Proceedings of the 3rd WSEAS/IASME International Conference on ENGINEERING EDUCATION, Vouliagmeni, Greece, July 11-13, 2006 (pp39-42)

Leadership and training process for building a R&D group in SMEs of developing countries

D. CALVA MENDEZ, ALEJANDRO LANDA QUEZADA, M. LEHMAN
División de Investigación y Desarrollo Tecnológico, Sofilab SACV
Lisboa 14-A, Col. Juárez, 06600 México DF
MÉXICO, e-mail: dcalva@sofilab.com

Abstract: - In this paper, we show different considerations regarding structuring and education during the formation of a Research and Development (R&D) Group inside a Small and Medium Size Enterprise (SME). We consider that such R&D Group must have characteristics of the Operative Groups (in terms of the social psychology) and so, the styles of leadership and the achievement of the CROS-group (Conceptual, Reference and Operative Schema of the group) are taken into account. Also, we include a modified curve for the leadership style, which is in agreement with the initial academic formation of each member, as well as the concept of Operations Group, and the extrapolation of operative group towards High Performance Organization.

Key-Words: - Industry and education, psychological aspects, group and teamwork, leadership, small and medium business, education in research and development

1 Introduction

The globalization has influenced clearly several sectors in each country, and it has facilitated the inclusion of new politics for many governments.
The companies, especially SMEs (Small and Medium Size Enterprises) [1,2] of emerging economies require of a great change, since in general they are family businesses. If also, these companies look to become Technological Based Enterprises (TBEs) [3-5], they will develop training programs and their personnel will be in constant education and capacitation.

Fig. 1. A Technology Management Model, based on the education of human resources.

This type of enterprises should adopt some model for the management of technology [6-9]. A general model for management of technological has been presented in a previous work [8], and its structure is shown in the Fig. 1. This model is based on the Technology National Prize from the Mexican Government [9]. In the figure, we can see that the base of our model is the education and training of the human resources which are involved in the company.
In the present work the process to build a Research and Development Group (R&D) inside a SME is analyzed. It may seem very simple, if we think that there are many R&D groups in the world which already have been formed, but most are in the academic environment, from where they also receive their education. Then, to constitute a group inside a SME, means not only destroying barriers placed by the members of the group, since these kind of groups do not work in the same way as they do inside the university; but it also means that the R&D group will exercise a great influence inside the company. Then, this also means that it will be in a relevant position to decide the destination of the company, because of their contribution to the innovation and development of products and processes. So, this group will lead the SME for a change that has to be embraced from the lower level employee to the higher directors.
Today, the psychology of groups [10-13] has numerous applications, from companies to soccer teams, and there is a lot of interest in the study and applications of their involved concepts. So, the members of an operative group or teamwork must understand clearly the role that they are playing inside the group. The group dynamics [12] may help them to identify such role. It is also oriented to obtaining a high performance from each member, and it is some times used in the selection of the managers of companies.

2 Leadership and group

There are two basic activities for people that are part of an organization: acting as a group and communicating events or results. The first thing is due to the same human nature, since people need to belong to any group. Speaking about groups or teams is important because of its reaches in diverse environments of our lives. All people belong, in any way, to one or more groups: friends, study or work partners, family, religious, therapeutic, etc. Communication allows strengthening the knots in a group and also to locate the role of each member.

Many studies can be found regarding leadership [14-17] and the styles that have to do with confronting different situations or status of the members in a group.

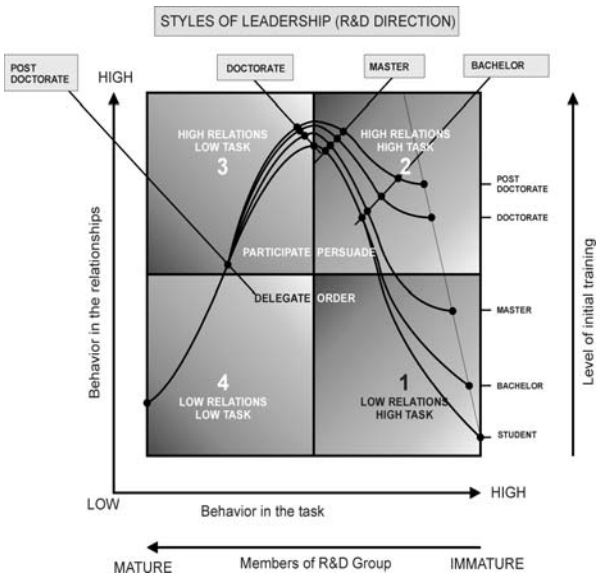

Fig. 2 – Leadership styles adapted for the build of R&D group.

