



## **Jiis' policy research report on enhancing R&D Collaboration as a tool for supporting SMEs: potential implications for the EEN**

**A research conducted as part of the Jiis participation in the EEN**

### **English Summary**

#### **Background**

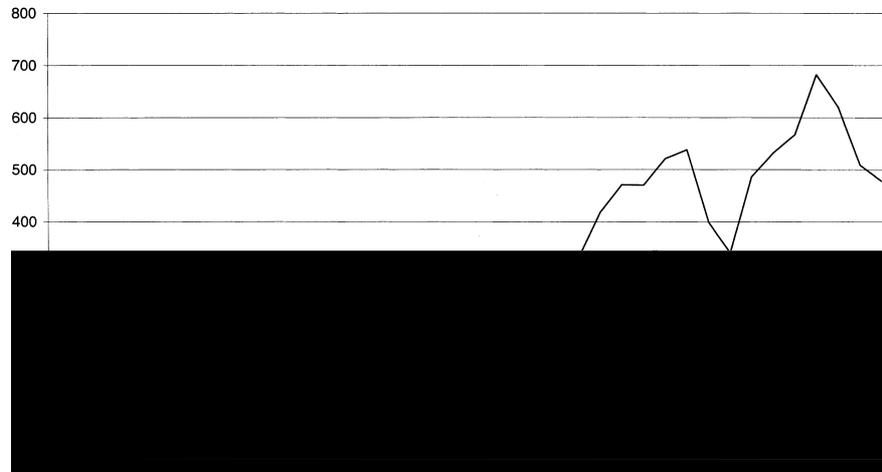
The Jiis' current policy research report on R&D international cooperation continues the previous research concerning *The Israeli Incubation Program*. While the previous report argued that the *Incubation Program* is a significant player in encouraging entrepreneurs who wish to build a new technology-based firm (start-up), the current study indicates that international R&D collaboration projects serves as a crucial element for supporting the realization of these new technology-based ventures into viable SMEs. The study concludes that collaborative projects are critically important at the early stages of the firms both as a financial resource for further technological development and as a channel of networking and business development.

These collaborative projects are especially important to incubated firms since their initial networking level is lower than regular new ventures (Kaufmann, et al 2007). However, the exact impact of R&D collaboration projects on the firms' activity *de-facto*, as in the case of the technological incubators, is highly controversial. Hence, an important goal of the study is to evaluate the added-value of such collaborations, i.e. their impact on the firms' business, commercial and technological capabilities. The study focused on examining potential connections between the *Enterprise Europe Network (EEN)* and the international R&D schemes and their future extension is explicitly recommended, as will be described at the last section of the summary.

There is a clear trend of R&D collaboration around the world. Projects are increasingly directed at elaborating technological cooperation and business collaboration between different countries. This trend is part of a wider conception that visualizes future



technological development as a cross-border mission that requires both technological as well as business abilities which are not all gathered in a single country. Likewise, perceptions of competitiveness are also expanding from one country towards a cluster of states.



The increase in new R&D collaborations in general (Hagedoorn 2002)

The European Union was one of the first bodies to recognize and react to this tendency and to consider it not only as a mode of enhancing competitiveness, as it supports the dissemination of knowledge and brings together different R&D methods.

*The EEN*, for example, is an important instrument for disseminating technology and novel discoveries through the provision of a platform which assists firms in marketing their technological solutions and searching for new ones. The European view on the importance of international R&D cooperation is grounded on the conception that strategic policy is necessary in order to promote cooperation between enterprises and companies from various countries and that well-chosen policy tools will be able to assist in realizing R&D activities while exploiting their business potential.

The state of Israel maintains a similar perception. At the middle of the ninetieth, Israel started implementing a number of policy tools in order to extend the cooperation between Israeli and foreign companies. Vast amount of public funds were invested in different schemes directed at realizing industrial international cooperation through R&D programs. These programs are divided into three categories. **The first category** is composed of *bilateral funds* such as "Israel-US Bird Foundation", which are directed at stimulating and supporting industrial R&D of mutual benefit to the countries that support the fund. **The second category** is composed of *bilateral and multilateral agreements*, which are signed between Israel and other countries, such as France, Germany, United Kingdom, China and Brazil, and are dedicated to the development of long term R&D collaboration between companies of the countries involved. In the framework of the second category is "*Eureka Network*", a pan-



European network that supports businesses which carry out projects that develop innovative products, processes and services. Lately Eureka established "*Eurostars Program*" dedicated to enhancing collaborations between SMEs in particular. Within this second category, "Eurostars" is unique since it holds a distinct fund responsible for financing the collaborations, whereas at the other bilateral and multilateral agreements, the funding is received through each country's innovation agency. **The third category** is composed by the European Framework Program.

