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The Jerusalem Institute For Israel Studies



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The Technion - Israel Institute of Technology



Free University of Amsterdam



Mr. Yigal Erlich

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Ifise Final Report

PLANNING FOR THE CREATION OF SEED AND START-UP CAPITAL SOURCES FOR HIGH-TECH FIRMS IN ITALY FOLLOWING THE ISRAELI SUCCESS STORIES OF THE YOZMA AND THE TECHNOLOGICAL INCUBATORS PROGRAMMES

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INDEX

Executive Summary				
Introductio	n	4		
Chapter 1	r 1 The Yozma Programme, or How to Create a Venture Capital Industry from Scratch			
	1.1 The Yozma Programme - Definition Process and its Final Structure			
	1.2 Validation of the Yozma Programme			
	1.2.1 Economic Impact - Output Indicators	9		
	1.2.2 Economic Impact - Outcome Indicators	11		
	1.3 The Israeli VC Evolution - Main Features	13		
	1.4 Success Factors, Lessons and Issues from the Yozma Programme and the Evolution of the Israeli VC Industry	14		
	1.5 Conclusions	19		
Chapter 2	The Technological Incubators Programme and the Provision of Seed Capital to Research-Intensive New Firms	20		
	2.1 Programme Background and Operation	20		
	2.2 Validation of the Technological Incubators Programme	22		
	2.2.1 Economic impact - Output indicators	22		
	2.2.2 Economic impact - Outcome indicators	27		
	2.3 Evolution of the Technological Incubators Programme Over Time	29		
	2.4 Success Factors, Lessons and Planning Issues from the Technological Incubators Programme and its Evolution	31		
Chapter 3	The Italian Innovation System and its Potential for High-tech Start-ups	38		
	3.1 General Characteristics of the Italian Innovation System	38		
	3.2 High-tech Activity per Sector and Geographical Region	40		
	3.3 The Electronics and Telecommunication Sector	45		
	3.4 The Biotech Sector	47		
	3.5 The Supply of Private Seed and Venture Capital Sources	49		
	3.6 Public Incentives to Innovative Firms in Italy	53		
	3.6.1 The EU regulations	53		

	3.6.2 Law 297/99 and the incentives to research operated by new firms	54
	3.6.3 Regional programmes	54
	3.6.4 European programmes	54
	3.6.5 The Startech programme	55
	3.6.6 Laws 95/95 for the incentive of juvenile entrepreneurship	56
Chapter 4	A Proposal for Seed and Venture Capital Schemes in Italy: Four Projects	58
	4.1 General Planning Orientations	58
	4.2 Project 1. Rotational Seed Capital Funds for New High-tech Companies in Regions with High Potential	62
	4.2.1 Motivations behind the project	62
	4.2.2 Project outline	63
	4.2.3 Requirements for seed funds' management companies	65
	4.2.4 Additional criteria for the selection of the management company	65
	4.2.5 Fund of funds' role and monitoring	66
	4.2.6 Qualified supporting institutions	67
	4.3 Project 2. Biotech-Pharmaceuticals Incubators	68
	4.3.1 Motivations behind the project	68
	4.3.2 Basic facts and guidelines used for planning	68
	4.3.3 Programme definition and incentives	69
	4.3.4 Investment rules	70
	4.3.5 Qualified management companies	70
	4.3.6 Selection criteria for management companies	71
	4.3.7 Role of the central agency and monitoring	71
	4.3.8 Possible launching institutions	72
	4.4 Project 3. VC Funds for Depressed Regions	73
	4.4.1 Motivations behind the project	73
	4.4.2 Description of the proposed project	73
	4.4.3 Qualified management companies	75
	4.4.4 Rules of investment	75

4.4.5 Monitoring	75
4.4.6 Possible launching institutions	75
4.5 Project 4. A Coordinating Institution for High-tech Industries' Incentive Policies	76
4.6 Recommendations for Future Research and for the Definition of Innovation Policies	77
Acknowledgements	78
Bibliography	79
LIST OF TABLES	
Table 1.1 - Original Yozma Funds and their Evolution	9
Table 1.2 - Growth Rate of Yozma-Affiliated Companies vs. a Sample of Non-Yozma-Affiliated Companies	12
Table 1.3 - Sales of Yozma-Affiliated Companies vs. a Sample of Non-Yozma-Affiliated Companies	13
Table 2.1 - Graduating Projects that Succeeded in Securing Financial Support, by Location	23
Table 2.2 - Sectorial Distribution of Incubated Projects as Opposed to a Representative Sample of High-tech Firms in Israel	25
Table 2.3 - Project Initiators' Level of Satisfaction from Services Provided vs. Level of Importance Attached to these Services	26
Table 2.4 - Incubator Managers' Level of Satisfaction	27
Table 2.5 - Previous Occupation of the Founders - "Incubator" Companies vs. Generic Sample Companies	28
Table 2.6 - The Working Environment for the Genesis of the New Idea	29
Table 2.7 - Sales Revenues (2000) of Incubator-Graduate Companies Vs. Non-Incubator Sample Companies	29
Table 2.8 - Average Source of Funding of Incubators, by Location	32
Table 2.9 - Project Selection Process in the 21 Israeli Incubators, by Location	33
Table 3.1 - Major R&D Indicators per Geographical Region	42
Table 3.2 - R&D Indicators per Main High-tech Sector and Local System	44

