Learning, knowledge management and human resources strategic planning.

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a. Background

a.1. Introducing TGS

Transportadora de Gas del Sur S.A. (TGS) started operations on December 28, 1992, upon the privatization process carried out in the Argentine energy sector. Since then, its relevance in the industry has steadily grown.

TGS is, as a public utility company, a remarkable player in the Argentine natural gas business, both in gas transportation and processing. As a gas transporter, our company operates a gas pipeline network of 9,008 km. Our transportation capacity is of 80.3 million cubic meters per day with an installed power capacity of 722,400 HP. The main pipeline infrastructure enables the rendering of this service from the oilfields located in the south and west of Argentina, where the gas reservoirs are located, towards the consumption points, including Great Buenos Aires and the city of Buenos Aires, the main natural gas consumption center of the country.

Apart form the transport services, which are regulated, TGS performs other non regulated activities in the industry, chiefly the production and marketing of Liquefied Natural Gas (LNG). By processing the natural gas transported through the pipelines, TGS obtains ethane – in gaseous state – propane, butane and natural gasoline. This process takes place at Gral. Cerri complex, a few kilometers away from Bahía Blanca city.

As part of our continuous improvement system, we periodically construct and incorporate to service new gas pipeline sections that widen and improve our service. The foregoing issues take place within a context of increasing demand mainly driven by the fact that natural gas represents 60% of the national energy matrix. The expansions to the natural gas transportation system are made by means of two complementary procedures: existing pipeline expansion and increase of the installed power capacity, either in the existing compressing plants or in new plants to be installed in specific points of our gas pipelines.

a. 2. *Introducing the challenge*

In the last years, the company started facing a renewal process of its workforce, in view of the fact that a significant portion of its personnel reached the retirement age, and the associated risk of losing a high tech know-how. Furthermore, the Argentine labour market is scarce in human resources with the required qualification to operate and maintain the gas transportation system in a safe and reliable way, because each time less people choose related careers or although they finish their grade studies they end up without the required specific training. In addition, for the acquisition of new talents, in certain regions, we compete with oil and gas producers, that offer hiring conditions (specifically the compensation issue) which are very hard for us to meet.

Our present circumstance has originated in the lack of a timely workforce planning, because the specific know-how is not viable to be immediately transferred from the outgoing to the incoming personnel:

> We are experiencing a generational renewal stage, that makes us speed up the training times and be very precise when transferring knowledge and skills, in order to maintain reliability and minimize operation risks. (Pipeline Manager).

The vastness of the territory where we operate makes TGS a very dispersed company in geographical terms. This situation adds and extra challenge for knowledge management. In fact, even when the required knowledge is present in one location of the company, it will not spread to the rest of it unless specific policies are adopted.

b. Aims

Our challenge is to preserve and develop the organizational knowledge in view of its direct influence on operational reliability.

Although interlinked, we distinguish three mayor tasks in the realm of knowledge management:

- To keep knowledge in the organization in a scenario where a significant portion of the skilled workforce approaches the retirement.
- To overcome the lack of specific skills in the labour market.
- To encourage knowledge flow and transfer in a company where plants and people are geographically spread.

c. Methods

In order to address the above mentioned challenges we followed a method consisting of three steps:

1st. To assess the implications of the challenge and identify a theoretical framework that proves helpful to understand the problem and find courses of action.
2nd. To define a policy that meets the needs of the company in terms of knowledge flow.
3rd. To develop tools and implement practices in order to foster organisational learning. These practices are tied to the annual development process and to the human resources strategic planning.

c. 1. Understanding the problem and defining a policy
If we wanted to successfully cope with the challenge of managing knowledge, we would need to take some actions. However, it was clear for us that not any action would lead us to the desired ends. It is our conviction that actions need to meet at least two requirements to be effective in the long term: they need to be inspired in principles articulated in a theory and they need to be integrated with other actions so that they result in a consistent approach. Therefore, the need of a policy capable of inspiring our practices and conferring them coherence became clear for us.

