COPESUL MANAGEMENT SYSTEM: ACHIEVING WORLD-CLASS RESULTS

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SUMMARY

This paper describes the change in the management of a large-sized Brazilian petrochemical industry through the application of the concepts of organizational reengineering, redesign of the key business processes, and ISO 9002 and ISO 14001 certifications, building an integrated business model, reconciling the use of innovative practices, and continuous improvement practices as a business development strategy. In 1997, the company achieved the National Quality Award (Brazilian), similar to the MBNQA and in 1998 the Award Witness to Business Excellence "Donald Marquardt," given by the Latin American Institute of Quality Assurance (INLAC) for being the only Latin-American company to have ISO 9002 and 14001 certifications and the national quality award of its country.

KEY WORDS

continuous improvement, integrated business model, reengineering

THE COMPANY AND ITS BUSINESS

Copesul—Companhia Petroquímica do Sul, is the company that operates the raw material plant of the Petrochemical Complex of Triunfo, in the state of Rio Grande do Sul in Southern Brazil, the third to be installed in Brazil in the beginning of the 1980s.

From naphtha, a by-product of oil, the company makes and sells ethylene and propane and other aromatic hydrocarbons, which are the basic petrochemicals of the petrochemical chain. Additionally, the company makes and sells utilities such as steam and industrial waters used by the complex.

The industries installed on the complex transform products received by Copesul into petrochemicals known as intermediate petrochemicals, such as polyethylene, polypropylene, etc., which are the raw material with which the transformation industries manufacture consumption goods such as plastics, rubbers, films, varnishes, and so on.

Copesul is a capital intensive company with state of the art technology with control of production processes and in real time according to the distributed control digital system (DCDS). The high degree of human resources training and education has always been one of the strengths of the company, which currently has 928 coworkers (employees), of whom 21% have a higher education degree and 62% have high school degree.

Copesul has been a private company since 1992, with Brazilian capital control and its shares are marketed on Brazil's main stock exchanges. In 1999, its gross revenue was around US$ 840 million.

It started its operations in December 1982. With a current capacity of 1,135 thousand tons/year of ethylene, having just been expanded to 60% of its capacity, it is considered a large-sized plant accounting for around 40% of the

Brazilian market. Its products are sold mainly in the domestic market and the rest in the Mercosur region, the United States, and Europe.

Copesul is proud of having opened to public visitation in 1991, the Copesul Environmental Protection Park, which covers 70 hectares next to its industrial facilities, in which the region's typical fauna and flora live in harmony and provide the community with an environmental education opportunity. In 1999, almost 12 thousand people have visited the park.

CHANGE THROUGH REENGINEERING

A state company in its inception, Copesul was privatized in May 1992. It started a deep managerial change in 1993 to be competitive in the scenario of changes projected for the domestic petrochemical sector due to the opening of the market and free prices, which started in the beginning of the 1990s in Brazil.

The change process was lead by the board of directors (BD), which sought international consultants with experience on this kind of project. Out of the group of coworkers, sixty people with an enterprising and inquiring profile were chosen, from different hierarchical levels of the organization and with a variety of professional backgrounds, including engineers, technicians, and staff people; constituting the redesign team. Their job was to redesign the business processes and conceive a new organization. Starting from drivers with the support of the BD and aligned with the state of the art in management, the reengineering process began in March.

Focus on the company key business processes: based upon the high performance business, the key processes are the means through which stakeholders have their satisfaction met (D'Little 1992). Human, material, and financial resources, as well as work organization are the foundation which has to support these processes, that is, they are "at the service" of the processes and should be defined only after the latter have been redesigned (see Figure 1). The goal of the management by processes is to break the compartments that exist in the traditional departmental view and focus on activities that add value to the process end customers (stakeholders).

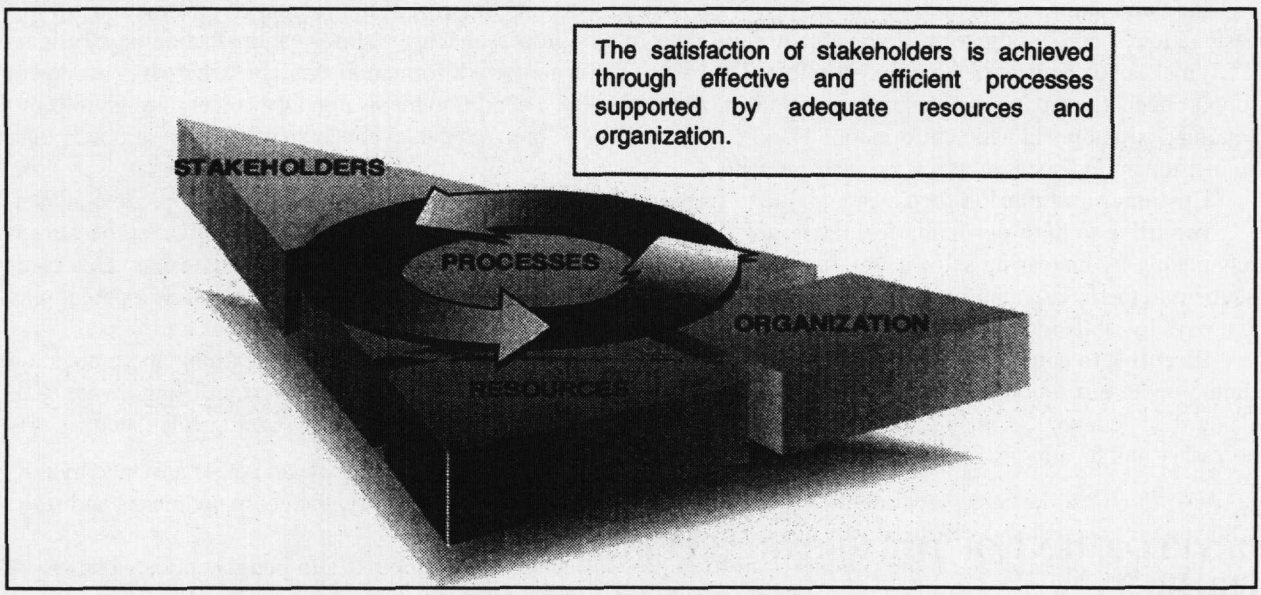

Figure 1. Concept for a high performance business.