Telecommunication Equipment - National Basic IndicatorsTable 3.4 - R&D Investments and Personnel in the Biotech-Pharmaceutical47Sector in Italy and in the Major Industrialized Countries47

45

Table 3.3 - Electronic Components, Computer Hardware and

Table 3.5 - Number of Investments and of Early Stage Investments in the Biotech and Pharmaceuticals Sector - year 2001				
Table 3.6 - Seed and Start-up Investments of VC Funds in Italy - year 2000	52			
LIST OF FIGURES				
Figure 2.1 - Project Selection Process - General Flow Chart and Percentage Approved	21			
Figure 2.2 - Government Investment vs. Private Investments in Incubator Graduate Projects	31			
Figure 3.1 - Main Innovation Indicators, Italy vs. Europe	38			
Figure 3.2 - Enterprises in the Biotech Sector in Main European Countries per Country	48			
Figure 3.3 - Internal VC Investments as a Percentage of GDP	50			
Figure 3.4 - Early Stage Investment by Italian VC Funds by Region (2000 - 2001)	51			
Figure 3.5A - Major Objective 1 (depressed) Areas	57			
Figure 3.5B - Concentrations of Inventors	57			
Figure 4.1 - Scheme for Public Incentives to Seed Funds	64			
Figure 4.2 - Public Incentive Scheme for Investment Funds in Economically Depressed Areas	74			

LIST OF ACRONYMS

- EC -European Commission
- EU European Union
- GDP Gross Domestic Product
- IPO Initial Public Offering
- ICT Information and Communications Technology
- IRR Internal Rate of Return
- IT Information Technology
- IVA Israel Venture Capital Association
- M&A Mergers & Acquisitions
- OCS Office of the Chief Scientist at the Ministry of Industry and Trade in Israel
- R&D Research and Development
- VC Venture Capital, Venture Capital Management Company

EXECUTIVE SUMMARY

This document represents the final results of the project IFISE (Israeli Financing Innovation Schemes for Europe), which was supported by the European Commission under the Innovation and SMEs programme of the Fifth Framework Programme. Aims of this project were: (1) The validation of two Israeli programmes: *Yozma* and the *Technological Incubators Programme*; (2) The extrapolation of principles useful for the efficient creation of seed and venture capital schemes in Europe; and (3) The proposal of public schemes for the efficient creation of seed and venture capital sources in Italy.

All papers presented by partners in this project are available on the website http://ifise.unipv.it.

Results of the project indicate that the Yozma programme, launched in Israel in the early 1990s, was an outstanding success. All indicators are consistent with this affirmation and indeed suggest that this simple and relatively small programme has created the current venture capital industry in Israel. It has thereby become a very strong contributor towards the incredible blossoming of the Israeli high-tech industry in the second half of the nineties.

The Technological Incubators Programme (T.I.P.) can also be described as successful, having given opportunities to inexperienced entrepreneurs or to initiatives in sectors that are uncommon in Israel. However, not all success indicators are consistent and some improvements should be made to the programme.

Some of the most important lessons derived from these two programmes are the following:

- Public intervention for the establishment of seed and venture capital funds is usually necessary and desirable. While for seed funds (€0.1-1 million) this has to be continuous, in the case of start-up capital (€1-5 million) it should be timelimited.
- 2. Venture capital for the high-tech industry is an instrument suitable only for mature situations, i.e. for regions that already feature a strong potential for high-tech spin-offs and some demand for private equity.

- 3. **The state** should play a passive role in venture capital schemes. Any decisions about investments should be made by professional and private entities.
- If there are no special reasons to employ incentives aimed at specific sectors, neutral instruments, i.e. instruments that are not reserved to firms in any one sector, should be used.
- 5. Any targeted programme must be inserted into a context of **innovation policy** which is integrated and interdisciplinary. For this purpose it is advisable to set up an ad hoc agency able to manage policy for the high-tech industry.

The Italian Innovation System was analysed by means of various surveys and data elaboration. The main results used as a basis for planning are the following:

- 1. Distinction between generally innovative firms and *research-intensive* firms is crucial in Italy, where there is an abundance of the former, but very few of the latter.
- 2. Italy lacks seed capital for the high-tech industry, especially in the regions that have the strongest potential for high-tech start-ups.
- 3. Hardly any new biotech-pharmaceutical firms are found in Italy, despite large markets and significant academic research.
- 4. Economically depressed areas in Italy lack venture capital activity in all industrial sectors.
- 5. Existing public programmes for the support of new high-tech firms seem inadequate.

Planning for investment schemes in Italy has led to the suggestion of four proposals to the Italian authorities:

- 1. <u>The creation of rotational seed capital funds</u> for new research intensive firms in the regions with the highest potential. The public incentive will be by way of participation in the funds, with private investors given the option to buy the public shares under privileged conditions. The programmes shall be repeated every four years.
- 2. <u>The establishment of biotech incubators</u> in the areas with the highest potential for this sector. These shall be linked to the best local university research centres and will give financial, consulting and infrastructure support. Given

that initiatives in this field have strong needs in terms of time and finance, public support shall be particularly generous.