The 'Policy on Training and Development' is aimed at providing principles and guidelines to our actions to encourage the flow and transfer of knowledge within the organisation. Its goal is to help the organisation, the teams, and the individuals to enhance their learning

processes and to install the necessary competencies to fulfil the firm's mission. As such, the policy is grounded on solid theoretical basis stemming from research and scholar work on the field of organisational learning. Here are the principles adopted by our policy:

- *Knowledge is individual and social*. Traditionally, learning and knowledge have been regarded as concerning to individuals. From this perspective, learning and knowledge occur in the head of individuals while group phenomena can be reduced to an aggregation of individual cases. Further to the individual level, we also integrate another perspective. In the last decades, 'research and publications (…) have begun to treat groups and organisations in their own right' (Cook and Brown 1999:385). Particularly, the growing body of research on communities of practice reveal how knowledge is created, conserved, and renewed by groups (Wegner and Snyder 2000). As summarized by Crossan et al. (1999:524) 'there is a reasonable degree of consensus that a theory of organizational learning needs to consider the individual, group, and organizational levels'.

- *Knowledge may be explicit or tacit*. In accordance to Polany´s distinction -and a vast number of scholars that build on it- , we recognise two basic forms of knowledge: explicit and tacit (Nonaka 1994). Explicit is the knowledge that can be said or codified by means of a system of symbols, typically language or numbers. This is the kind of knowledge that is usually privileged by organisational actors. However, as Polany (1966 in Nonaka 1994:16) affirms, 'we know more than we can tell'. The knowledge we can codify and transmit through language is just a portion, the tip of the iceberg of the body of knowledge (Nonaka 1994). Tacit knowledge refers to a form of knowledge that 'is deeply rooted in action, commitment, and involvement in a specific context' (Nonaka 1994:16) and therefore is hard to formalize and codify. In the now classic example of riding a bicycle, explicit is the knowledge that people can say or write about riding a bike. In contrast, tacit knowledge is a kind of knowledge that, although present in bike riders, it cannot be put into words: 'many people who say they can ride a bicycle will claim, when asked, that they do not know which way to turn the handlebars to prevent a fall to the left or to the right' (Cook and Brown 1999:384).

- *Context acts as an enabler or hinderer of knowledge transfer*. Although emphasis is usually posed on the learning and performing subjects, we share the view that context-related factors in organisations are important for learning and performance. Particularly, we believe that organisational climate, learning culture, and adequate leadership are paramount for enabling organisational learning. Thus, building a sense of psychological safety (Edmondson 1999), a learning supportive culture, and encouraging an active role of leaders in knowledge transfer (O'Dell and Grayson 1998) are essential pillars of our approach to this issue.

Rooted in these theoretical principles, our Policy on Training and Development claims that:

- Its goal is to help organisations, teams, and individuals to learn.
- The fulfilment of the mission of the company requires the growth of different kinds of knowledge.
- There is a variety of needs (i.e. diverse kinds of knowledge and learning levels) that call for diverse methodologies.
- Leaders are responsible for creating the appropriate context for learning development.

c.2. Implementing practices and tools

A number of practices and tools derive from our Policy on Training and Development. The general goal is to guarantee knowledge transfer in order to prevent workforce renewal from draining the company in terms of know-how and to overcome the lack of specific skills in the labour market. The fulfilment of this aim is achieved through the deployment of a set of practices that, though diverse, constitute an integral approach consistent with our standpoint and aligned with our organizational culture. Within this approach, some tools and practices may be associated with the traditional approach (i.e. the ones regarding knowledge as individual and explicit). In our policy, these are called 'Conventional Training Actions'. Other practices, in turn, are more easily associated with more recent developments (i.e. those that recognize that knowledge is also social and tacit). Our policy calls them 'Non-Conventional Training Actions'. It is worth noticing, however, that although elements coming from both traditions are mixed and overlapped in training actions, the distinction we propose takes into account the main feature of each.

Finally, apart from training actions, there are other organisational initiatives aimed at dealing with the context, which is, as mentioned above, a key enabler of learning. Together, these tools and practices provide an effective course of action to tackle the issue of knowledge transfer.

c.2.1.Conventional Training Actions

The most salient tools and practices in line with a conventional approach are our 'Matrix of Competencies', 'Technical Schools', and the 'Specialization in Gas'.

c.2.1.1.Matrix of knowledge

This is a tool that results from the enumeration of the technical competencies (i.e. knowledge) and the level of mastery of those required by each position. The experts of each area of the company, assisted by the methodological guidance provided by the HR department, define the list of competencies needed in their sector and allocate a level of proficiency of those competencies to each position. This information can be accessed through the HR Portal, the SAP HR self-management tool (see the appendix, #1). By means of this portal, the employees and their leaders can assess their knowledge by comparing their current skills against the list of required skills. Furthermore, by means of this tool, TGS guarantees the qualification of employees performing qualified tasks.