Meeting the stakeholders needs in a balanced way: the business processes must take into account high performance with a focus on meeting the satisfaction requirements of the stakeholders in a balanced way. This practice strengthens the concept of the "virtuous circle" (see Figure 2) which is generated when the satisfaction level of the parties reaches high levels, becoming self-stimulating and increasing satisfaction. This concept is essential for an organization that wants to operate according to total quality principles.

Systemic view: processes and actions generate interconnected results. This cause-effect relationship is not always seen due to several factors and also to the time interval between the actions and the results that from a business point of view are not immediate. The basis is the learning of the 5th discipline concepts (Senge 1993).

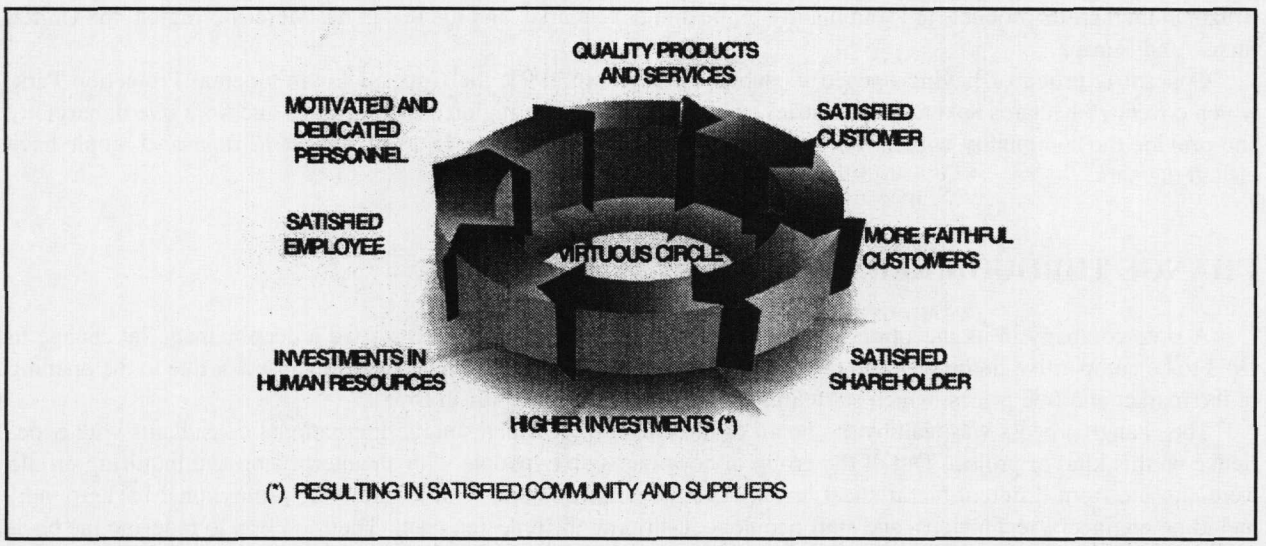

Figure 2. Meeting the needs of the stakeholders in a balanced way.

Teamwork and multiskill: managing the processes in order to have as a result a high efficiency degree and customer satisfaction requires active and dynamic organization of work with skilled people who are empowered and have a strong sense of team. The presence of multiskills makes it possible to add more value to work due to a higher degree of empowerment and flexibility of the team in the performance of the work, in addition to a better use of the potentialities of the individual, thus contributing to qualify his/her job, raise his/her salary, and increase his/her motivation. The concepts of a team-based organization were used (Shonk 1993).

Fast and shared information: the agility in decision making and the trust in the sources of information are two basic requirements for the teams to be able to fulfil their role as process managers. Information Technology Systems (ITS) makes this new work condition possible. The role of ITS is to make information available where it is needed to support decision making in a dynamic, accurate, and reliable way, a condition that is not always met through the conventional structures in which information is more of a privilege of hierarchical level and an instrument of power than an instrument indispensable to good management.

Customer and market focus: essential for a former state company to be able to survive in a competitive market.

Incentive to high performance: the establishment of incentive systems is a key factor to motivation because it acts mainly by increasing self-esteem, in addition to enabling a variable remuneration (bonus by results) as a complement to the fixed monthly payment. At the individual level, the need to generate a professional development plan that pays by skills instead of the traditional remuneration by jobs or positions which existed so far.

Incentive to continuous learning: the search for excellence is a never-ending process. Learning and innovation should be an institutionalized stimulus so that the company does not become "obsolete" without being aware of it. Using the "pedagogical mistake" as an instrument of improvement, and not punishment, running calculated risks is necessary and healthy for the growth of people and of the organization itself.

DEVELOPMENT OF THE REENGINEERING PROJECT

The reengineering project was developed in five steps: Diagnosis of the view of the stakeholders, design, benchmarking, redesign, and implementation (see Figure 3).