- 3. <u>The creation of venture capital funds</u> for depressed areas dedicated to all industrial sectors. In this case, venture capital funds will be entitled to invest in any industrial sector. Private investors will have the option to buy public shares under favourable conditions. This program is meant to be a trigger for the venture capital and private equity industry which is considered self-sustainable; therefore, after a certain number of funds are established in each region this programme will terminate.
- 4. <u>The establishment of a National Institution</u> for the coordination of all incentives for the high-tech industry. This shall have a large budget, broad capabilities and the power to launch, modify or stop any programmes for the high-tech industry in Italy.

INTRODUCTION

In an attempt to follow the American example and create their own pool of New Technology-based firms, several European countries and the European Commission have directed much effort towards the creation of innovation policy, so as to encourage employment, innovation and economic growth.

Among the many aspects of innovation, the availability of venture capital and private equity is crucial. Various forms of venture capital schemes for the creation or strengthening of an industry have been adopted since the second half of the nineties. However, since most of these instruments are less than five years old, it has been quite difficult to validate their performance and analyse their operation over time [Dimov and Murray, 2001]. This makes the Israeli schemes particularly interesting: not only have they contributed to the spectacular growth of the high-tech industry in that country, but they can also point to a relatively long track record.

The aims of the IFISE (Israeli Financing Innovation Schemes for Europe) included the validation of the Yozma and Technological Incubators Programme, the extrapolation of lessons to be used by policy makers for planning financial tools, and the actual proposal of practical plans to be implemented in Italy. In order to reach its conclusions, the project underwent the following phases:

- 1. The thorough analysis of the Yozma and Technological Incubators Programme in Israel by means of literature and field surveys, including interviews with venture capital and incubator managers, entrepreneurs, and policy makers, and a review of similar projects in Europe.
- The extrapolation of success factors and various planning issues from the two programmes, and from the review of similar European programmes, which could prove useful for policy makers.
- 3. An analysis of the characteristics and potential of the Italian reality through available data and targeted field surveys.
- 4. An analysis of public schemes for venture capital which currently exist in Italy, plus an assessment of the availability of private venture capital by region and industrial sector.

- 5. The planning of adequate programmes for Italy by applying the lessons gathered from Israel, and the consultation of senior experts in the Italian reality as analysed in all its relevant aspects.
- 6. The involvement of Italian policy makers in the planning process and their suggestions taken into account for the various proposed programmes.

It is important to mention that although academic papers will result from this project, it is primarily meant to help policy makers define their instruments at various levels. Therefore, a variety of planning issues are proposed, be these the results of the surveys conducted in Italy and Israel, the interviews conducted with various market actors, or the brainstorming that was done by IFISE partners at various stages of the project. This document was written by Vittorio Modena who has originated and coordinated the IFISE project. Whenever a result was obtained by a different partner, the source is cited.

Results of this project have been made public by means of two workshops, in Pavia, Italy, and Amsterdam, Holland, which were held in May, 2002. Many Italian and other European policy-makers participated. Project results are also available on the site: http://ifise.unipv.it/downloads.html.

Chapter 1 deals with the validation of the Yozma programme and the resulting planning issues. Chapter 2 examines the validation of the Technological Incubators Programme and its issues. Chapter 3 looks at the Italian Innovation System, with some insights into the provision of private venture capital and the existing public schemes for the support of VCs and new innovative firms, and Chapter 4 outlines the proposals that were made to Italian policy makers.

The participants in this project wish to especially thank the European Commission, which made the project financially possible under its Fifth Framework Programme.

THE YOZMA PROGRAMME, OR HOW TO CREATE A VENTURE CAPITAL INDUSTRY FROM SCRATCH

This chapter is aimed at presenting the results of the IFISE project associated with the validation and analysis of the Yozma programme. The evolution of the Israeli VC industry was also taken into account, as we have proceeded with extracting lessons, rules of thumb, and stimulating thoughts with the goal of creating VC industries in other regions. This part of the project has been carried out mostly by Prof. Morris Teubal and Mr. Gil Avnimelech of the Jerusalem Institute for Israel Studies [Teubal and Avnimelech, 2002]; when other research is employed, the source is cited.

1.1 - The Yozma Programme - Definition Process and its Final Structure

The situation in Israel at the end of the 1980's showed clearly that background conditions existed for the creation of venture capital funds, but the venture and seed capital funds themselves were lacking. Indeed, only one VC fund, Athena, existed, with \$12 million in available funds.

At that time, the policy of government subsidies to industrial R&D had begun to be questioned by the Chief Scientist¹ in charge, Mr.Yigal Erlich. He reasoned that despite the good work carried out by professional evaluators before giving money to private firms, the state could not be as effective as private investors. After several visits to countries with strong venture capital programmes, he was convinced that the future of Israel's high-tech industry was rooted in venture capital, and that the state must make an effort to trigger its creation. Erlich and his team also sought the advice of world experts, and of key figures both from Israel's high-tech industry and from Israel's Capital Market. They also assessed alternative courses of action. This process of search, analysis and research led to the shaping

¹ The Office of the Chief Scientist at the Ministry of Industry and Trade is Israel's most powerful R&D policy institution, commanding around \$400 million annually.

of their mission: to put in place a mechanism that would stimulate the creation of venture capital funds in Israel. This plan can be summarized in the following points:

- in order to create a serious venture capital industry in Israel, it would be necessary to invest at least \$200 million;
- foreign organizations (venture capital funds, investment banks, etc.) will not invest in Israel without significant incentives. Lacking such incentives, these investors will turn to other countries with which they have experience and whose markets they know well;
- it is important to ensure that there would be no monopoly in a new market;
- it is important to promote learning within the industry, such that when support for the program ends, the VC industry would continue to operate and develop; to ensure a minimum of government intervention in the fund's management; and last but not least, to ensure that the proposed program would in fact be implemented.