Following the establishment of the Israeli Incubators Program at 1990, "Magnet Program" was founded with the purpose of creating collaborations between Israeli industry and academy directed at generic technology. Gradually, five dedicated *bilateral funds* were created with The United States, Singapore, Canada, Korea and the UK (first category) In parallel, Israel promoted *bilateral and multilateral agreements* with different countries concerning industrial R&D international cooperation. These agreements were derived from the perception that apart from the technological aspects, R&D international cooperation can significantly contribute to strengthening business aspects in addition to the position of Israeli companies in global markets. Israel also joined *Eureka Program* at 2002 that includes today Industrial R&D collaboration projects within 40 countries (second category). At 1994, Israel joined the European Framework Program (third category).

The Israeli governmental finance of the second category's programs, similar to the finance of the bilateral funds of the first category, is provided through a typical matching procedure: the public finance is up to 50 percent of the project's costs while the companies are required to complete the rest of the costs from their own resources. The public finance is conditional: if the project is commercialized, the company returns the loan through royalties. The firm has to pay 3% from its revenue until the loan is fully returned and The State of Israel uses its income from the royalties for financing additional R&D projects. However, if the project ends with failure, the loan is perceived as a subsidy and no royalties are been returned to the state.

This wide range of programs emphasizes the importance of efficient instrument dedicated to partner search since such an activity is commonly beyond SMEs' capabilities especially in the case of incubated and start-up companies. This study points to the potential ability of the *EEN* to assist in the process of finding appropriate partners for the different European programs, mainly *Eureka* and the FP7. The *EEN's* capability is derived form its



acquaintance with the local industry, its technological abilities and commonly the informal relations of the *EEN* with firms' management.



## Summary of Literature Review

At the beginning of the nineteen's, following the wide recognition of the importance of R&D collaboration and as a reaction to the growing use of industrial firms of the various international cooperation programs, there has been a significant increase of academic research concerning international R&D cooperation. At first, the academic literature was directed at analyzing the importance of innovation processes, and R&D projects in particular, through local and international collaborations of different organizations. Today, following the extensive research and the international programs' progression, a wide consensus has been reached regarding the relevancy and the significant role played by R&D international cooperation. The general study today is concerned alternatively with evaluating the different international schemes and with trying to identify success cases.

The research area of international collaboration is not without complexity; first, major difficulties exist in evaluating innovation processes which include the accumulation of technological and professional knowledge, skills and methods that are very hard to estimate (Veugelers 1998); Secondly, a necessary length of time is needed in order to foresee their affect on the companies' performance; Thirdly, there's a difficulty in assessing the quality of innovation processes that ends without a new patent or product. This picture becomes even more complicated when it involves not only regular in-house R&D, but also collaborative R&D. In most cases, these two channels are being used simultaneously, which makes it hard on researchers to differentiate between them. In addition, there is a variety of organizations conducting R&D collaboration including among others industrial firms, research institutes and academic bodies, which are very different in character and require distinctive treatment. Moreover, exogenous causes such as geographic and cultural factors, production environment and governmental support schemes influence the research when R&D collaboration becomes international.

Interesting outcomes and conclusions exist despite the complex nature of the research. Most researchers agree that R&D collaborations are highly beneficial from the companies' point of view due to information liquidity, knowledge transfer, economics of scale, sharing of costs and risks and reducing transaction costs. In addition, international cooperation is seen as a substitute for geographic proximity between firms, especially in cases of uncertainty and constant technological change (Narula & Santangelo 2008). Moreover, international R&D projects usually involve high technology, due to its "codified knowledge" which is easy to



absorb. In contrast, "implicit/tacit knowledge", which is hard to encode, is commonly not a component at these projects (Teixeira, Santos & Brochado, 2008). However, in this current study, many CEOs emphasized the importance of international cooperation in networking, which greatly contributes to the transfer of implicit/tacit knowledge.

Furthermore, most researchers agree that since international R&D collaboration and in-house R&D are simultaneously conducted ("Hybrid R&D"), the latter is dedicated for the company's core technology whereas the former is directed at supplementary technologies that can contribute to the firm's internal projects (Goyal, Moroga-Gonzalez & Konovalov 2008). This conclusion was reinforced by the current study.