The diagnosis of the view of the stakeholders identified their satisfaction requirements and how the organization was perceived by shareholders, customers, coworkers, suppliers, and the community (stakeholders). In everyone's view, the company had limitations such as: too much bureaucracy in decision making, centralization of power, low focus on results, fear of running risks, low level of motivation and opportunities for professional growth, and excessively rigid rules to deal with customers and suppliers. During that stage, consultants confronted Copesul, as perceived by its stakeholders, with the best practices. Business process concepts were also presented and the project's drivers and objectives were reinforced. After defining and preparing the Redesign Team for the project, the existing processes design stage showed how things

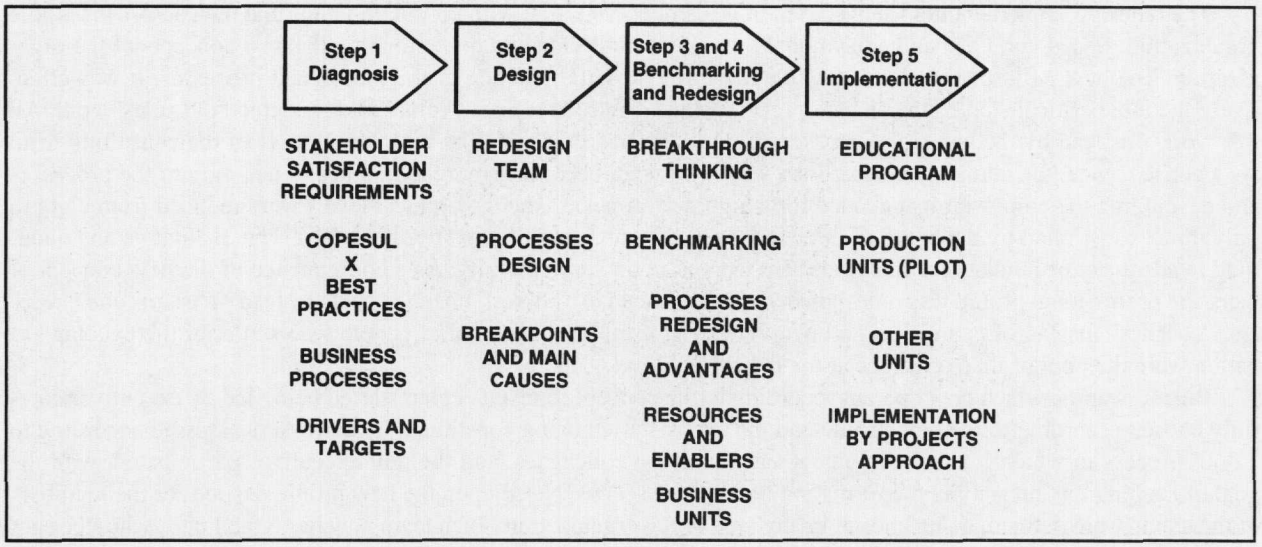

Figure 3. Reengineering project overview.

were done in the everyday work at the organization and the breakpoints of the processes and their fundamental causes were analyzed. Prior to benchmarking, the redesign team was prepared for breakthrough thinking and visualization of the future desired for the organization. The benchmarking, which was performed both at the international and national level, aimed at learning about the best practices of 81 companies, out of which 25 were located in the United States and Europe, which were used as a benchmark for the redesign. On the redesign stage concepts, flows and paper at the organization were redefined according to eight fundamental processes that cover the main operations at Copesul. This was done from scratch, as if the organization was being created at that very moment. There was no incremental improvement in the existing processes. We should point out that after the redesign had been defined, when it was analyzed whether the stakeholders satisfaction requirements were being met, it was found that definite solutions not only solved the breakpoints and causes, but also introduced creative, innovative and proactive practices. The benefits of all new solutions were highlighted. Redesigning included an estimate of resources (quantitative and qualitative), including the needs in terms of staff and skills, as well as all enablers needed for its implementation, most of it based on information technology. Once the redesigning was completed, organizational structures were redefined according, from the on, to business units and respective teams. The key business processes and the most related stakeholders are shown in Figure 4.

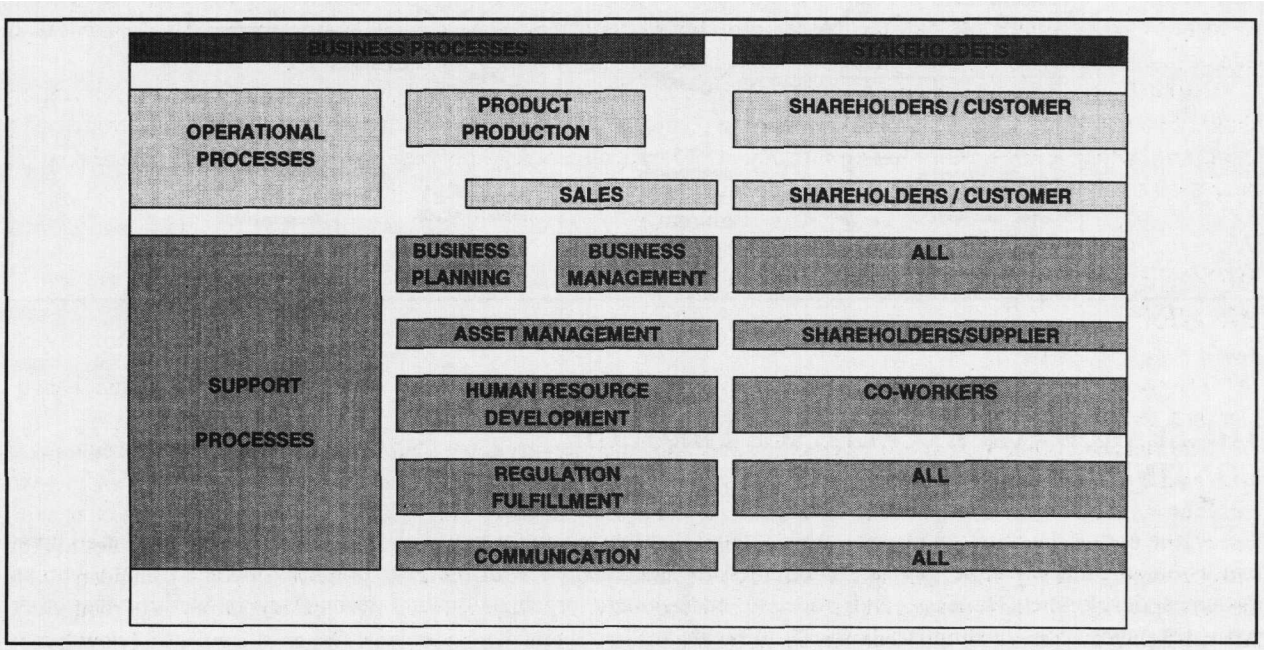

Figure 4. The key business processes and their stakeholders.