One of the more used theories in the literature and with bigger quantity of intuitive applications is the one developed by Hersey and K. Blanchard [17], which is known as a situational model. According to this model, the leader of a group should take different position (represented in quadrants) regarding each member of the group, considering the variables of relationships and task. These positions depend on the maturity of the members for acting in a group, but also with the academic formation of each member, for the case of a R&D group. Then, with these considerations several curves are obtained, from the original situational model (see Fig. 2). Then, the initial position of the leader is according to the academic level of the corresponding member, at the beginning of the formation of the R&D group. We see that until the post doctorate level, the leader can begin to delegate tasks and relationships, since it supposes bigger experience in both variables (for each member). Also, this way the leader can act considering academic formation of each member and not only in the individual plane, which can be very subjective. This way, he also gets rid of criticism from the other members since they will have clear view of the way they will be treated in consonance with their academic level. Another addition we have made to the original model of Hersey and Blanchard is the variable of time inside each quadrant that is shown diagonally from the white color to higher levels of gray. All new members in the group can be included in any quadrant according with their academic level and their experience in working in a group. This modified model permits the comparision of the maturity of each member, with the purpose of building an homogeneous group.

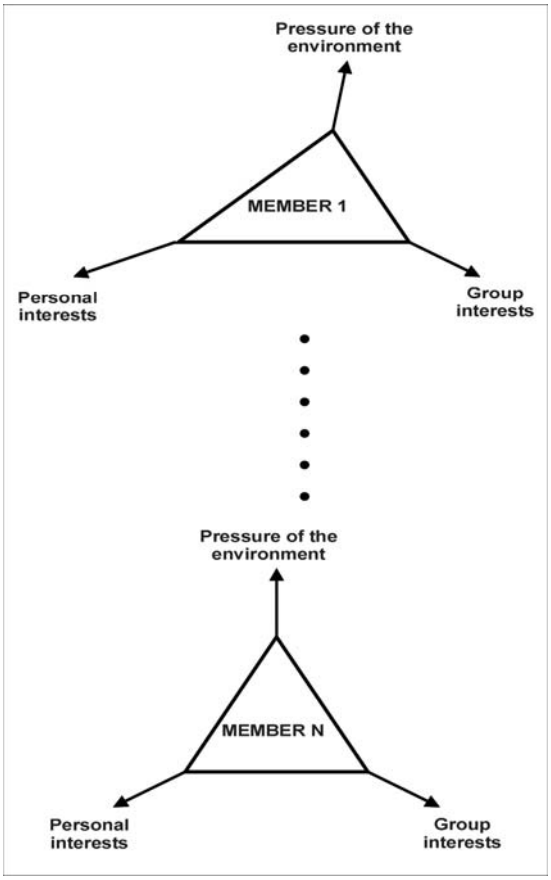

Fig. 3 – Triangle of each member in an operative group.

Also, it is important, from a group point of view, to establish a CROS [18] (Conceptual, Reference and Operative Scheme) of the group, starting from each individual CROS. This concept can be seen in Fig. 3, where each triangle of a member is influenced by personal and groupal interests, as well as for the pressures of the environment. The form of each triangle represents the CROS of each member of the group, which can also be modified through the interaction with the remaining members. For the planning of common objectives each triangle should have finally a similar form. This is a fundamental result that can be achieved through the group dynamics. It is true that each member reacts differently under the same conditions of pressure or have different personal interests, but it is important to be able to achieve the CROS-group with which each member will feel identified.