Additional illuminating conclusions are concerned with the public funding of the international programs. Due to extensive externalities, firms must be provided with financial incentives in order to conduct R&D and therefore governmental intervention is necessary (Arrow 1959). However, public funding can create negative affects when it substitutes the private R&D expenditure and thereby damages the firms' commitment to the innovation process. On the other hand, public funding schemes that involve matching can stimulate the companies' motive to innovate. Some of the researchers believe that the negative affect overcomes the positive affect (Wallsten 2000), whereas others illuminate the cases in which the exogenous factor of public finance is necessary and beneficial to all the sides involved in the process (Song & Vannetelbosche 2007, Qiu & Tao 1997). Meaning, public support is correlated to the firms' success. Not with standing, other studies have shown that public funding can become an endogenous factor when the companies that are found eligible are at the outset the most successful ("picking-the-winner-strategy"). This particular insight has been mentioned several times within the cuurent study, as will be mentioned later.

In Israel, an important study was carried out in order to assess the governmental subsidies affect on R&D. It has been found that small companies tend to increase there expenditure on R&D a year after they receive the funding, whereas large companies do not. Therefore, a "crowding out effect" is attributed to large companies that would probably finance R&D projects themselves if the government abstained subsidizing them. In other words, higher level of additionality is perceived in SMEs.

In general, lack of research is apparent when trying to evaluate the efficiency of the R&D collaborations. This is due to the difficulty in determining success indicators and defining what does "success" includes and what should be excluded from its definition. Apart from the importance of technological development, there are many critical business aspects



that must be taken under consideration, such as the projects influence on the companies' networking, their exports and position in global markets. A productive method of attaining success indicators is based on the companies' perspectives on this matter (Bougrain & Haudeville, 2001). Following this rationale, one significant objective of the JIIS research is to estimate the projects' success and efficiency from the firms' point of view. In other words, an important target is to examine whether the companies perceive R&D through international cooperation as beneficial and in which ways their benefits could be maximized, especially by using complementary schemes such as the *EEN*.

### **Objectives and Methodology**

The current research was directed at industrial R&D international collaboration and the ability to extend existing links with the *EEN* and create new ones in order to improve the current international R&D collaborative schemes. The objectives were (a) to assess the affect of international R&D collaborations on the Israeli companies' technological capacity; (b) to assess the affect of international R&D collaborations on different business aspects and especially on the Israeli companies' ability to maximize their profits derived from their participation in the programs; (c) to assess the imperfections which impede companies to participate in the programs; (d) to assess the programs' effect on the companies' ability to cope with issues related to new legislations, EU policies and the common market; (e) to assess the *EEN*'s ability to provide structured support such as: assisting in partner search, offer legal and contractual framework, publishing and marketing the programs, etc. As a case study, the ability to link between the *EEN* and the *EUREKA* network was examined. 65% of the research sample argued that the *EEN* should be used for the purpose of partner search.

The research was composed of quantitative and qualitative aspects based on in-depth interviews and questionnaires. More than 100 questionnaires were circulated among companies that conducted regular in-house R&D and international collaborative R&D. 80% of them were active at the High-tech sector. Twenty in-depth interviews were conducted with firms' CEOs, business directors and R&D directors who participated in several international projects and gained a substantive amount of experience in R&D collaboration.



### Summary of Research's Results

50% of the companies in the research sample argue that there is a need for a European network supporting the process of conducting affective collaborations, such as the *EEN*, 60% of which even stated they were prepared to pay from their own pocket in order to extend the services provided by the *EEN*. In particular, *incubated firms* that were interviewed stated that the contribution of schemes such as the *EEN* to their participating in international R&D collaboration is essential, since these companies are inferior in terms of networking level and business and managerial experience. Furthermore, many of the incubated companies are established in the periphery.

In regard to assessing the programs' affect on the companies' ability to cope with issues related to new legislations, EU policies and the common market, 44% of the SMEs claimed that the collaborations did not contribute to their understanding of the policies. The *EEN* Israeli representation, however, can assist in providing the companies with this kind of information. For example, conferences and workshops organized by the *EEN* may assist SMEs' in thoroughly understanding these legislation issues and thereby better utilize their R&D collaborations.

The motivations for conducting international R&D collaborations were divided to three. First, there is the technological motivation which is realized through joining a partner with complementary technology (61% of the sample emphasized the technological motivation). Secondly, there is the financial driver. In some cases, the funds and agreements are seen equal to investments by venture capital (53% of the sample emphasized the financial motivation). Thirdly, there is the business driver including networking, penetrating into new markets, improving the firms' position in foreign markets, learning about commercial needs and providing solutions to the market's demand (51% of the sample emphasized the business motivation).

Another important finding of the current study, which is reinforced by the literature, that the collaborations are dedicated only to related technologies; the companies' core technology is not being developed within these collaborations due to the risk of knowledge liquidity and IP issues.