The redesign implementation step started in December1993, first with production units and then across the whole organization. Based upon a sound educational program, reinforcing and disseminating the new concepts of the organization. The new culture started being gradually formed by the practice of the redesigned processes. It was effectively the most critical step of the change process, since it introduced new values and rendered "old rules" void. All this work was lead by the redesign team, reporting to the board of directors with the support of the consulting firm. As a consequence, the company changed the way it worked, becoming more dynamic and adapting to the processes and developing the empowerment needed for a high performance. The hierarchical levels were reduced from eight to only three, constituted by the board of directors, business units, and their respective teams. The qualitative and quantitative adequacy of human resources was also worked upon very carefully. As a consequence of the new concept of work the professional profile was redesigned. Leaders instead of "bosses," change agents instead of "status quo" keepers, "coaches" instead of controllers and people willing to run risks instead of people who settle for the existing situation were the core of these changes at the behavioral level.

Business units, which now operate according to the concept of result center, started being led by executives carefully chosen according to the new profile and the teams started being constituted by coworkers assessed according to a 360° process in which internal customers and suppliers, colleagues, and the unit executives participated, with the goal of keeping the integrity in the formation of the teams. Thus, based upon the new profile desired for the members of the teams were defined, being chosen in any area of the organization. Each team now has a facilitator who does not belong to any hierarchical level within the team. The facilitator is a member of the team who, for having been identified as a leader and for having easy access among internal customers and suppliers, is selected to lead the team in search for high performance and development of the members of this team. The selection process is the same 360° process. Thus, the basis for the change started with the implementation of the human resources development process which, in summary, established the following key factors for a high performance at Copesul, described in Figure 5.

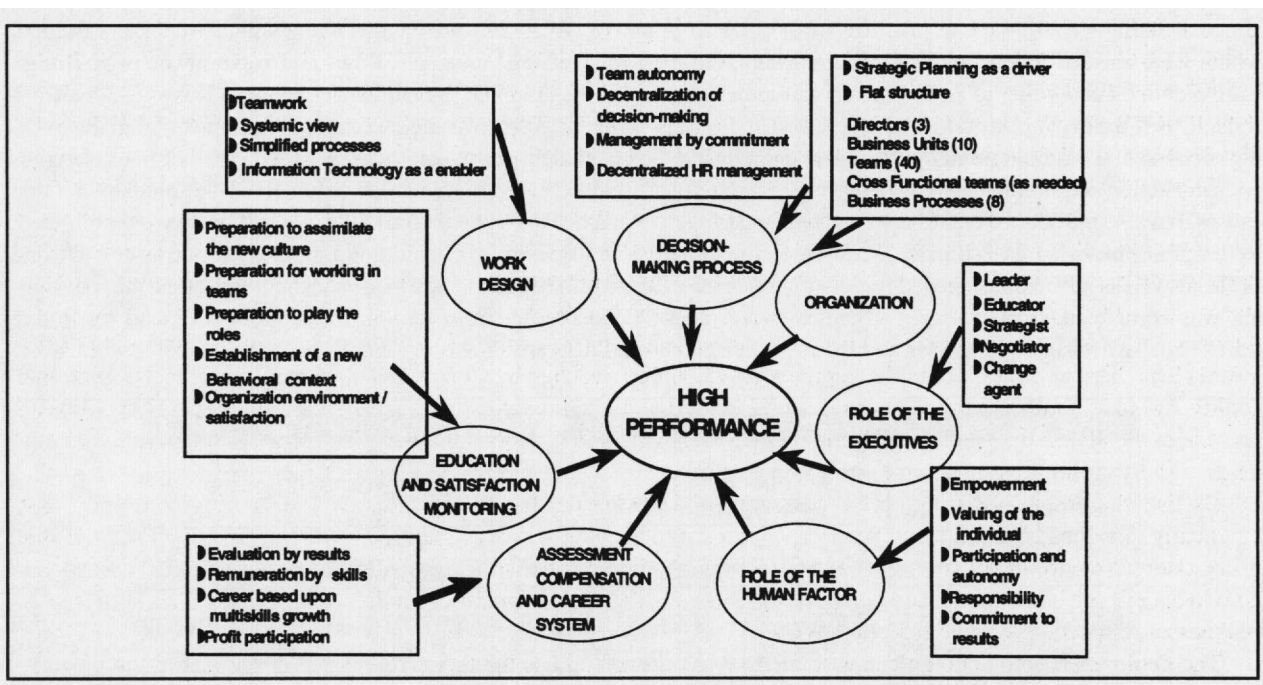

Figure 5. Key factors of work at Copesul.

THE SEARCH FOR EXCELLENCE THROUGH CONTINUOUS IMPROVEMENT

At the end of the redesign process, it was found that the search for world class would be successful based upon two essential pillars: people who are committed to and satisfied with the new practices included in the human resources development process; and effective management organization and technology defined in the other processes, whose content summary is shown in Figure 6.