> We have recently agreed with labour unions to design and carry out theoretical – technical assessments pursuant to this matrix, to upgrade employees under collective bargaining agreement from one category to the following one. (Labour Relationships Manager)

c.2.1.2.Technical Schools

The schools were designed to provide TGS with the technical skills that its operation demands. They consist of formal courses on different specialities. Currently we have courses on Cathodic Protection, Welding and Calibration of Valve Safety Systems, Gas Turbines, Centrifugal Compressors, and Lubricant and Seal Oil. For each of these courses a handbook has been made with the advice of specialists in didactic material design (See the Appendix, #2). Also, as from 2012, an operating simulator of a compressor plant, that is now in a development phase, will constitute part of the Technical Schools.

It is an essential feature of the schools that experienced and skilful employees have an active role in both the design and the delivery of the courses. This is particularly important due to the need of transferring knowledge from older generations of employees to newer ones.

> The main thing is to reach people and to give them the practical knowledge one has acquired during a quarter century of work in the company. (Pipeline Specialist)

c.2.1.3.Specialization in Gas

As from 2009, young TGS engineers with a very good performance are eligible to attend a demanding postgraduate course of Specialization in Gas at the Gas and Petroleum Institute of the University of Buenos Aires (IGPUBA). Travelling from remote places of the country, these professionals attend their classes in the city of Buenos Aires during one week per month, in full-study days of 10 hours each. It is structured in 15 subjects totalising 500 lecture hours. The course constitutes an intensive version -especially designed for TGS- of a traditional program of IGPUBA. The advantage of it is that it enables the attendance of engineers from distant locations of the country, helping to cope with the geographical dispersion challenge.
The program comprises specific technical subjects, as well as economics, law, management and project evaluation. This permits participants to acquire a wide and integral vision, not only of the Company but also of the Industry. Living and working in isolated places may lead engineers to get only a partial view of the business. This experience provides the postgraduate attendees with a framework to deeply understand the diverse processes, problems and operating issues inherent to the business.

c.2.2. Non-Conventional Training Actions

No conventional practices emphasise the social and tacit nature of knowledge. Among them, the most representative ones are 'Ega+', 'Overlapping', 'Cross Training' and what we call 'Induction process to the operations department'.

c.2.2.1.Ega+

The operating areas teams, spread throughout the pipelines, work under a self-managed modality, called in TGS 'ega+'.
Ega+ is more than a practice of knowledge management, it is a way of organising work that takes the social nature of knowledge very seriously. Apart from empowering teams, this organisational model is designed to reinforce communities of practice formed by people who share similar activities and face similar challenges (Wegner and Snyder 2000; Carlile 2002). Members share their issues, their best practices and, very important, they find solutions to their common problems in a collective way. Regular meetings, a newsletter, a directory of specialists, and an on-line platform where best practices are explained are some of the means by which TGS aims to reinforce communities of practice. The Ega+ portal can be accessed on www.egamas.com by any member at any time and is designed to get and to share knowledge that is relevant for each community (See the Appendix, #4). We understand that Ega+ provides a powerful framework for conserving existent knowledge, developing new knowledge and fostering knowledge flow and transfer. It is also a privileged site for the development of new employees.

In fact, Ega+ is a context where newcomers can easily get in touch and learn from experienced colleagues.

c.2.2.2. Overlapping

In the last years TGS implemented an 'overlapping policy'. In the light of a foreseen retirement of an employee, we implement an overlapping plan for one year. During the overlapping period, the experienced worker and the new one share the position and the tasks. This is a unique opportunity to secure knowledge transfer in a way that exceeds –and is complemented by- the use of textbooks. The know-how, which is different from the know-that (Cook and Brown 1999), is acquired in the context of the practice, where tacit knowledge plays a fundamental role. The extra costs implied by this policy are assumed as an investment under the conviction of the extreme importance of the 'master-apprentice' relationship in the learning process.