The most evident insight, which was repeated by all interviewees, was that the programs' funding was critical in difficult times of the firm's evolution. In particular, within the early stages of the firm's life, the common claim is that it would not have survived without



the finance given through the collaborative schemes. One of the interviewees stated: "At times when you are not sure that you could pay the next month's salaries, the funding is a necessary condition for the survival of the firm" (CEO of company no.19). SMEs that started their activity through the *Incubation Program* mentioned that the R&D programs play a similar role in providing a necessary assistant, which in the case of its absence could have terminated their activity. Furthermore, the interviewees indicated that the financial assistant was necessary especially during the two major financial crises.

In addition, the finance contributes to the companies in reference to their uptake of potentially risky projects. Several interviewees, in particular companies with vast experience in collaborative R&D programs, mentioned that a large portion of the projects would not have been conducted without the finance, since the risk, and the costs associated to it in cases of failure were too high. Consequently, they claimed, the realization of new and significant technologies and improved products could have been abstained without the governmental conditional funds.

A common response to the question: "Do you think that R&D should be exerted specifically through collaborations?" was positive and the emphasis was on the method of realizing the great potential of the cooperation. Many aspects are critical for maintaining a stable and a successful process with beneficial outcomes: the sizes of the firms associating with one another, the relationship's quality in regard of technological and commercial capabilities, strong personal connections, well-defined contract and a full understanding of both sizes regarding their responsibilities.

The interviewees mentioned different and sometimes controversial perceptions regarding the optimal size of the firms associating with one another. In many cases a small company is motivated to cooperate with a large key-player. In comparison to the large company, its relative advantage can be found at the technological area. However, SMEs have trouble coping with large companies and can be very vulnerable to their economic power. In this sense, and despite the SME's potential benefit from such collaboration, most of the interviewees stated that SMEs should join force only with other SMEs in order to maintain a balanced relationship. However, several interviewees claimed that without associating with large and influential companies, the collaboration would have not been realized since the financial and commercial abilities of the large companies are indispensable. Not withstanding, although there is a fertile potential in working with large companies, taking into account the problematic nature of such collaborations as mentioned above, SMEs can be



better candidates for the purpose of the collaboration depending, of course, on the nature of the project.

When were asked about the *bilateral funds* (first category, see above), the majority of responses was highly favorable. The firms stated that they are less bureaucratic and very well organized. Most of the interviewees stated that the funds are a smooth and convenient mechanism, since they are obliged to answer only one authority along the project.

When they were asked about the *bilateral and multilateral agreements*, such as *Eureka* (second category, see above), the responses were more ambiguous. The majority said that the process is too complicated and time consuming. In most cases, the project needs to be accepted both on the program level and within the innovation agency in each country which finance the project. There were a number of projects that were approved within Eureka, for example, but the innovation agency in one of the countries or both was reluctant to approve them.

Several other insights were brought into consideration. First, a majority of the interviewees mentioned that they are aware of a negative exploitation of the programs by companies that could have conducted productive international R&D collaboration without Israeli public funding. However, they claimed, due to "picking-the-winner-strategy", these companies are often being awarded and receive finance again and again. The major problem of this strategy is that the mechanism's rational should be to provide incentives for pioneering and even revolutionary projects, that can often end with failure since the risks involved in the project are impressively high. Therefore, there are many cases in which although the firms hadn't proven success yet, they have a great potential in inventing novel technological solutions. The *EEN* can assist project evaluators by providing them with relevant data regarding state-of-the-art technologies and potential demand for such technologies.

Second, concerning the international cooperation's added-value, the interviewees depicted a multilayered picture. They admitted that R&D collaboration is a very complicated issue with various complex aspects. An important conclusion was that in-house R&D is essentially directed to technological innovation, whereas cooperative R&D is a way of enhancing commercial capabilities and businesslike aspects. Therefore, the added-value cannot be searched only in the technological area. Indeed, the added-value can be found in direct technological improvement, but it is also critical to show the success in business aspects. Some wished to collaborate on a much more business basis, since IP liquidity is a major bound which is impossible to control. However, others claimed that the R&D



component is necessary for a successful integration with another company. The study found that the collaborative projects do not use sufficiently the *EEN* as a tool for disseminating their joint technological outcomes. Clearly, the *EEN* should enhance its "marketing" efforts towards such projects as it can channel the technological success into business and commercial benefits.