It was clear to Yozma promoters that the existence of background conditions was not in itself sufficient to assure success; it was crucial also to assure the positive involvement of the various government bodies in order to implement real change. In order to assure the Treasury's support, some of that body's members became part of the program team and participated in the discussions at the planning stage.

Two instruments were considered: (1) the creation of a large \$200m fund with government investment, and (2) the creation of a large number of smaller VC funds with a total sum of \$200m.

The first option was supported both by the Ministry of Treasury, and by a large international investment company which tried to achieve a monopoly of the government incentives. However, Erlich was committed to the principle of avoiding monopolies; therefore the second option was finally adopted.

Another interesting issue was the decision of the size of government investment. Some proposed that the government invest up to 80% of the fund's equity, but this proposal was objected to, even by the private sector consultants. The 50-50 option had also been discussed, and finally it was decided that government investment be limited to 40%. The final assets of the Yozma programme were as follows:

- Yozma would be organized as an independent entity under contract to the Office of the Chief Scientist;
- the government would allocate \$120 million to the fund of funds Yozma, which would participate in VC funds, with up to 40% and up to \$8 million (whichever the lower of the two figures). A small part of that sum would be used for one venture capital fund to be run by Yozma itself.
- the new funds would be managed by private management companies;
- investors in the new funds would have the option to buy government shares at their original cost +7% annual interest;
- the state will withdraw from the programme after 7 years;
- the investors' team must include a foreign partner with expertise in VC investments;
- the investors' team must include a local financial partner.

It should be mentioned that parallel to Yozma, in 1992, the "Inbal" Program was implemented. Its central idea was to stimulate VC funds by guaranteeing the *downside* of their investments. The mechanism used was the creation of a Government Insurance Company ("Inbal") that provided a 70% guarantee to VC funds which are traded in the stock market (calculated as 70% of the value of their public issue). The program imposed certain restrictions to the investments of the 'protected' funds.

"Inbal" was not a great success. Four funds were established - Mofet, Marathon, Teuza, and Sdot Mop. Their valuations in the stock market were like those of Holding Companies (low valuations). The funds encountered bureaucratic problems and had to go to great lengths to prepare regular period reports. Eventually, all of the funds attempted to leave the program, i.e., they renounced their guarantees in order to free themselves from the bureaucratic restrictions, which they eventually succeeded in doing.

1.2 - Validation of the Yozma Programme

Validation of the Yozma programme has been carried out by a series of indicators. We have divided these into Out*put* Indicators, i.e., what has been the <u>direct result</u> of the operation of the Yozma programme; and Out*come* Indicators, i.e., what is believed to have been the <u>long term indirect result</u> of the programme. It should be mentioned that while the first set of indicators very accurately depicts the programme's operation, the second can only be regarded as a general picture of the VC industry. Indeed, many factors may have affected the incredibly fast evolution of the Israeli VC industry in the 1990's. Unless otherwise mentioned, these indicators have been measured by Prof. Teubal and Mr. Avnimelech of the Jerusalem Institute for Israel Studies [Teubal and Avnimelech, 2002].

1.2.1 - Economic Impact - Output Indicators

The output indicators which have been measured are as follows:

1 - Number of new funds launched. Yozma has directly created 10 funds. The funds' names, their present size and principal foreign investors are shown in Table 1.1.

Original Foreign Investor	Fund's Name	Original State Contribution (M\$)	Present Capital under Management (M\$)- year 2000 (*)
Daimler-Benz (DEG)	Eurofund	8	72
Advent (USA)	Gemini	8	350
Van Leer Group (NL)	Inventech	8	100
Oxton (USA/Far East)	Jerusalem Ventures Partners	8	255
MVP (USA)	Medica	8	70
AVX, Kyocera (JP)	Nitzanim-Concord	8	270
CMS (USA)	Polaris	8	700
TVM (DEG) & Singapore Tech	Star	8	600
Vertex International	VERTEX	8	150
Walden (USA)	Walden	8	120
Yozma	Yozma	20	180
Total		100	2870

Table 1.1 - Original Yozma Funds and their Evolution

Source: Sadovski, 2001a

(*) - Size of the first fund raised was around \$ 20m

2 - *Number of management companies created*. Ten management companies were created. In the beginning, each management company was directing only one fund. The creation of ten specialized management teams was of huge importance.

2A - Number of employees in the management teams. The management teams created by Yozma had more than 30 new partners and approximately 100 new employees.

3 - Amount of money allocated from private sources to investment in new high-tech industries. Yozma has directly caused the allocation of \$150m from private funds to high tech start-ups.