c.2.2.3. Cross Training

The lack of specific skills in the labour market as a consequence of the uniqueness of TGS' activity made cross training an usual, natural, and necessary practice. In it, experienced employees perform on-the-job training activities aimed at young and inexperienced workmates. Especially when complex activities take place, such as a turbine overhaul for instance, novel workers are sent from different locations to participate in the task under the guidance of a veteran colleague, who will teach the "art" of the job. Again, not only explicit knowledge is transferred in this context but also tacit knowledge, which cannot be found in books neither can it be learnt alone.

c.2.2.4.Induction process to the operations department

Recently, TGS has redefined its induction process. The new procedure, apart from providing rich information about the industry, the company and the departments within it, encourages the encounter between the newcomer and his/her new colleagues, particularly the team leader. The procedure prescribes interviews and meetings where those already working introduce the new member into TGS' world.

A successful induction process is particularly relevant for the operations department. The magnitude and complexity of the tasks demand that new workers quickly become efficient, safety conscious and reliable. Consistent with our understanding of the learning process and our policy, the approach is double. On the one hand, we encourage socialization through the prescription of a number of activities aimed at the integration of the new member to the group. On the other, we provide both general and specific handbooks containing technical information to perform the job. They are:

- TGS Operations Dept. Handbook
- Handbook of General Knowledge on Natural Gas
- Safety handbook
- Transportation Dept. Handbook
- Maintenance Dept. Handbook
- Measurement & Quality
- Processing and Storage Dept. Handbook

(See the Appendix, #5)

c.2.3. Context for learning.

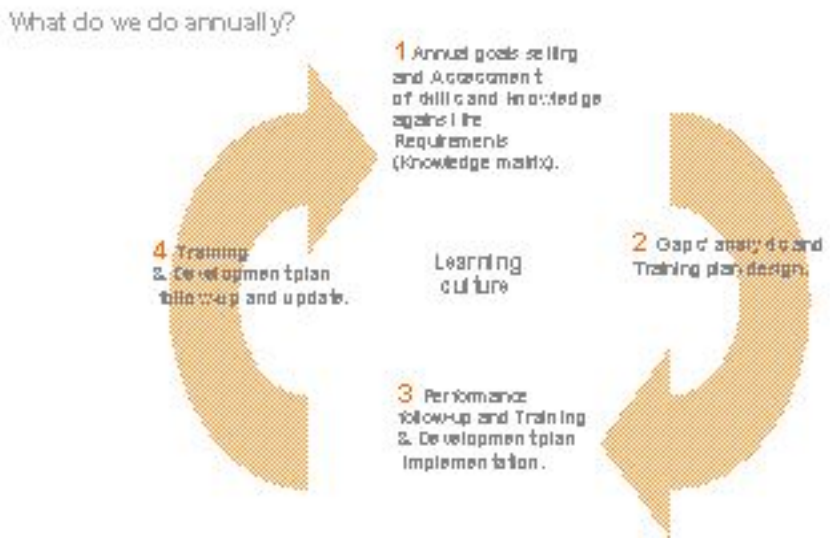
None of the presented practices would be successful without a committed learning culture. Learning processes require a facilitating context, in which a good climate is essential. That is why the role of the leaders is paramount. They have to be climate builders and learning facilitators, as well as performance managers.

In order to sustain and develop a favourable context for learning processes, on an annual basis we implement a climate survey. The results are used by leaders to define –with HR professionals guidance- courses of action to keep and improve labour climate within their teams.

c.2.3. Strategic planning

The practices presented above are not implemented randomly but strategically planned. First, a planning process takes place on an annual basis. The aim of this process is to foster the training and development of workers in the context of a dialog between them and their superiors and to reinforce a learning culture across the organisation. This process involves every member of the organisation. Figure 1 shows the mains steps of it.

Figure 1



The second process consists of critical positions identification. By analysing the impact each position has on the results of the company and the difficulties to find accurate profiles to fill them, we come up with a list of those positions that are more critical. Subsequently, special effort is put in order to form, develop, and retain those people holding those positions and those who are eligible for holding them in the future.