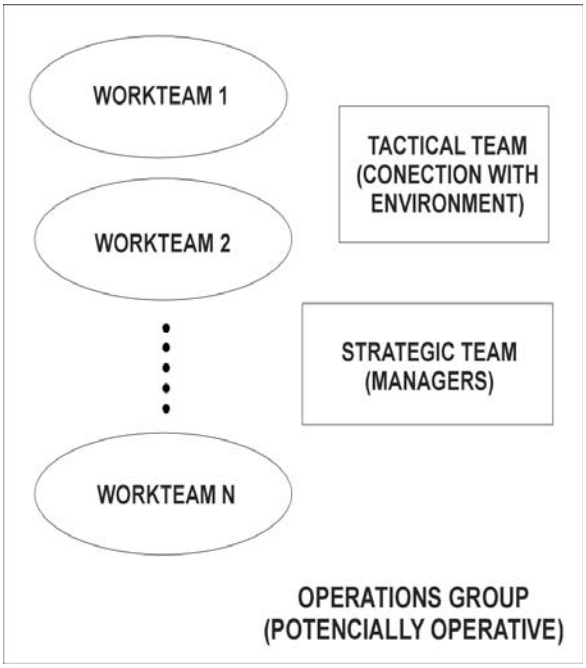

Fig. 4 – Structure of Operations Group

3 Operation groups

Now, we introduce the concept of Operations (different to Operative) Group, in a similar way to the special groups that exist inside the police, Red Cross, firefighters, etc. This type of groups only enters in action whenever there is a task, but remain inactive when there is not a task. Meanwhile, they should receive a training to maintain their form and structure, in order to be prepared for the moment to enter in action. R&D Groups act in a similar way, because they are operative when they have a project. Also, this concept can be extended for all the enterprise, because from different aspect it can be operative or operations enterprise. In the bibliography the term operative is not used for enterprises, and they are know as High Performance Organizations.

As we can see in Fig. 4 the operations group has different teams inside its structure. There are two important teams, one is the Tactical Team that allows establishing relationships with other groups and takes the administration and management of technology. Another is the Strategic Team that determines the direction and takes the decisions inside the group, establishing the priorities of research and development and detecting the needs (relations, task and academic background) of each member.

There exist several studies about the manner in which an organization or company becomes a High Performance Organization [19-23]. In Fig. 5 we show the structure of such organization, where we can see that it has a similar structure than the Operations Group, although now there are work teams and operations groups inside it.

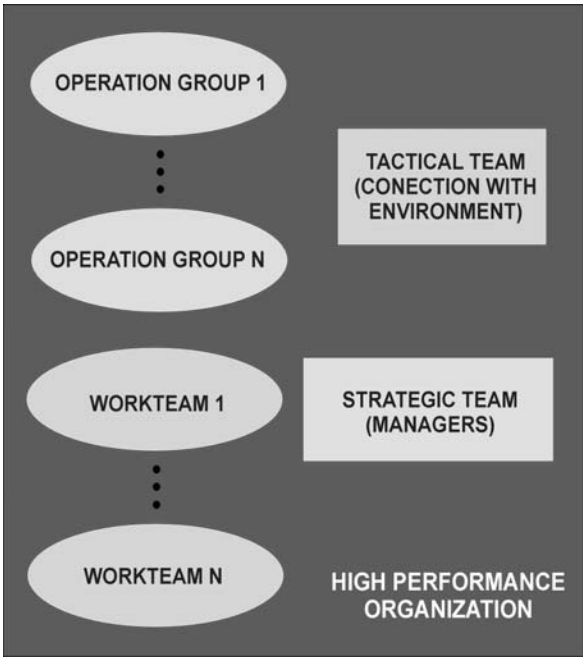

Fig. 5 – Structure of the High Performance Organization.

4 Conclusions

Several aspects related with the formation of a Research and Development (R&D) group, inside a

Small and Medium Enterprise (SME), have been shown. This is part of a Management Technology model, based on training and education of the personnel inside the company, presented in a previous work [8]. In the first place, the style of the appropriate leadership is shown, and the theory of Hersey and Blanchard [17] is adapted for our case, considering the initial academic formation of each member. Then, some considerations about the Conceptual Reference and Operative Schema (CROS) of each member in the group is done. Also, the concept of Operations Group and the structure for a High Performance Organization are developed. In this case, it is supposed that the structure of the R&D operative group has been extrapolated towards the whole company.