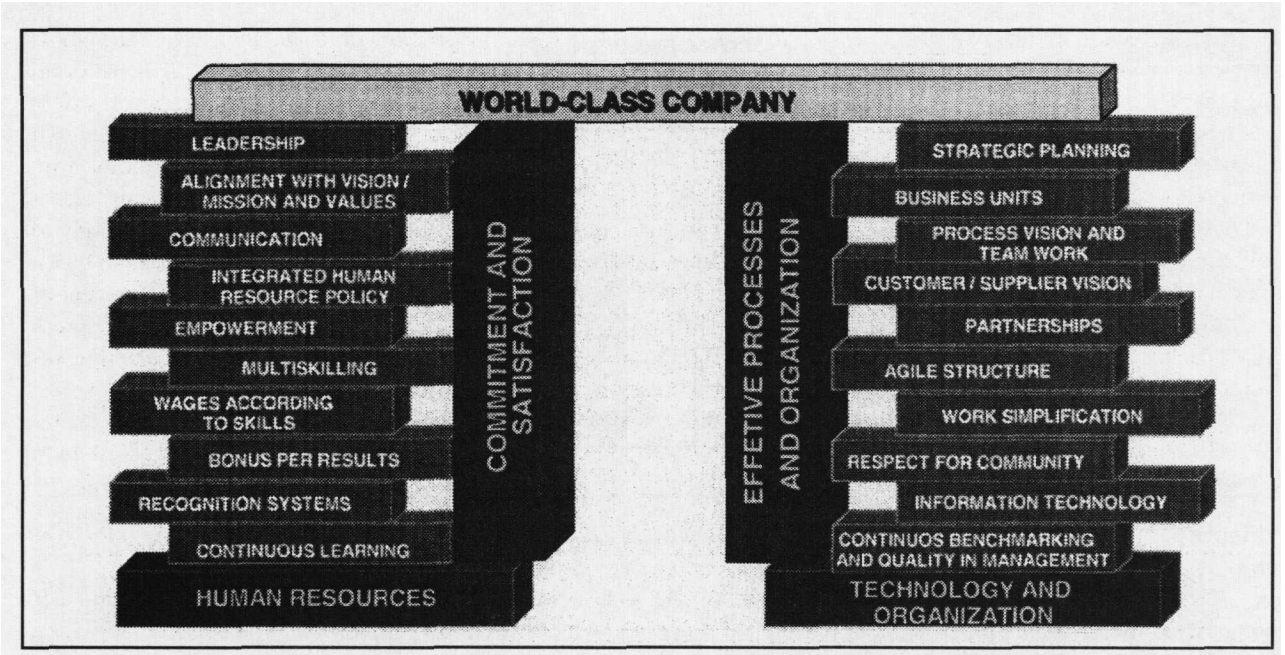

Figure 6. Copesul Management System—reengineering summary.

During the second semester of 1994, when the first cycle of the strategic planning was developed based upon the business planning process redesign, the steering committee, constituted by the board of directors and the executives decided to strengthen the new business identity, giving rise to the Copesul Management System. On this moment the view, mission, and values were defined and the objectives and strategies defined for a period of up to 5 years, being all disseminated all over the organization.

Among the most significant strategic objectives are the goals to reach world class performance and management standards by December 1997, and competitive leadership on its operation area by 1999.

How could the evolution of the Copesul system toward world-class be followed and how could the results of that objective be measured? The answer came through benchmarking during the participation in the 48th annual conference of the ASQ. The Malcom Baldrige Award came to be considered by us as the great integrator of management practices with a focus on excellence. Thus, the Steering Committee decided to use the criteria of the National Quality Award (Brazilian) as a measure of the degree of development reached by Copesul Management System. The National Quality Award is similar to the Malcom Baldrige Award and like the latter, has a strong affinity. Since 1995, Copesul has systematically participated in the National Quality Award and at every annual cycle of strategic planning, it implements significant improvements in search for excellence.

By listening to and focusing on the customers and market needs and expectations, the steering committee systematically develops objectives and strategies, taking into account scenarios, analyzing threats and opportunities due to the external environment, strengths and weaknesses relative to existing competencies and structures, comparing them to excellence benchmarks and competitors, and consolidating its analyses on the well-known matrix—strengths, weaknesses, opportunities, and threats (SWOT).

The deployment into action plans with a 1 to 3 years horizon has the full participation of the teams and coworkers who include in their daily work the commitment to high performance and to the achievements needed to get better results in the future. Most actions are translated into projects that are worked upon across the teams, thus strengthening the view of processes and end results desired for the organization. Customers and key suppliers are largely taken into account in the design of plans and partnerships.

The leadership system encourages and recognizes leaders on the teams and in the management of cross-team programs. The management of the company is done jointly, which comes through both in the daily routine in which executive share the same room, and in the strategic planning cycles when the Steering Committee jointly carries out the action plans and their deployment, regardless of the area in which each of them work. Doors are open through the direct day-to-day contact of the executives with the people on their teams.

The evolution of the maturity of Copesul Management System, measured against the criteria of the National Quality Award is shown in Figure 7.

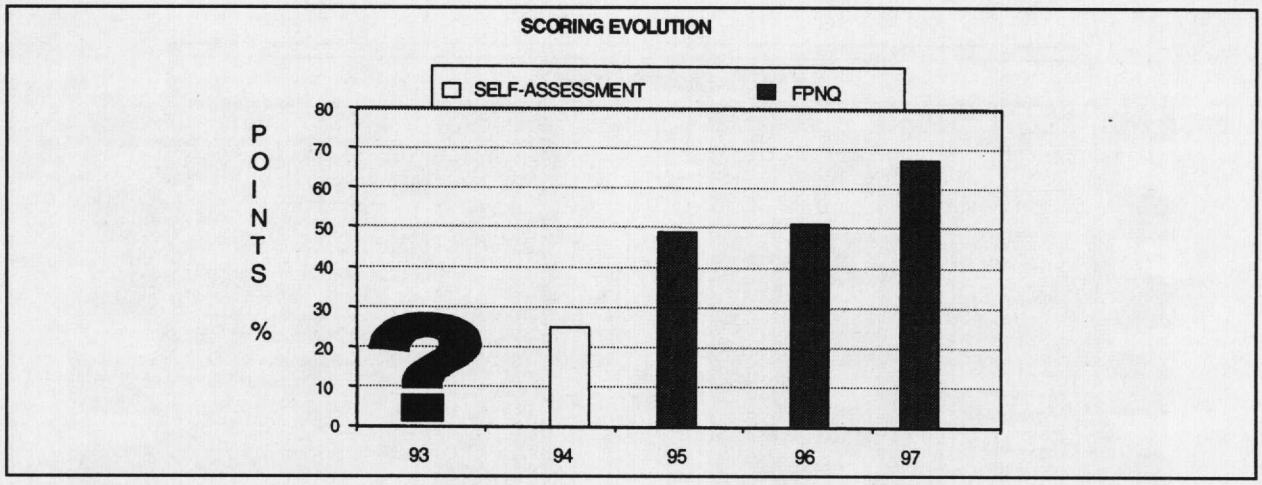

Figure 7. Maturity of Copesul Management System according to the Brazilian Quality Award Criteria—FPNQ.