4 - Number of highly reputable VC organizations that entered the market as a result of the project. Having required the participation of international partners of prime importance, Yozma caused 5 high-reputation entities (Advent, Daimler-Benz, Walden, Vertex and TVM) to enter the Israeli market, thereby creating a positive reputation for Israel even before the first successful exits occurred (see table 1.1).

4A - Variety of reputable investors that entered the market as a result of the project, by type of investor. In order to achieve an optimal mix in the market, the program aimed at attracting reputable investors in the following different categories: investment banks, strategic partners, private equity funds, U.S. business angels and U.S. pension funds.

5 - Number of high-tech companies that have received venture capital from a newly created fund. The 10 Yozma funds have supported 256 high-tech firms during their existence.

6 - Internal Rate of Return (IRR) of the funds. Although IRR could not be measured precisely, it is known that Yozma funds were very successful.

At least 4 Yozma funds (40% of the funds) had an IRR of more than 100%.

7 - *Number (percentage) of exits out of total investments of Yozma funds.* Yozma funds succeeded in exiting in 70 cases (27.3% of their investments); out of these 38 (14.8%) were IPO's (Initial Public Offering) and 32 (12.5%) were M&A (Mergers and Acquisitions).

8 - Opinion of venture capital funds' managers about the importance of the impact of the Yozma programme. All of the VC managers that were interviewed (a total of 15 both from Yozma and other funds) believed Yozma to be one of the major triggers of the growth of the Israeli VC industry.

9 - Contribution to initial critical mass: size of the total allocation to high-tech start-ups as initiated by the programme, as a percentage of the total capital available for start-ups in the first years. A government contribution of \$100m to the Israeli VC industry in 1993 was leveraged by \$150m from private entities. In general, out of the \$440m managed until 1994, \$250m originated from Yozma funds.

10 - Number of funds as a percentage of total funds available in 1993-4. Yozma has created 9 (the tenth was created in 1997), or 53% of the 17 funds existing at the time.

1.2.2 - Economic Impact - Outcome Indicators

The outcome indicators, i.e. impact indicators that were measured several years after the programme was completed, were measured as follows:

l - Total number of funds created by the management companies that were started under the original programme. All of the 10 management companies that were created as a result of the Yozma programme have created additional, subsequent funds, although the Yozma programme no longer supported those funds. Thirty nine funds have been created from the inception of Yozma until the end of 2001.

2 - Total capital under management of all subsequent funds. Total funds raised by Yozma management companies add up to \$3.2 billion (+\$250m managed by Yozma funds), as opposed to the total capital under management of all other 118 Israeli and foreign investment organizations active in Israel (\$6.8b after eight years). Fifty percent of all total funds can be related to the Yozma programme.

3 - Survival percentage of the management companies that were formed as a result of the original programme. Eight years after Yozma's establishment, 100% of the companies are still operational.

4 - Percentage of the Yozma funds that have used the option to buy government shares. Of the management companies that were formed as a result of the original

programme, 80% used their option to buy government shares in the funds after five years (before the fund was closed), at a price of the initial investment plus 7% interest.

5 - Size of the total allocation to high-tech start-ups initiated by the programme as a percentage of the total capital available for start-ups several years later. A government contribution of \$100m to the Israeli VC industry in 1993 was a major trigger to a total allocation of almost \$10b during the years 1993-2001. This would make the government contribution only 1% of the final result.

6 - *Reputable investors*. Out of fourteen strategic investors involved in Israeli VC until 1997, seven strategic investors were involved in Yozma management companies. Six out of twelve reputable investment bank investors previously involved in Israeli VC until 1997 were involved in Yozma management companies. Reputable investors were found to correlate positively with good performance of the fund.

7 - *Growth of start-up enterprises financed by Yozma funds*. Table 1.2 compares a sample of 24 firms that have been financed by the ten Yozma funds, as opposed to a sample of 105 high-tech enterprises (a representative sample) in Israel. It is evident that the first group outperforms the second [Sadovski, 2001].

Years	19	98	1999		2000	
Yozma affiliation	Yozma affiliated	Non Yozma affiliated	Yozma affiliated	Non Yozma affiliated	Yozma affiliated	Non Yozma Affiliated
Number of respondents	13	48	15	55	17	63
Growth %	Companies (% of total)					
No Growth	46	64	47	51	24	41
1-40%	8	15	13	29	35	33
>41%	46	21	40	20	41	26

 Table 1.2 - Growth Rate of Yozma-Affiliated Companies vs. a Sample of Non-Yozma-Affiliated Companies

Source: Sadovski, 2001

8 - Sales of Yozma-affiliated companies as opposed to the average high-tech companies. Table 3 shows how the group of enterprises that were financed by one of the ten Yozma funds clearly outperforms the compared sample of companies. For instance, while 41.5% of the Yozma-affiliated enterprises sold for more than \$1 million in year 2000, only 18% of the sample companies did so [Sadovski, 2001].

	otal)	
Sales	Yozma-affiliated	Non-Yozma-affiliated
No sales	46	55
100k\$-1m\$	12.5	27
>1m\$	41.5	18

 Table 1.3 - Sales of Yozma-Affiliated Companies vs. a Sample of Non-Yozma-Affiliated Companies (*)

Source Sadovski, 2001

*24 Yozma-affiliated companies were compared to 105 non-affiliated companies

9 - *Rate of enterprises that went IPO*. While 4.9% of Israeli high-tech firms managed to raise money on the stock exchange, enterprises that were financed by one of the ten Yozma funds reached a rate of 17.9% [Sadovski, 2001].

