>Enterprise value: 0.1 %</i>	0%	0%	0.1%	0.3%	0.8%
	Highest 10%	Highest 25%	Median	Lowest 25%	Lowest 10%
Energy and utility costs as percent of sales (v) (B) <i>Enterprise value: 1.38%</i>	3.78%	3.53%	1.93%	1.31%	1.02%
Inspection labor hours as a % of total shop labor hours (-)(P) <i>Enterprise value: 8.3%</i>	23%	12.8%	10%	7.1%	4%
		25% said at least	Median	25% said at below	
% of Shop Labor Time Spent Doing Assembly, Packaging. <i>Enterprise value: 6.1%</i>		23%	15%	10%	

Identification of skills and capabilities of the Core Processes. To identify the skills and capabilities of a core process the next tool is proposed (Molina, 1999) (Figure 3). This figure shows how the human resources or technologies are helping the business process and who the practices/procedures are used to implement philosophies in the enterprise. For example the order fulfillment process, identified as a core process, has the next skills and capabilities. *Human Resources:* a1) the personnel has good technical background in all the tasks to perform the process and a2) the personnel has minimum experience of 5 years to manage and perform the process. *Practices/ Procedures:* b1) use of Statistical Quality Control, b2) partially use of Single Minute Exchange Die (SMED), use of Pull Systems in the factory layout and b4) partially use Benchmarking. *Technology:* c1) use of a MRP System to support the production area and c2) in process of implement a ERP System in the enterprise.

Human Resources Analysis				Quantity of people in each process		Educational Level		Experience (years)	
BUSINESS PROCESSES									
• Product Development									
• Order Fulfillment				20		a1		a2	
• Obtaining Customer Commitment									
• After Sales Service									
• Support									

Technologies Analysis
Technologies		PROCESSES							
		1 Product Development		2 Order Fulfillment		3 Obtaining Customer Commitment		4 After Sales Service	
• CAD									
• CAM									
• CAPP									
• CAE									
• MRP				c1					
• MRP II									
• ERP				c2					
• CAT									
• CAO									

Philosophies & Practices Analysis
TOOLS		Philosophies							
• Control Charts									
• Visual Control									
• Statistical Quality Control						b1			
• Poka Yoke									
• FMEA									
• QFD									
• Design of Experiments									
• SMED						b2			
• CIM									
• JIT									
• Pull systems						b3			
• Kanban									
• Forecasting									
• Problem solving									
• Market intelligence									
• Benchmarking						b4			

Figure 3 – Identification of skills and capabilities of Core Process

Importance	High	c2		c1	b3 a2	
	Average	b4	b2	b1	a1	
	Low					
		Immature	Low developed	Partial Developed	Developed	High developed
		Capabilities				

Figure 4 – Identification of possible Core Competencies

Identification of possible Core Competencies. The tool to identify the possible core competencies of the company is a simple graph “Capabilities versus Importance”. In this graph the results of the skills and capabilities identified for the order fulfillment process are shown (Ramírez, 1998) (Figure 4). The Order Fulfillment (OF) process requires the next capabilities to be “the best in class”: *Human resources*: 1) Knowledge of the Order Fulfillment process, 2) Knowledge of the OF Information Flow, 3) Knowledge of the Systems Information that support OF. *Practices/ Procedures*: 1) Benchmarking to get benchmarks for some indicators (Percent of units made right the first time, Percent on-time deliveries to your customers, Percent of supplier shipments delivered to you on time, etc.), 2) Pull Systems utilization, 3) Poka Yoke. *Technologies*: 1) Utilization of an ERP System.

The conclusion of this analysis is that an enterprise needs to develop the next two capabilities: Benchmarking and implement the ERP System, when these capabilities will be completely developed, the Order Fulfillment process will be a Core Competence.

2.3 Infrastructures Of The Virtual Enterprise (VE)

The infrastructure elements (Information, Legal/Explicit, Social/Cultural and Physical) (Goranson, 1999) are helpful to evaluate enterprises for possible cooperation in a Virtual Enterprise. The tool to evaluate the infrastructures' elements of a VE of the possible members is based on the following questionnaires: questionnaire for Agility Audit (Goldman, 1995) and questionnaire from VIRTEC (Bremer, 1998). The infrastructure questionnaire has five sections: Marketing/Sales/Services, Operations, Procurement, Human Resources and Firm Infrastructure.

3. VIRTUAL INDUSTRY CLUSTERS IN MONTERREY

A Virtual Industrial Cluster Project is developing in Monterrey, Mexico. A pool of 27 micro, small and medium enterprises was selected to collaborate in five different type of cluster: Machining (VIRTUAL-CNC), Foundry (VIR-CAST), Die and Tools (DIE & TOOLS), Stamping (VIR-TROQ) and Plastics (VIRPLAS). The main objective of the project is to develop small and medium enterprises of the Metal Mechanical and Plastics sector in Monterrey, Mexico, with support of information technologies, especially Internet and evaluate their impact in the enterprise competitiveness. A WWW page for each cluster will be created to describe member key information on competencies and infrastructures. The clusters WWW pages are already finished; the WWW address is <http://tamayo.mty.itesm.mx/clustersvirtuales> (Figure 5).

Figure 5 – Clusters WWW Pages

4. CONCLUSIONS

A methodology to identify and select a partner to the VIC was presented. This methodology evaluated the next components of the enterprise: components (product, process and capabilities), core competencies, and infrastructures elements for the VE. A set of tools to evaluate enterprises was used or created, these are ISIC Industrial Classification, PBS Indicators, ENAPS Business Process, PBS Benchmarking Report, Core Process, Core Process skills and capabilities and Core Competencies tools and Infrastructure questionnaire. A Virtual Industry Cluster project is developing in Monterrey, Mexico to improve the competitiveness of micro, small and medium enterprises.

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