

# Management Skills Difference between Low and High R&D Concentration Firms

**Amiram PORATH**

Tel Aviv University (The Leon Recanati Graduate School of Administration), Israel  
E-mail: amirampster@gmail.com  
Phone: +972-54-8028171

## *Abstract*

*The article shows that in firms with high R&D concentration management involvement in R&D issues is high. That involvement shows that the management team has a crucial part in the role of R&D in these firms. It requires that the management develop the skills and intuition required to deal with R&D issues in addition to the internal routines in the firms. In low R&D concentration firms that requirement does not exist. The environment does not encourage the wasteful practice of developing unnecessary skills. However, when moving firms from the Low end of R&D concentration to the High end, in parallel to the development of the required internal routines, and the creation of the infrastructure, new skills have to be developed in the management team.*

*Further, the article shows that firms with high R&D concentration involved in Collaborative research tend to copy management organs and routines from their structure to the consortia they form. This tendency presents another difficulty for firms with low R&D concentration when they come to join such consortia or programs.*

*As this is only a preliminary research into these aspects as they are demonstrated in collaborative research consortia, the article ends with recommendations for future research.*

**Keywords:** *R&D, research, statistics, concentration management, development*

**JEL classification:** *C44, O32*

## **Background**

The EU has been talking about increasing the cooperation between the research community and society (EU, 2006), the drive towards the knowledge based society (EU, 2003) and other initiatives, intended to make Knowledge the basis of the EU economy.

However the EU has significant traditional sectors, with little or no R&D performed in the firms in the sector. These sectors may have research performed in

research organizations, or in some firms that supply the results on the form of machines or processes to the rest of the sector members. These sectors (e.g. wood, furniture, jewelry) find it difficult to accept the drive for innovation in order to improve their competitiveness as they are traditionally used to compete on quality, price service or similar, and performing research and development is alien to them. When compared with firms which perform R&D as part of their regular activity (e.g. the High-Tech sectors) the traditional sectors show different organizational aspects.

The firms with high R&D concentration live in the technological world, which has its own characteristics influencing their structure and routines. The technological world is getting more competitive (Kaiser, 2000) the ever-shortening product life cycle, and the technological revolutions are placing increasingly heavy demands on the development departments of the industry.

The environment is becoming more and more complex as presented by Brown and Eisenhardt (1998), in their definition of Co-Opetitors - describing the interesting enemy – friend relationships that complicate the commercial scenery. This complication in the working environment of the firms with high R&D concentration is further enhanced when considering the involvement of the research organizations and the government. When in their 1997 article Etzkowitz, & Leydersdorff presented this complex relationship as the “Triple Helix” their selection of the name referred not only to its fundamental role (such as the double helix of the DNA), but also to the intertwining and complexity derived from it.

The cooperation between industry and academy in large consortia for generic technology development while the firms involved keep competing in the market place is relatively new. In both major areas for such cooperation, the US and the EU, that type of cooperation was forbidden in the past. Only since 1984 in the USA<sup>1</sup> and 1985 in the EU (Miyagiwa and Ohno, 2002) have the law restricting such cooperation been lifted. The change allowed governments to actively support such activities, which were considered a potential boost to economic development, and encouraged research into the economic nature of this activity with numerous models (Katz, 1986; D’Aspremont, & Jacquemin, 1988; Kamien, Miller, and Zang, 1992; Laredo, 1998; Pastor & Sandonis, 2002), The literature also focused on different players (, Rosenberg, 1990; Lukkonnen, 1988), as well as different disciplines such as social and organizational theories (Thursby, Thursby, & Mukherjee, 2005; Stern & Pozner, 2007) ending with more complex models presented later (Doz, Olk, & Ring, 2000; Porath, 2008).

While this research activity looked at both the function and the structure of the consortia, there was never any doubt as to the importance it held for the participants. Therefore it was expected that the management of firms in that world would tends to be familiar with R&D and monitor it closely. As the R&D, like marketing, purchasing has become an interface with the external world, and not just an internal procedure, the management attention and involvement became more important.

---

<sup>1</sup> The USA National Cooperation Act of 1984

For firms with Low R&D concentration dealing in a different environment, this is not the case. R&D is not an interface with the world, it is not part of the competition / cooperation network of the business and therefore the management would not be required to show any expertise in that field. In fact, due to the low concentration of R&D, any management involvement or expertise development can be seen as a waste of resources.