10 - Average number of employees in an enterprise. Yozma-affiliated enterprises have 88 employees on average, while the average Israeli high-tech enterprise has 22 employees [Sadovski, 2001].

1.3 - The Israeli VC Evolution - Main Features

The evolution of the Israeli VC industry can roughly be divided into three phases: the Yozma phase, 1993-1996; the expansion phase, 1996-1999; and the maturity phase, 1999-2000.

The beginning of the VC industry in Israel (1993) is characterized by an excess of demand and little competition, which made it easy for the first Yozma funds to spot the right firms and to be successful in their resale. The typical size of these funds was around \$20 million, there was no specialization, and both investment and

divestment sizes were relatively small (\$1-2 million of investment per deal, \$10-70 million of sales for the successful exits). There was very little experience among Israeli managers.

In phase two (1996-1999), funds grew larger - \$100 million - and more experienced. Pension funds and a larger number of strategic partners invested in Israeli funds. Many efforts were made during this period to develop links with U.S. financial institutions. A trend to specialize both in specific sectors and financial stages was also seen. Some funds even specialized into links with financial institutions rather than industrial partners, and vice-versa.

Between 1999 and 2000, funds' size continued to grow and reached \$200 million on average. In this period we saw the most important exits, like *Chromatis*, which sold for \$4.5 billion. There was a trend to link more directly with big strategic partners such as Nortel, Cisco, AOL, Yahoo, etc. Israeli VCs had by now acquired some good experience and they were not very different from their American colleagues. Competition was fierce, as there was (probably) more money than good ideas. Therefore, funds looked more into seed investment and started, for example, taking equities in technological incubators. They also started investing in non-Israeli companies.

In general, we can certainly see a learning process which led the Israeli managers to acquire skills and links until they became experts. Their reputation grew steadily, until the recession came (at the end of year 2000) and took the sector into a deep crisis. At the time this report is being written, a hard recession has caught the telecom sector, which is the most important industrial sector in Israel. Competition is fierce and the sector is shrinking, with many management companies going out of business.

<u>1.4 - Success Factors, Lessons and Issues from the Yozma Programme and the</u> Evolution of the Israeli VC Industry

After analysing the history of the Yozma programme and the emergence of the Israeli VC industry, the IFISE team led by Vittorio Modena has extrapolated the success factors, the lessons, and the issues to be kept in mind when planning for the

creation of a venture capital industry in another region. These have been discussed at various occasions at IFISE meetings. A brief presentation of them follows.

1. Background conditions and the existing demand for VC

Venture capital can be used as a means of economic development in mature situations, i.e. when background conditions already exist. Necessary background conditions can be roughly divided into two categories: (1) The investment of substantial funds into applied research both by the public and the private sector, and the consequent presence of skilled personnel. (2) The existence of a few at least partially successful ventures before the start of the programme.

While the first factor leads to potentialities and capabilities on the technological side, the second factor is more linked to cultural attitudes and the motivation to create new companies.

It is extremely important to check for background conditions before starting a public scheme aimed at the creation of a VC industry. In this respect one should not confuse the need to develop a high tech industry with the need to develop the economies of disadvantaged regions, which, more often than not, have little potential for high-tech.

2. The problem of timing and flexibility in R&D policy and how the Israeli system copes with it

Timing has proven to be of the essence for the extraordinary success of the Yozma programme. This factor was made up of components both cyclical and unique, the former including the positive trend of the high-tech industry in general (e.g., as measured by the U.S. NASDAQ index), and the latter, one-time events such as the massive immigration from the former USSR and the concomitant lay-off of scientific personnel in the 1980s. At the inception of Yozma, all these factors were present.

At first sight, finding the right timing for policy-making may appear as much a gamble as any other; but deeper insight is gained from the analysis of the operations of the Office of the Chief Scientist (OCS) at the Ministry of Industry and Trade in Israel, the institution that shapes Israeli high-tech policy. The OCS commands around \$400m per year under the framework of the 1984 law for the encouragement of industrial R&D. It is entitled to launch and stop R&D incentive

programmes or to modify their rules, as well as to select projects for funding. Decision making at the OCS takes no longer than a few weeks.

Uncertainty is a natural characteristic of high-tech markets, and the Israeli Office of the Chief Scientist is an ad-hoc institution able to either take advantage of opportunities or to stop useless public spending. Therefore it is recommended that any region with high-tech potential should establish an institution such as Israel's OCS, which is able to cope with sudden changes.

3. Capabilities creation, reputation and disclosure - initial involvement of an international partner, as most of these firms are "global" oriented

One of the rules of the Yozma programme stated that, in order to be eligible for incentives, a fund must have the participation of an experienced foreign partner. This simple demand caused some of the most important VCs from around the world to participate in the Yozma funds. The "social" importance of their participation, in terms of image, and the crucial opportunity to learn from their specific experience and international networking, has been thoroughly analysed. This appears to be particularly important in the wake of increased market globalisation.

4. Importance of the Israeli (local) body involved

Another condition for eligibility of a fund for the Yozma incentives was the participation of a known Israeli financial body. This was the base for the necessary local commitment and financial monitoring.