According to the self-assessment at the end of the first semester of 1994, we had a score of around 250 points/1000 for having a *proper focus* of redesigned processes, which, however, still needed to be applied and widely used. Beginning in 1995, we started to participate in the National Quality Award because we knew that the management direction was the right one and that through the application and comprehension of the new practices, we would conclude the implementation of the processes and would learn with their use. The scoring on that year (494 points) reflected this conviction. In 1996, we concentrated on decreasing the gaps and improving the business processes (scoring in that year 508 points), whose results would appear in 1997 due to the period of time between making a decision and putting it into practice. In 1997, we reached the score corresponding to band 7 (over 650 points), which qualified us as a world class company in many of our practices, and that was when we received the National Quality Award.

Since the Copesul Management System implementation, the company has had a number of achievements. In 1996, ISO 9002 certification and the Local Quality Award. In 1997, the National Quality Award in the manufacturing category, and according to *Exame* magazine, a well-known publication devoted to management practices, it was considered, 3 years in a row, as one of the 50 best Brazilian companies to work at (1997; 1998; 1999). In January 1998, it received the environmental certification according to ISO 14001 rules, being the first raw material petrochemical plant in Latin America to receive this certificate, which reflects its commitment to the environment and the transparency of its operations toward both the internal and external community, something that had already been stated when it signed its commitment to the Brazilian Association of the Chemical Industry (ABIQUIM) for the implementation of the Codes of the Responsible Care Program, starting in 1992. More recently, in May 1998, it received the Award Witness to Business Excellence "Donald Marquardt," in Mexico, given by INLAC, for being the only Latin-American company to have ISO 9002 and 14001 certifications and the National Quality Award of its country. Finally, in June 1999, the conclusion of the Production Capacity Increase Project, started in May 95, aimed at meeting the needs of customers and the market, developed with state of the art technology in production process, included environmental aspects, industrial safety, and occupational health in the workplace, placed Copesul among the 14 largest petrochemical plants of the world located on a single site, giving it a competitive advantage in terms of scale and technology.

Thus, the two large objectives set in 1994 became reality in 1997 and 1999, respectively.

As to the National Quality Award, it should be pointed out that since its inception in 1992, until 1999, 137 Brazilian organizations participated in the process and only 11 received this acknowledgement. Table 1 shows the winning companies and the year the award was given (Brazilian Quality Award Foundation, FPNQ 2000).

Table 1. Companies that won the Brazilian Quality Award.

COMPANIES	YEAR	COMPANIES	YEAR
IBM—Fábrica Sumaré (*)	92	Citibank—Unidade CB (*)	97
Xerox do Brasil (*)	93	Copesul	97
Citibank—Unidade GCB (*)	94	Weg Motores	97
Serasa	95	Siemens Telecomunicações (*)	98
ALCOA—Unidade Poços de Caldas (*)	96	Cetrel	99
		Caterpillar Brasil (*)	99

(*) Globalized companies

COPESUL MANAGEMENT SYSTEM—DAY AFTER: IMPROVEMENT AND LEARNING

The Copesul Management System is dynamic and it works as shown in Figure 8, that is, the steering committee reviews the company policies focusing on the environment external to the organization, values, and satisfaction requirements of the stakeholders.

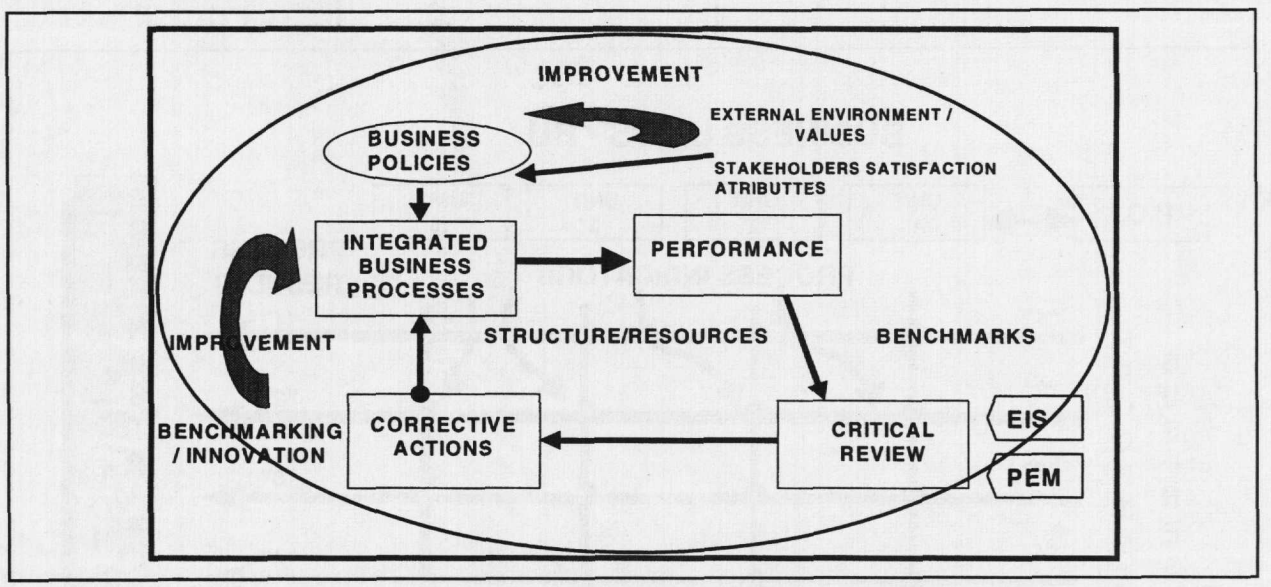

Figure 8. Improvement Process.