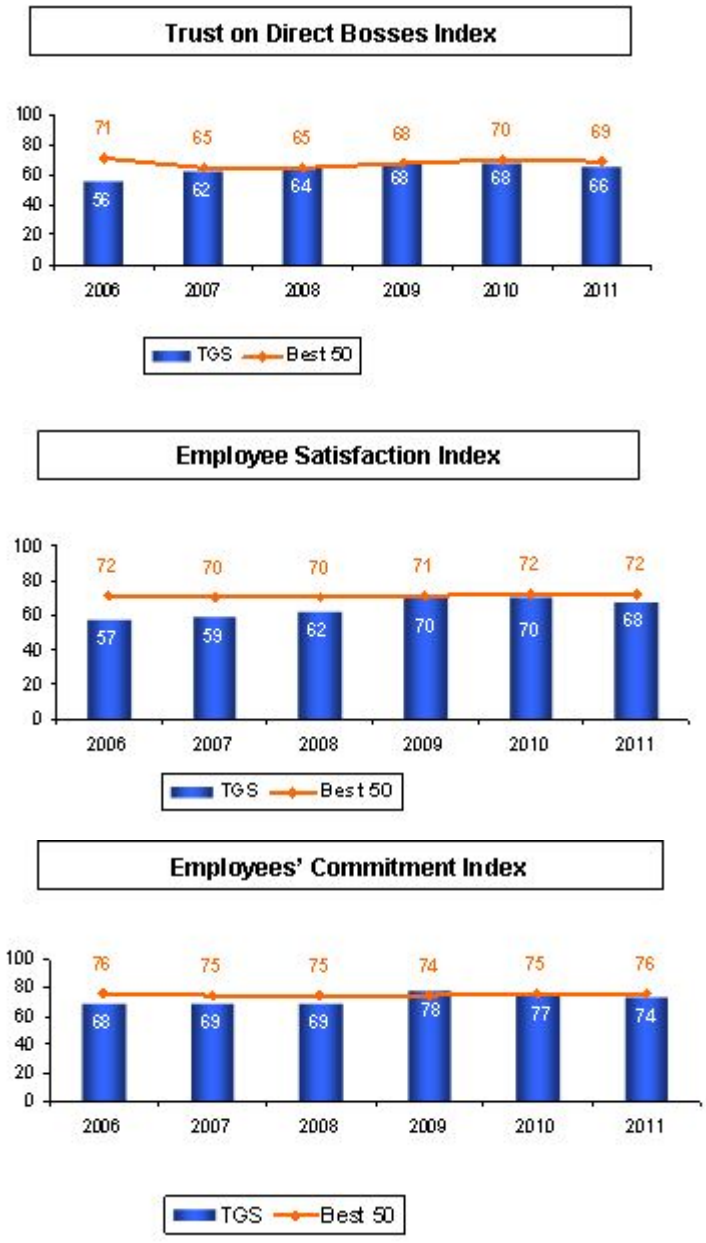
d. Results

The impact of human resources management on the results of companies are not always easy to measure. It is difficult to tell up to what extent companies' success is a consequence of them. However, we believe that our good results in terms of operational reliability are

deeply connected to the systematical and integral way in which knowledge management is tackled. The importance of context for the development of a learning culture makes figures in fields such as trust, satisfaction, and commitment very relevant. Also, the perception employees have of the variety and quality of training and development activities is crucial because they are a key component of the learning culture, necessary for an outstanding performance. Turnover and development indexes are also critical for knowledge preservation and growth, which are essential to obtain good operational results.

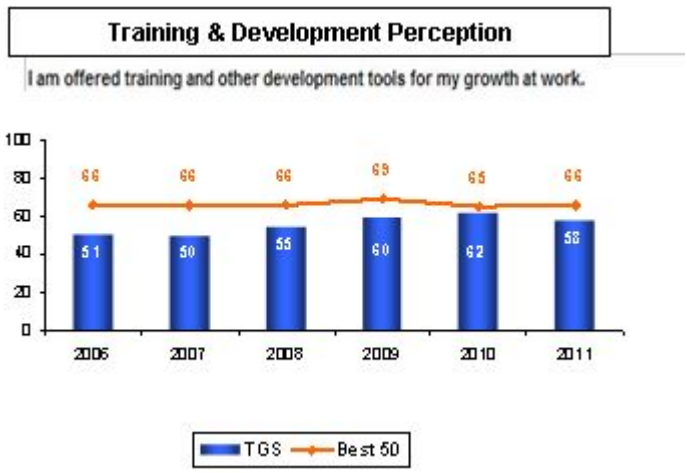
Our concern for and systematical work on the organizational culture, through the leadership and a diverse range of initiatives, leads TGS to the achievement of positive results regarding trust, employee satisfaction and commitment. The required context-related conditions necessary to enhance learning processes are given, as shown in Figure 2.