5. Public intervention as a trigger to the creation of the venture capital industry in Israel

The Yozma programme was initiated in 1993 and privatisation was completed in 1998. Indeed, unlike seed capital provision, the start-up capital is supplied from around the world, from well-established private funds. The role of public support is therefore to trigger the emergence of the industry by generous incentives for a few years, but it must not be intended as a permanent intervention.

The simple awareness that the state is involved only for a limited period of time has led to more confidence on the part of private investors.

6. The state as a passive investor

In spite of its significant share in the first Yozma funds, the state has never interfered with decisions made by the funds' managers. This has allowed for market-oriented decisions.

A representative of the public sector was part of the Board only to make sure that the VC fund was acting according to regulations, but he was not involved in the process of decisions concerning investment [Erlich, 2002].

It appears that it is always important to decide at the outset under which rules the state will withdraw from the programme. The reason for the state's withdrawal is not only to allow the opportunity to increase the fund's profit (in case this possibility is given by the programme), but also in order to free the fund from the bureaucracy involved with working with public representatives. Similar conclusions were reached by Nijkamp, et al. [2001] who studied the case of the *Twinning Programme* in the Netherlands.

7. A team with a strong technology background (both educational and working) is a critical factor to success

Management company teams with strong technological backgrounds have been shown to be more successful than average.

8. Upside vs. downside incentives

As has been shown in other cases [Murray, 2002], upside incentives (incentives that cause funds to be more profitable in case of success) appear to be more appropriate than downside incentives (incentives that limit the investors' losses in case of bad investments). The IFISE team reasoned that if guarantee schemes are to be used, it is important to make sure that they apply only to passive investors such as pension funds, and not to management companies or strategic investors who actually influence the investments' choice and support.

9. Avoid giving monopoly to any one fund

In the process of building the venture capital industry, Mr. Erlich, manager of the programme on behalf of the Israeli government, took particular care that all public funds were not controlled by the same management company.

10. A variety of instruments for the market must be considered. It is important to pilot and to be ready for failures or amendments

It was shown that the Inbal programme, which had been launched at the same (convenient) moment as the Yozma programme, was much less successful. While the reasons could be different (downside incentive, much bureaucracy), it is clear that there is a need for flexibility; that is, the ability to launch different programmes, or to amend existing ones continuously, so as to be able to cope with any misjudgements from the beginning.

On the other hand, it is important to stress that any initiative should be at least partially successful from the beginning. Indeed, programme failures cause poor reputations both for the public institution involved and for the whole industry, thereby inhibiting its development for the foreseeable future.

11. Fund size

Following the evolution of the funds over time it is clear that they have grown considerably in size. Indeed, from an average of \$20 million at the start of the Yozma programme, the funds reached more than \$500 million in 2000.

The implication for policy concerning this evolution may not be clear-cut, as there always is a limit to the extent of governmental participation in private ventures. Moreover, we reason that venture capital schemes are only needed where the VC industry does not exist or is still in its infancy. Therefore, public participation in the range of \$8 million (which was the case in the Yozma programme) may provide the right order of magnitude of public participation.

12. Funds and sectoral specialization

All Yozma funds but one (Medica, which specialized in medical devices and biotech) had no restrictions for investments in any sector, provided that the investee firm was high-tech.

With time, many funds tended to specialize in one or more fields, most notably telecommunication and software, as this was where the strongest potential was found. The two planning approaches most discussed were the following: (1) the state should be absolutely neutral with respect to sectoral investment and limit itself to checking that the investee firm are high-tech, and (2) the public sector

should invest in those sectors that have a strong and unexploited potential in their region.

While both approaches are interesting and each has its rationale, the IFISE team reasoned that it is quite difficult to identify the strong and unexploited sectors, and that adding constraints to the fund managers is usually very badly perceived; therefore neutrality seems to be the best alternative. An exception should be envisaged for sectors that need particular infrastructure, such as the biotech-pharmaceutical sector.

1.5 - Conclusions

Since the Yozma programme has been validated as an extremely successful one, it comes as no surprise that various countries such as New Zealand, Australia, Denmark, Korea, the former Czechoslovakia, Taiwan, and South Africa adopted the same or similar schemes [Erlich, 2002a]. Many good lessons can be learnt and different issues raised from the analysis of this programme.

In the framework of the IFISE project, analysis of the programme and the Israeli VC industry has been used for extrapolating new lessons to be transferred to other countries, and has then been applied to the Italian reality. Details on the analysis of the Yozma programme and part of the extrapolated lessons are found in [Teubal and Avnimelech, 2002], those on the comparison of Yozma-affiliated enterprises and other Israeli companies are found in [Sadovski, 2002], additional extrapolated principles and the application of the extracted lessons to the Italian reality are found in [Modena, 2002].

CHAPTER 2

THE TECHNOLOGICAL INCUBATORS PROGRAMME AND THE PROVISION OF SEED CAPITAL TO RESEARCH-INTENSIVE NEW FIRMS

2.1 - Programme Background and Operation

In the wake of massive immigration of skilled personnel from the former U.S.S.R., the Israeli government decided in 1990 to establish the *Technological Incubators Programme* (T.I.P), with the aim of both helping the immigrant scientists and engineers find employment in their own fields of expertise, and of creating new high-tech and export-oriented companies.