However, when trying to introduce the firms with low R&D concentration in the R&D game, and especially into the collaborative research (more complex) segment of that world, the management can be often caught off-guard without the preparation to deal with this activity.

The firms with high R&D concentration would be interested in the success of the collaborative research and as they are familiar with the management involvement mode of operation would seek to copy that into the consortia they were forming. For the firms with low R&D concentration this unfamiliar structure and emphasis would seem strange and unfamiliar and could lead to further apprehension.

## **Research**

### **Research question**

Considering the above, the research question is: Does the management involvement in firms with high R&D concentration also influence the structure of R&D consortia they form?

This could be translated into working hypotheses:

- 1. Firms with high R&D concentration will show management involvement in R&D related decisions;**
- 2. Firms with high R&D concentration will tend to form management organs and routines similar to their own when forming R&D consortia.**

In order to verify the involvement of management in firms with high R&D concentration, and their tendencies I used the results of the research described below. That research dealt more generally with consortia forming mechanisms, but the decision making regarding the formation in the firms joining, and the resulting structure of the consortia formed, were part of the research scope.

### **Instrument**

The questionnaire employed was an adaptation of a validated questionnaire from the research performed by Dyer and Nobeoka (2000). The original questionnaire was relevant to consortia registered in the US. These consortia were organized voluntarily without any government funding and therefore had a free structure, with no compulsory institutional structure or by-laws. As the consortia researched here were financed by the government and were under a structured

program this required some adaptation of the questionnaire to relate to the specific circumstances of the projects, the main parameters however, remained unchanged.

The questionnaire relates to several stages in the consortium life cycle: the circumstances leading to the establishment of such an entity, the role or potential role of certain functions the structure and function of the resulting consortium, and the expectations from such an activity.

### **Population**

The primary data were derived from the questionnaire and supplemented by interviews for clarification and refining of viewpoints. The population is comprised of firms applying to the Israeli Magnet Program (Porath, 2004) as well as those that are participating in or veterans of its projects. To date, the Magnet Program has initiated 37 projects, 11 of which are currently ongoing. They cover most of the industrial areas existing in Israel, from agriculture to medicine and from materials to communications and general software platforms. On average, Magnet issues calls for formation of consortia for proposing new projects at least three times per year (4 in 2003 and 5 in 2004). Firms that have participated in kick-off meetings are also among the population examined as veterans of successful and failing proposals. The entire population of such firms is relatively small, as it is a sub-section of firms seeking government support that is not overly large, because of the limitations imposed by the R&D Law, which are a major deterrent to seeking such help, and because of the small number of firms in that group that are large enough to deal with generic research (a maximum of 30% generic R&D is allowed per firm). Since the program targets long-term research, this reduces the number of firms that are involved or are ready to be involved (Porath, 2004).

The questionnaire targets firm managers and project managers who were involved in the process of making the decision to join the consortium and have experience of its operation and functioning.

### **Methodology**

Ninety-seven questionnaires were received out of 220 sent or handed out at various meetings of Magnet consortia; a 44.1% response rate. The responses came from 20 of the 33 Magnet projects (60%) existing at the end of data collection (end of 2005). Since the beginning of the program, firms have merged and split, some have disappeared completely, or the relevant personnel could not be tracked down. The gathering of information by mail showed little response despite the introduction letter by the program director; personal collection via meetings or e-mail following meetings and phone calls proved the most efficient. The sample was therefore comprised of managers of projects, firms' representatives, and CEOs with actual first-hand acquaintance or interest in the program. Most had previous experience but some were newcomers to the program.

The statistical analysis performed in this research was adapted to the specific needs of the analysis. The results section presents the questions answered and analyzed.

## Results

The results regarding the involvement of management levels involved in approving the participation in the project , and regarding the expected structure of the consortium management.

### Questions regarding decision making (join the consortium)

Question 8 referred to deciding on joining the consortium - Forming a committee to decide regarding joining a consortium. This again is a Yes/No question.

#### Q8 Statistics

**Table 1**

Item	Yes	No
Will you form a committee?	64.8%	35.2%

As can be seen, in most firms the decision to enter a consortium would follow the evaluation work of a committee, an indication of the multi-departmental effort expected of such a decision.