The policies state the intentions and principles regarding the business, including quality, health, safety and environment policies. These policies are put into practice according to the eight key integrated processes generated from the redesign, through structure and resources, whose performance is assessed against benchmarks and corrective actions are adopted in order to reach the established performance. The integration of the processes is facilitated by sharing documents that are common to the several processes and systems that contribute with a specific focus on strengthening the Copesul Management System itself, as ISO 9002, 14001, including legislation data banks, environmental aspects and impacts analysis, and others systems like BS 8800 (in certification process). The use of customized Lotus Notes facilitates this activity of integration and dissemination of documents in the organization through the PCs connected to the intranet. Figure 9 shows how to access Copesul Management System and all other specific systems. The improvements in the Copesul Management System take place based upon the inputs that impact policies and upon the updating of the key processes themselves, resulting in a better performance. As in the case of change through reengineering, improvement may be innovative or incremental, depending on the performance gap identified by the indicators of the key processes.

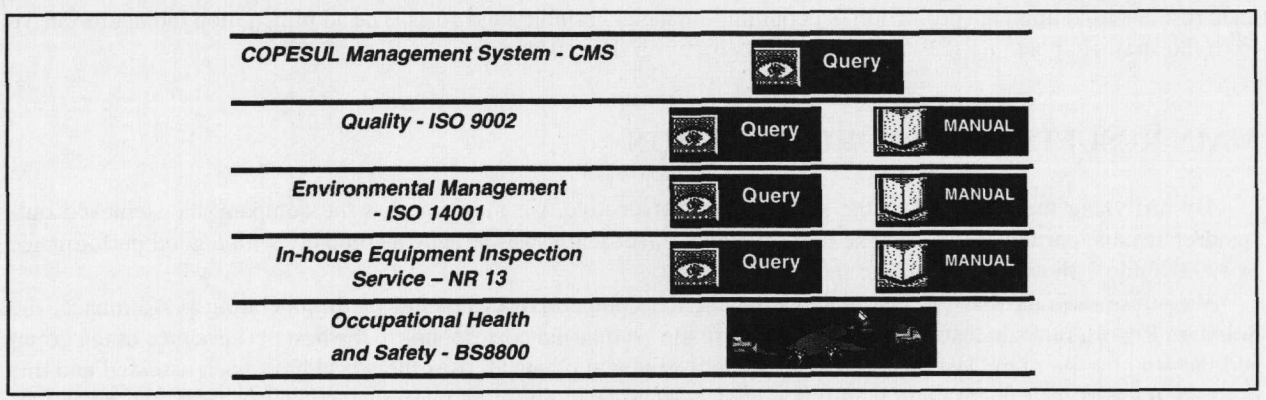

Figure 9. Integrated Management System.

The key processes are cross functional in the organizational structure, so that every unit/team has well-defined roles and responsibilities as to their contribution to the end result desired for each of them. Each of the eight processes has an executive in charge of high performance and improvement, called "Process Owner (PO)". For this job, each PO has a team of coworkers from different areas of the company who help evaluate and define the improvement plan that is defined every year and worked upon cross functionally in the organizational structure, aligned with the strategic planning cycle with the objective of sustaining world class performance and management. The relationship between the organizational structure and the processes is shown in Figure 10.

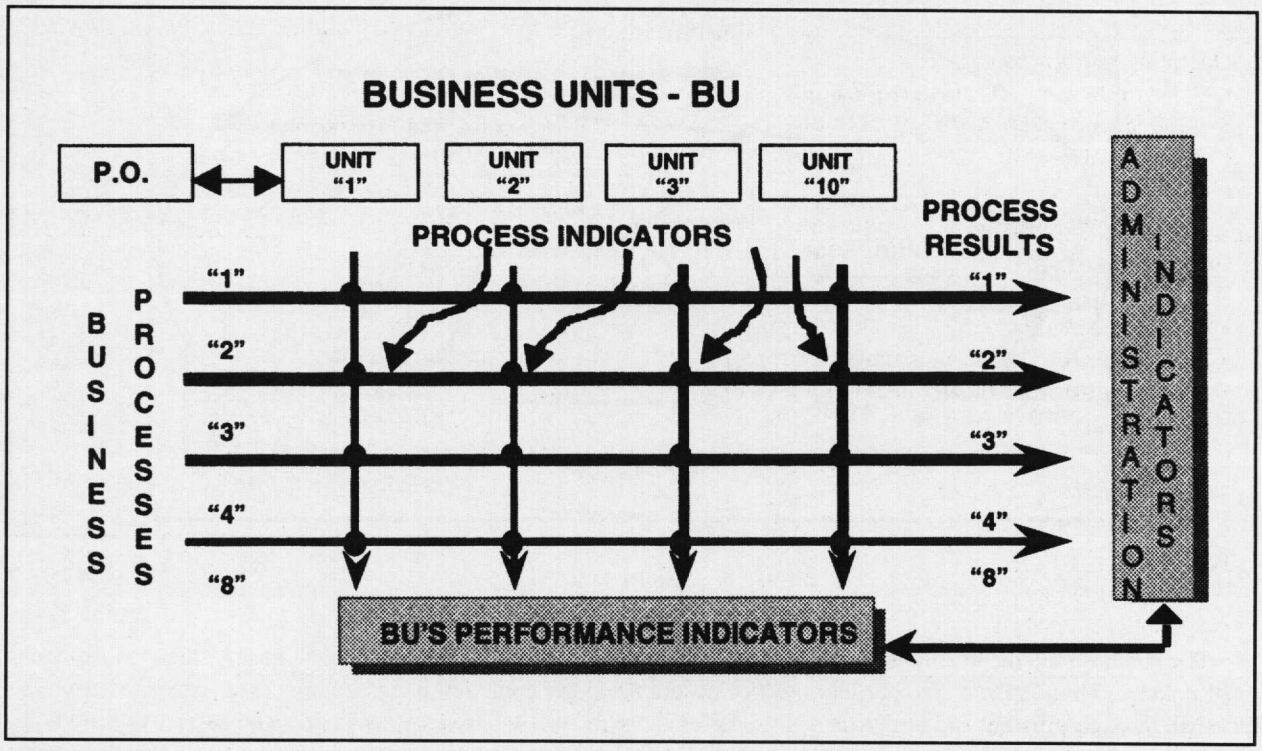

Figure 10. Organization structure and processes.