Acknowledgments:
This work was supported by Sofilab S. A. de C. V., CONACyT and Secretaría de Hacienda y Crédito Público (México).

References:

[1] H. Katrak, R. Strange, *Small-Scale Enterprises In Developing And Transitional Economies*, Palgrave Macmillan, 2002.

[2] E. Zeballos, "Micro, pequeñas y medianas empresas en Latinoamérica", *Rev. Cepal* **79**, pp. 53-60 (2003), *in spanish*.

[3] Michael J. C. Martin, *Managing Innovation and Entrepreneurship in Technology-Based Firms*, John Wiley & Sons, Inc., New York, 1994.

[4] L. F. Marcano González, Lorena García, "The technological base enterprises: Options for Latin-America", *Espacios* **18**(2) (1997), *in spanish*.

[5] M. Zhang, A. Macpherson, O. Jones, "Conceptualizing the Learning Process in SMEs: Improving Innovation through External Orientation", *International Small Business Journal* **24**, 299-323 (2006).

[6] Y. Malhotra, "Knowledge Management and New Organization Forms: A Framework for Business Model Innovation", *Information Resources Management Journal*, **13**(1), 5-14 (2000).

[7] C. M. Chang, *Engineering Management: Challenges in the New Millennium*, Pearson/Prentice Hall, NJ, 2004.

[8] D. Calva Méndez, M. Lehman, "Technology and innovation in Mexico: a perspective from Small and Medium-Sized Enterprises (SMEs)", *Proceedings of IEEE International Engineering Management Conference*, Newfoundland (Canada), 2005.

[9] Secretaría de Economía, *Guía de Participación para el Premio Nacional de Tecnología 2005*, http://www.pnt.org.mx/pdf/modelo2005.pdf (in spanish), acceded 23-05-2006.

[10] Daniel T. Gilbert, Susan T. Fiske, G. Lindzey, *The Handbook of Social Psychology*, Fourth Edition, McGraw-Hill, New York, 1998.

[11] H. H.Kelley, J. W. Thibaut**,** *The Social Psychology of Groups*, Transaction Publisher, NJ, 1986.

[12] D. Levi, *Group Dynamics for Teams*, SAGE Publications, Inc., Thousand Oaks (California), 2001.

[13] B. Tuckman, "Developmental sequence in small groups", *Psychological bulletin* **63**, 384-399 (1965).

[14] J. Murphy, K. S. Louis, *Handbook of Research on Educational Administration*, Jossey Bass, Inc., San Francisco, 1999.

[15] F. W. English, *The SAGE Handbook of Educational Leadership Advances in Theory, Research, and Practice*, SAGE Publications, Inc., Thousand Oaks (California), 2005.

[16] S. L. Jacobson, E. S. Hickcox, R. B. Stevenson, eds., *School Administration: Persistent Dilemmas in Preparation and Practice*, Praeger Publishers, Westport (UK), 1996.

[17] P. Hersey, K. H. Blanchard, *Leadership and the One Minute Manager*, William Morrow, 1999.

[18] Pichon-Rivière, Enrique; *El proceso grupal*, Ed. Nueva Visión, Buenos Aires, 1985, in spanish.

[19] S. Jones, M. M. Beyerlein, *Developing High-Performance Work Teams*, American Society for Training & Development, 1999.

[20] White, B. J. "Developing Leaders for the High-Performance Workplace", *Human Resource Management* **33**(1), 161-168 (1994).

[21] E. E. Lawler, **"**Creating high performance organizations", Asia Pacific Journal of Human Resources **43**(1), 10-17 (2005).

[22] F. Hesselbein, R. Johnston, eds., *On High Performance Organizations: A Leader to Leader Guide*, Jossey Bass, Inc., San Francisco, 2002.

[23] L. Holbeche, *The High Performance Organization: Creating Dynamic Stability and Sustainable Success*, Elsevier, Oxford, 2005.