The questionnaire asked (question 20) how many management levels would be required for approval of participation in the organization? The answers varied between 1 and 3 with 2 getting 56.0% of the answers.

#### Q20 statistics

**Table 2**

Item	Mean	Median	Mode	SD
Two levels of management	1.87	2.00	2	0.655

It is important to bear in mind that these firms are high concentration R&D firms, some large international firms and some medium size. There were no early stage start-ups, as the regulation of the Israeli Magnet program demand that the firms participating would invest more than 30% of their R&D budget on the generic project. Therefore the firms involved would have more than one or two management levels. In most cases the minimal management level required for approval would be the Vice President for R&D.

## Questions regarding future consortium management structure

The results regarding the management expectations and the type of management structure to be established were as follows:

### Statistics

Table 3 – Q12–13

Item	Yes	No
Will the consortium have a board?	84.9%	15.1%
Will the consortium have technical committees?	97.9%	2.1%

### Discussion and conclusions

The results above show with high clarity that 2 levels of management were normally involved in the decision making regarding the firms involvement in the consortium and that these in most cases followed the work and evaluation (recommendation) of an interdisciplinary committee.

Such routines are indications of the seriousness the management views the involvement in such activities and the internal routines and expertise required to make them. The results in this preliminary research into the comparison in the management skills regarding R&D management capabilities between the high R&D concentrations firms and the low R&D concentration firms, would indicate although the hypotheses proposed above were supported, a more thorough, in depth research should follow. The involvement of the management presented above is beyond the economic size of the budgets compared to the normal business some of them do yearly<sup>2</sup>.

The involvement of the management supports the view that in the high R&D concentration sectors the R&D is viewed as a strategic activity and merits the involvement of the management. This highlights the difference between the high R&D concentration firms and the low in that aspect.

On the indication of the resulting management structure in the consortium it would appear that the firms view the structure as important enough to keep a similar structure to the one they employ internally. They board and technical committee would allow these firms to work in a familiar environment when coming to the management of an R&D activity.

These two points, the management involvement and skills and the structure of R&D collaborative research consortia, would indicate some of the difficulties low R&D concentration firms encounter when trying to integrate themselves into the high R&D concentration world. Convincing these firms to join R&D consortia would create internal, managerial and other problems that may in time lead to dissatisfaction and thus to these firms turning away from that direction. These

---

<sup>2</sup> Some of the Israeli multi-national firms selling hundreds of millions of US\$ a year participated in the projects, which could not be more than a few single percent of their annual sales.

firms would find the new world, activity, strange and unfamiliar, and may feel that due to their lack of ability to integrate they get out of it, less than others.

It may be useful for program managers, interested in integrating such low R&D concentration firms to create management support activities to supplement the R&D activity. These activities would allow the management in the low R&D concentration firms to develop the routines, experience and outlook and support their teams in the consortia. If that could be achieved, and the firms would feel that they get out of the R&D consortia activity as much as the other firms, it may lead to increased participation, and also to increased R&D. Such training, mentoring or other assistive activities are relatively easy to plan.

The research presented above is part of a larger research into the formation of R&D consortia under structured programs. The data collected for the formation mechanism research was wide enough to allow some additional analysis into the expected management structure, in addition to the analysis of the decision making process in the firms regarding joining the consortia. However, as these two topics were not the focus of the research regarding the management and the research questions mentioned here, the analysis cannot be complete. The research question and the hypotheses mentioned here were supported, and can be used for further research as described below,

### **Limitations to the research**

The most obvious limitation to the research mentioned here are the small sample of firms involved and the lack of a control group. It would however, be very difficult to create a comparative group of low-intensity R&D firms and check the involvement of the management in R&D.

Two additional limitations regarding the sample arise – one is the firm size. The firms were not controlled regarding size, and therefore the size may have some influence in the involvement of the management. However, as many of the firms were at least medium in size that would be a small concern.

Another limitation is the scope of sectors that were covered. Only few sectors were covered and some of them only in a very limited way (e.g. pharmaceuticals). The results therefore may have been indicative of the few sectors investigated and not as general as claimed. While that could not be helped due to the structure of the program investigated and the country it operates in, this is also not the case, as the results show that there is very high similarity in attitudes between the different sectors in that regard.