Figure 2



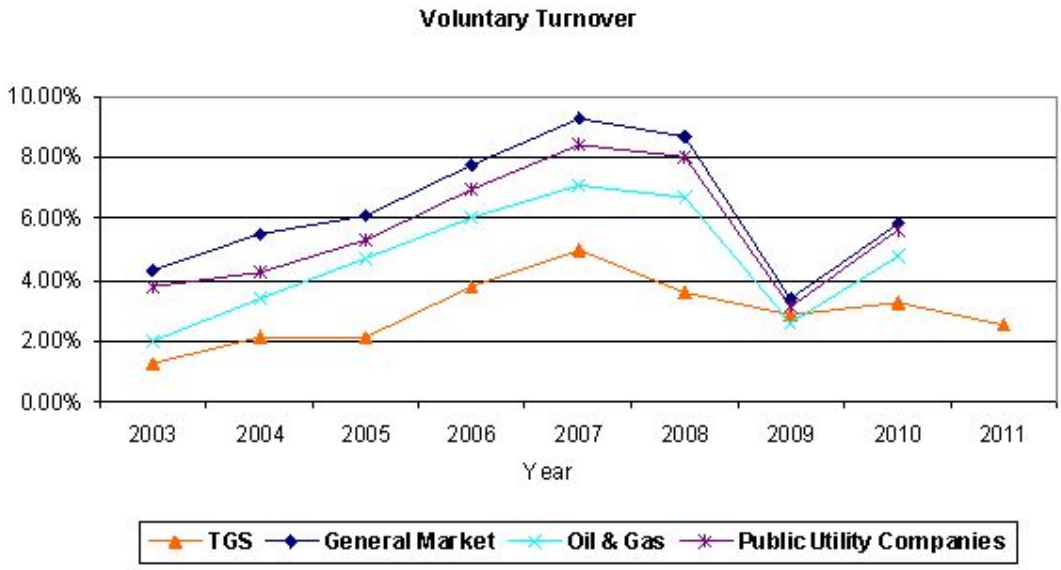
Source: Great Place To Work ©

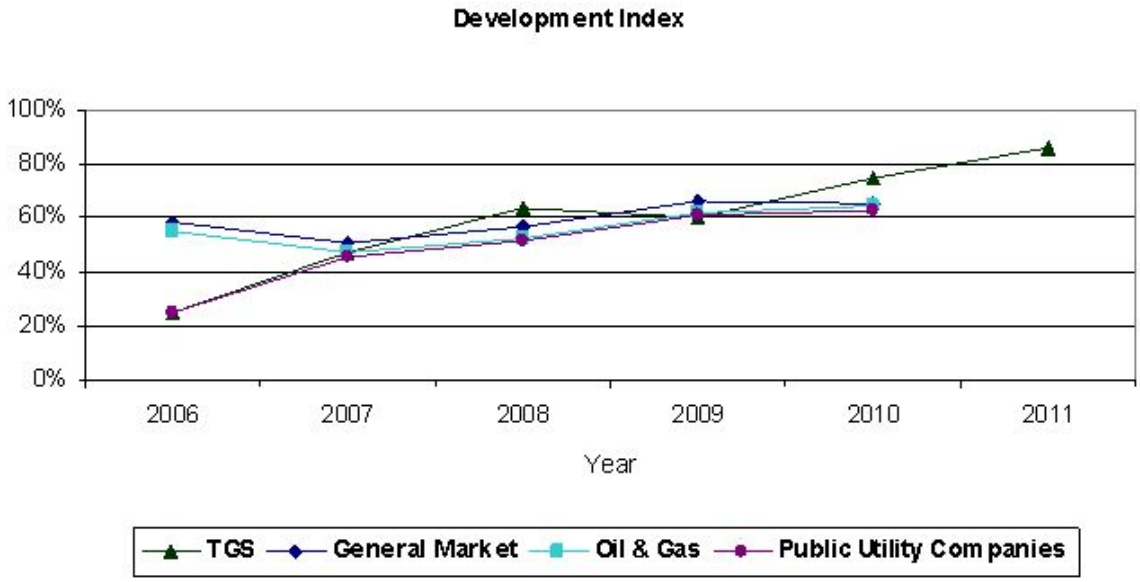
The great efforts made by the Company are well perceived and valuated by the employees. In the last years between 80% and 90% of the employees have participated in at least one training activity, and it is highly valued by the personnel.
The following chart shows the personnel perception as regards the training and development opportunities in the Company.