In regard to the technological benefits, an interesting insight was that apart from the direct technological success, such as in the case of a new innovative solution, the R&D cooperation serves as an important driver for the companies to exert R&D more intensively since they are committed to a contract with other bodies. Concerning the businesslike benefits, strong emphasis was being given to the collaboration's contribution to networking and the strong connections that are derived from the projects. Most of the companies are still in very good relations with their formal partners and use one another to generate more links and receive advices from one another regarding related markets. This conclusion is critical in the case of *incubated firms* that can use the platform of R&D cooperation in order to promote their business activity through partner search and extensive networking. Related to the last point, most of the interviewees felt that the quality of the relationship depends neither on the firms' characteristic nor on the particular features of the project. Rather, it is highly dependent on interpersonal relations. The *EENs* representatives around Europe and their deep acquaintance with local industry can greatly contribute to the quality of the match-making quality.

In addition, the public finance is an incentive for key-players abroad to associate with Israeli relatively small companies. Without these programs, according to the interviewees, the connections would not have been realized. This insight is also relevant for the *incubator firms* which face financial difficulties and other problems affiliated to networking with leading companies at their industrial sector. In summary, 53% of the SMEs argued that international R&D cooperation is highly important to their company.

### **Summary of Policy Recommendations**

Several policy recommendations were formulated, in continuation to the recommendations derived from the *Incubation Program Study*.

1. Related to the previous research, the different international R&D schemes should be published within the Israeli *Incubation Program*. Being another crucial component at the next stage of the companies' development, international R&D collaborations



should become a well-known mechanism already at the first stage of the firms' activity.

2. The *EEN* should be used for the purpose of partner search in the case of the *Eureka* network. In this way, another important role will be achieved: making the *EEN* more familiar to the companies. Matimop should make use of its supervision of the *EEN* in Israel to convince the *EEN* secretariat to create a platform for partner search for the purpose of the international R&D cooperation. This platform must be created in a rational and simple manner so that the firms will be inclined to use it, and should be published and marketed appropriately. As a result, both partner search for the sake of the international projects and extended recognition of the *EEN* will be achieved.

3. The *EEN* can assist project evaluators by providing them with relevant data regarding state-of-the-art technologies and potential demand for such technologies.

4. The *EEN* can enhance its "marketing" efforts and its informal acquaintance with the industry towards the results of collaborative projects as it can channel the technological success into business and commercial benefits.

5. The commercial attaches of the Ministry of Industry, Trade and Labor can also play a major role within the effort of partner search for the purpose of establishing new international R&D collaborations. This recommended instrument is especially important for small Israeli firms that are interested in extending their business and penetrate into new markets but lack the adequate connections abroad. The commercial attaches can become another channel for the important goal of finding adequate partners. For this purpose, there's a necessity in strengthening the connections between these representatives and the *Israeli EEN* especially in non-European countries.

6. Since one of the study's results is that generally, international collaborations do not assist in making it easier for companies' to cope with issues related to new legislations, EU policies and the common market, the *Israeli EEN* should be more active in explaining these issues. For example, a section of the portal can be dedicated to publish Hebrew abstracts of the new European laws and registration per sector.



7. Israeli firms should receive comprehensive, detailed and accurate information regarding the different international R&D programs. They should be notified about the different aspects of the processes including all the approval stages, the potential risks and benefits. "Success stories" that are published at the programs' website are one way of doing so, but other instruments are important as well, such as:

- a. The secretariat's agents should deliver a wide range of information, including all the process's stages and make sure that the firms are familiar with the mechanism.
- b. Companies which are submitting a proposal for the first time should be connected with experienced firms that can share their insight with them.
- c. Industrial companies that are inclined to exert R&D cooperation need to understand both its potential risks and its benefits. Therefore, a conducive instrument can be the presentation of updated statistical data regarding past projects: number of collaborations, the characteristics of the associations, success rates, etc. These figures do not necessarily require an extensive amount of work on the side of the administrations, since most of the data already exists. A representative sample should be presented to the firms so they could more confidently develop a rational line of thought and receive a wise decision.

8. The different international cooperation schemes should put more emphasis on the business and commercial aspects of the projects, especially on marketing. The technological excellence of the project is an essential aspect, but it is not the only goal that should be achieved. The Israeli companies emphasized the difficulty in channeling the technological success into a new and beneficial product due to lack of marketing experience and relatively small amount of financial resources available to this task within the projects. This is especially true within *Incubated companies*.

9. The Ministry of industry, trade and labor together with The Ministry of Finance and other related organizations should examine the following:



- a. Different options for local R&D industrial collaborations. A majority of the interviewees mentioned that a wide range of technological capabilities already exists in Israel, and going abroad is not always the appropriate solution.
- b. A new channel for business international cooperation that is not too dependent on innovative solutions (this was requested by a respectable amount of the interviewees).
- c. A "narrow channel" for international R&D cooperation that provides less finance but is simpler in regard of its mechanism.



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