Thus, every business unit and team has its functional performance indicators aligned with the processes that go through it, aiming at synergistically helping achieve the processes results, as well as the goals defined for administration indicators, which are measured by the steering committee. The steering committee performs the critical analyses as a basis of the managerial information system, executive information system (EIS)-type application—that has the administration indicators, process indicators and unit performance indicators, thus allowing to identify cause-effect relationships for the identified deviations. Additionally, the business planning application (PEM) is used to simulate results based upon the projection of economic-financial variables and costs. The administration indicators derive from the strategic planning (EP) and its concepts focus on the stakeholders.

MAIN RESULTS OF THE ORGANIZATION

By analyzing the results from the stakeholders perspective, we may say that the company has achieved outstanding results, particularly if we take into account the fact that it was already a company with a good performance in 1992. Table 2 shows a summary of the main results.

We stress the fact that the instrument used for the competitive evaluation of the operating performance, the Solomon Report, ranks industries in quartiles, where the 1st quartile corresponds to the best performance of the group and the 4th quartile to the last place. Around 90 petrochemical plants all over the world have been assessed and this is surely the best instrument there is in this regard. Special attention to people satisfactions: In 1995, the index was 62%, in 1996, 77%, in 1997, 88%, and 1999, 91%, performing a benchmark in Brazil.

Table 2. Organizational results—summary.

Results	*Copesul Rating*	*Reference or Benchmark-BM*
1. Financial		
• profits increasing (92 TO 99)	12.75% BY YEAR	
• Net margin	average 7.4%	average of the sector in Brazil: 2.2% (1) Best competitor: 0.1%
• ROE	average 6.5%	average of the sector in Brazil: 2.7% Best competitor: 1.8%
2. Operating performance		
• Power efficiency (Kcal/Kg ethylene)	5500-1st Q	Solomon Report 97 (2)
• Maintenance cost rate	1.4%-1st Q	Solomon Report 97 (2)
• Capacity use	99%-1st Q	Solomon Report 97 (2)
• Reliability	5,1%-2nd Q	Solomon Report 97 (2)
• Ethylene output	Average: 28%	BM: 30 to 32 % (3)
3. Customer/Market		
• Satisfaction	Average: 92.5%	BM : 88% (4)
• Recommendation	89%	
• Preference of quality relative to competitors	82%	Competitors
• Preference of relationship quality relative to competitors	75%	Competitors
• Quality according to specification	100%	BM : 100%
• Market share	40%	Best Competitor : 41%
• Market share increasing (92 T0 99)	25%	
4. People		
• Satisfaction rate	91%	Brazilian average: 75% (5)
• Objectives reached	Average: 96% (6)	
• OSHA # for accidents P/200,000 hh	1.3	BM: 0.6 (2)
5. Community		
• Wastewater (T/T load)	0.08	North America: 0.35 (2) Asia: 0.35 (2)
• Environmental objectives reached	88.5%	Average 98/99
• Investment in community actions (% over net profit)	2.5%	
• Positive quotations on the media	78% (6)	

Notes:

(1) Average of the last five years

(2) According to the Solomon Report, 1997 results since the next report will come out in 2000 with 1999 results (biannual). Plant 2 outdoes the BM: 3990 Kcal/Kg ethylene

(3) The average corresponds to the two units. Plant 2 presents state of the art: 31%

(4) Satisfaction survey: 98 data (99 dates in consolidation)

(5) Satisfaction survey: 99 data

(6) Average of the last 3 years

Other unmarked items refer to 98

CONCLUSIONS

Given the results obtained, we may say that choosing reengineering at that moment was the right thing to do, and the same holds true to the search for a management identity, later on through continuous improvement. We have learned that the management model is not a "package." It needs to be built and customized, getting the most appropriate elements out of each philosophy, that is, of reengineering, total quality or any other management methodology.

Our successive participation in the National Quality Award in the years 1995, 1996, and 1997, when we were the winners in the manufacturing category, were very valuable.

- We have matured the Copesul Management System with a focus on the most significant improvements, identified on the Evaluation Report of the Brazilian Quality Award Foundation—FPNQ examiners.
- We have disseminated in the organization the concept of excellence introducing a common language that made it easier to understand differences of management focus between the excellence criteria and those of ISO Systems, for example. The systems integration as part of the Copesul Management System became clearer.
- We have learned to be flexible in the strategies to reach improvements, but persistent in the search for the objective that is to achieve world class. We have practiced the concept of "persisting" throughout our organization.
- People's morale is high when they see that the results of the organization are achieved through their contributions. Working in a winning company became the "fuel" for people's self-esteem and satisfaction.

Each year we are using the criteria of the National Quality Award as the main benchmarking instrument for our management system. We believe that all these achievements are the result of strong leadership, not only the CEO, competence, hard work, and dedication. We also believe that the search for excellence is a never-ending journey, in which awards, certifications, and acknowledgments are mere celebrations of steps reached, not an end in themselves.

REFERENCES

Brazilian Quality Award Foundation (FPNQ). 1995, 1996, 1997, 1998, 1999, 2000. Business Excellence Criteria. Brazil.

Copesul. 1995, 1996, 1997. *Management Report*. Brazil.

D'Little, Arthur. 1992. The High Performance Business (first quarter). *PRISM*, pp 6, 8, and 25.

1997, 1998, 1999. *Exame* 647, 669, and 695. Brazil.

Senge, Peter. 1993. *The 5th Discipline*. Brazil: Best Seller Publishing House.

Shonk, James. 1993. Team-Based Organizations—Developing a Successful Team Environment. USA.