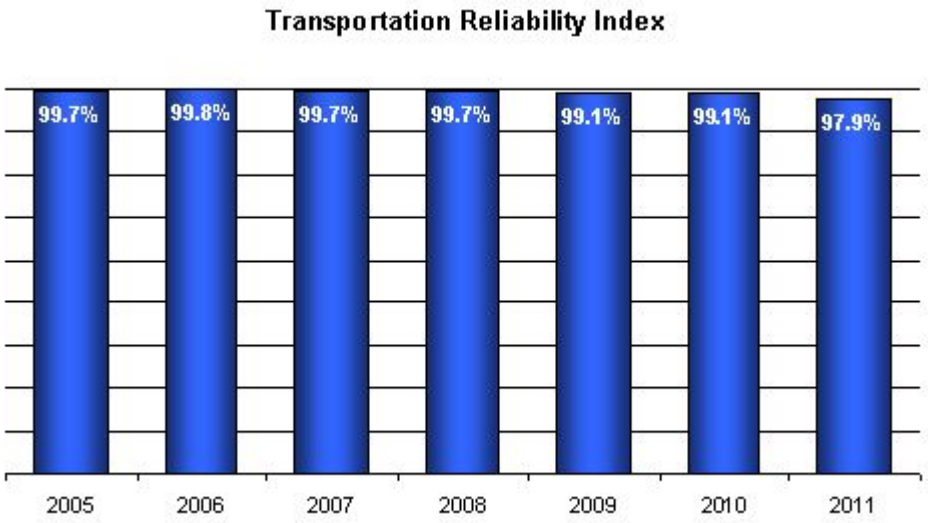
Source: Great Place To Work ©

These conditions bring about very low voluntary turnover rates and a positive trend regarding the development opportunities.





Only being consistently committed to learning, knowledge management and human resources strategic planning could bring about, in the described context, such favourable operational results. Our Transportation Reliability Index has been reaching very high values over the last years.



e. Summary / Conclusions

This paper presented a knowledge management challenge faced by TGS. Mainly, the problem is described as the risk of losing critical know-how in the sight that a big portion of skilled and experienced workers are approaching their retirement age. The challenge is deepened by the fact that the Argentine labour market is not in a position of supplying human resources equipped with the specific skills that TGS' operations require and by the geographical dispersion that TGS' workforce presents.

First, this work presented the issue and its implications. Second, it showed how the company coped with it by thoroughly analysing the problem and framing a policy capable of inspiring the needed actions and tools. Third, different practices and tools were presented, described, and classified according to the theoretical approach we subscribed. Finally, results supporting our approach to the problem were shown and commented.

TGS' understanding of the knowledge issue integrates conventional perspectives with more recent ones. Basically, it is assumed that knowledge is individual and social, that it is both explicit and tacit, and that context is crucial for fostering or hindering the flow of knowledge. The Company's Policy on Training and Development derives from this theoretical standpoint and prescribes that learning must be pursued not only at an individual level but also at a group and organisational levels, that different kinds of knowledge are required by the operation, that diverse methodologies need to be adopted, and that context has to be managed, especially through leaders.

Subsequently, tools and practices adopted by TGS are presented and described. Some of them are more aligned with a conventional approach to knowledge. These are mainly the development of Matrix of knowledge, the creation of Technical schools, and the implementation of a Specialization in gas. Others resonate with recent theoretical developments in the field of organisational learning. Chiefly they are implementation of Ega+, the Overlapping practice, the execution of Cross training, and a reformulation of the Induction process. All the practices are managed through an annual planning process.

Finally, data is presented in order to show both the acceptance of these practices by the organisation and the good performance of the company. We believe that such good results cannot be achieved without dealing with 'learning, knowledge management and human resources strategic planning' in a serious and integral way.