### **Future research**

A larger sample of firms from different High-intensity R&D sectors may present some differences in the management involvement and the resulting preference as to the management structure of R&D consortia. The research should also include a size division so as to see if the relative size of the R&D budget to the firm's economic activities merits the involvement due to the economic aspect.

Further empirical research is required (Fontana, Geuna, & Matt, 2006), including investigation into several of the interesting sectorial characteristics that emerged in this research. Even if only to remove any doubts regarding differences between high R&D concentration sectors.

### Bibliography

1. Brown, S., L. and Eisenhardt, K., M., (1998) *Competing on the edge*. Harvard Business School Press. Boston, Massachusetts, USA.
2. D'Aspremont, C., & Jacquemin, A., (1988) Cooperative and non-cooperative R&D in duopoly with spillover. *The American Economic Review*, 78, 1133–1137.
3. Doz, Y. L., Olk, P. M., & Ring, P. S., (2000) Formation processes of R&D consortia: Which path to take? Where does it lead? *Strategic Management Journal*, 21, 239–266.
4. Dyer, J. H., & Nobeoka, K., (2000) Creating and managing a high performance knowledge-sharing network: The Toyota case. *Strategic Management Journal*, 21, 345–367.
5. Etzkowitz, H. & Leydersdorff, Z., (1997) *Universities in the global knowledge economy: The triple helix University-Industry-Government relations*. London, UK, Cassel Academic.
6. EU., (2003) Communication from the Commission; Investing in research: an action plan for Europe. *COM (2003) 226 final/2*.
7. EU, (2006) Report of the CREST expert group on: Encourage the reform of public research centers and universities, in particular to promote transfer of knowledge to society and industry. *Final report, March*.
8. Fontana, R., Geuna, A., & Matt, M., (2006) Factors affecting university – industry R&D projects: The importance of searching, screening and signaling. *Research Policy*, 35, 309-323.
9. Kaiser, U., (2000) An empirical test of models explaining research expenditures and research cooperation: Evidence for the German service sector. *International Journal of Industrial Organization*, 20, 747–774.
10. Kamien, M. I., Muller, E., & Zang, I., (1992) Research joint ventures and R&D cartels. *The American Economic Review*, 82(5), 1293–1306.
11. Katz, M., (1986) An analysis of cooperative research and development. *Rand Journal of Economics*, 17, 527–543.
12. Laredo, P., (1998) The networks promoted by the framework program and the questions they raise about its formulation and implementation. *Research Policy*, 27, 589–598.
13. Luukkonen, T., (1998) The difficulties in assessing the impact of EU framework programmes. *Research Policy*, 27, 599–610.

14. Miyagiwa, K., & Ohno, Y., (2002) Uncertainty, spillovers, and cooperative R&D. *International Journal of Industrial Organization*, 20, 855–876.
15. Olk, P., (1991) *The Formation Process of Research and Development Consortia*. Unpublished doctoral dissertation, University of Pennsylvania, Pittsburg.
16. Pastor, M., & Sandons, J., (2002) Research joint ventures vs. cross licensing agreements: An agency approach. *International Journal of Industrial Organization*, 20, 215–249.
17. Porath, A., (2004) Intellectual property by-laws in national and multi national programs: A comparison of the EU Framework Programs and the Israeli Magnet Program. Proc. Inter. Conf. EARMA, Bucharest, Rumania.
18. Porath, A., (2004) Intellectual property by-laws in national and multi national programs: A comparison of the EU Framework Programs and the Israeli Magnet Program. Proc. Inter. Conf. EARMA, Bucharest, Rumania.
19. Porath, A., (2008) Joint Venture Forming mechanisms under structured programs. working paper. Proc. PhD workshop at Austauschprozesse: *Extracting the value out of University-Industry Interaction*. Muenster, Germany.
20. Rosenberg, N., (1990) Why do Firms do Basic Research (With Their Own Money)? *Research Policy*, XIX 2, 165-174.
21. Stern, I., & Pozner, J. E., (2007) Organizational size, performance and frequency-base imitation: A test of competing hypotheses. *ISC conference, Jerusalem, Israel*.
22. Thursby, M., Thursby, J. & Mukherjee, S., (2005) Are there real effects of licensing on academic research? A life cycle view. *NBER Working Paper* No. 11497.