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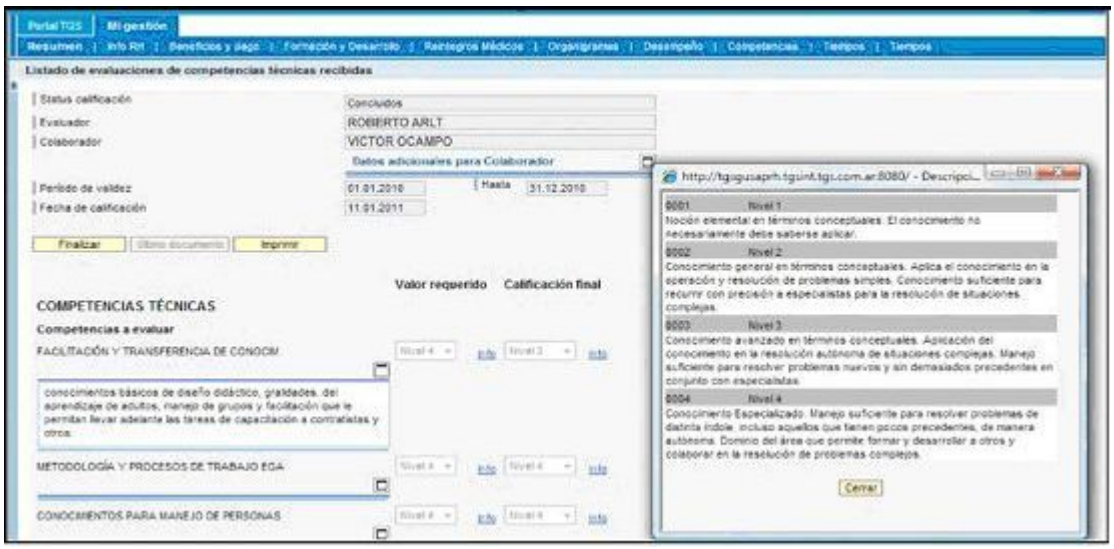
Appendix

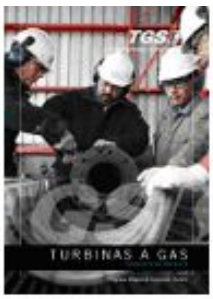
#1. Matrix of knowledge of an employee, as it is seen on HR Portal



#2. Handbooks especially designed and developed for the Technical Schools.

Cathodic Protection

Calibration of Valve Safety Systems



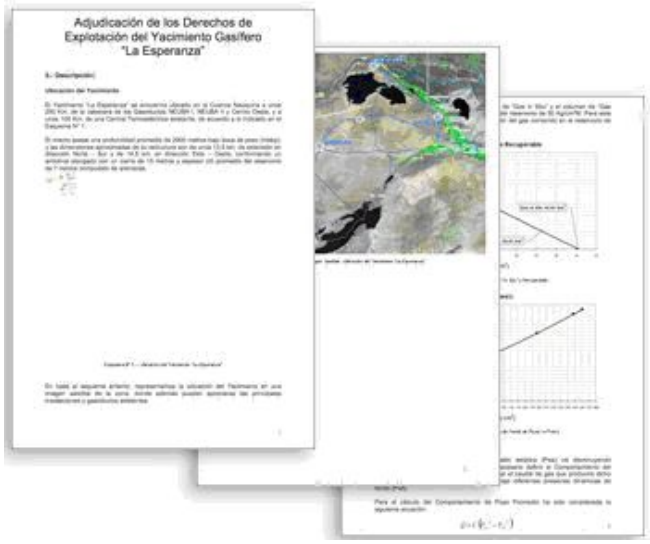
Gas Turbines

Centrifugal Compressors

Lubricants and Seal Oil

Welding

#3. Examples of the material used during the Gas specialization program.



#4. The ega+ website homepage.

#5. Handbooks especially designed and developed for the Induction to the Operations Department.

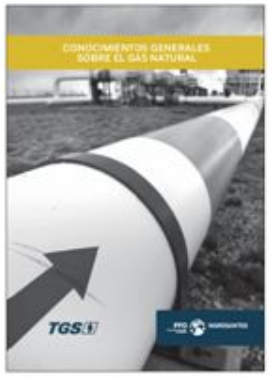
Gas transportation

Maintenance

Measurement
& Quality

Processing
& Storage

Operations
Department



General Knowledge
on Natural Gas

Safety