Between 1991 and 1993, 28 incubators were established around the country on the initiative of large firms, universities, and local authorities, or a combination thereof. An incubator is a not-for-profit organization providing financial support, office space and professional consulting to each incubated project. It usually hosts eight projects, which have the right to remain for a maximum period of two years.

The Office of the Chief Scientist at the Ministry of Industry and Trade grants incentives to both the incubator management and the incubated projects: the incubator is given up to \$180,000 annually and up to 100% of its annual budget. The projects are individually given up to 85% of their approved budget, plus up to \$150,000 annually, for a maximum of two years. Incentives are only directed to individual entrepreneurs, as existing firms are not eligible subjects. As of the end of year 2001, the T.I.P. featured:

- 23 technological incubators which have remained operational (5 have merged with larger incubators);
- 200 projects currently operating;
- 8 projects on average in each of the incubators;

- 735 projects already have "graduated" from the incubators.In addition, the T.I.P. has launched a framework programme for two bio-technological incubators which are currently being set up.

It should be mentioned that the T.I.P. only accepts projects that are both rooted in research and development and have a high level of innovation and uniqueness. Other selection criteria are that the projects have significant market potential, and are feasible with the available resources.

The selection process follows various steps. First, the incubator's manager, with the help of a group of professional advisors, selects the most promising projects from a multitude of inquiries. Then, together with the project's entrepreneur and an advisor, they prepare a "project folder" for submission to the incubator's steering committee (normally composed of academics, industrialists, and community leaders), which gives its preliminary approval or denial to the funding. The final decision is determined by the Central Incubators Administration in the Office of the Chief Scientist, who may request the advice of additional experts. The incubator manager's opinion is the most influential. Approved projects are evaluated anew after one year, and the decision is made as to whether to give them a second year of support. Figure 2.1 gives an idea of the "deal flow" in the average incubators.

Figure 2.1: Project Selection Process - General Flow Chart and Percentage Approved



Source: Shefer and Frenkel (2002) – See also Modena and Shefer (1998)

In general, we might say that the T.I.P. is built in such a way that any entrepreneur, regardless of his/her place of residence (incubators are almost everywhere), his/her field of expertise (there is no sectoral restriction), financial situation (the state provides most of the needed funds) or lack of experience (consulting is provided by the incubator itself) has the chance to set up his/her own company. It also worth noting that 84% of the entrepreneurs hold either a Master's or a Ph.D. degree, clearly testifying to the high-tech, research-oriented nature of their ventures.

2.2 - Validation of the Technological Incubators Programme

In order to validate the Technological Incubators Programme, we have again made use of two sets of indicators: output indicators aimed at checking for the direct impact of the programme, and outcome indicators used to evaluate the indirect impact of the programme; that is, to measure figures that may also have been influenced by other factors.

2.2.1. Economic Impact – Output Indicators

The output indicators that were measured for the Technological Incubators Programme are as follows:

1. Number of incubators established since the programme's inception Between 1991 and 2000, 28 incubators have been established.

2. Incubator's survival rate

After 11 years of operation, out of 28 incubators, 23 (82%) are still operational.

3. Number of incubated projects since inception and per year

Since its inception, 735 new enterprises have entered the incubators' programme. In 2001 there were 200 projects in all the incubators (an average of eight per incubator). The average number of projects per incubator was the same as in 1996 [Modena and Shefer, 1998].

4. Graduation from the programme

In the years 1999-2000-2001, 235 (86.4%) of the 272 incubated projects have graduated, that is, they have completed the two year period in their incubator [Shefer and Frenkel, 2002].

5. Percentage of enterprises which succeeded in securing financial support at the end of the incubation period

According to Shefer and Frenkel [2002], 77.9% of the graduated projects have succeeded in securing financial support (in addition to that granted by the incubators) at the end of the programme. It should be mentioned that the year 2000, in which the survey took place, is considered to have been exceptional in terms of the large amount of venture capital offered in Israel.

6. Financial support securement by location

One of the objectives of the programme was to create industrial development in economically depressed areas. Validation of the programme in this respect shows that projects incubated in peripheral, non-metropolitan regions showed a lower rate of success (67.9%). The metropolitan areas show a success rate (78.6%) close to the average, and the intermediate region resulted in the highest (84.3%).

	Location					
Field	Metropolitan region		Intermediate region		Peripheral region	
	Number	% of Total	Number	% of Total	Number	% of Total
1. Pharmaceutical (Drugs)	5	100.0%	4	100.0%	0	-
2. Medical equipment	16	69.6%	9	81.8%	9	75.0%
3. Chemicals and raw materials	18	90.0%	8	72.7%	6	60.0%
4. Mechanical engineering	13	65.0%	3	60.0%	4	57.1%
5. Hardware, communication, and electronic components	9	69.2%	4	66.7%	2	100.0%
6. Optical and precision equipment	10	71.4%	1	100.0%	2	50.0%
7. Biotechnology	1	100.0%	17	100.0%	8	80.0%
8. Energy and ecology	4	100.0%	1	100.0%	4	66.7%
9. Software	12	100.0%	12	85.7%	1	50.0%
Total	88	78.6%	59	84.3%	36	67.9%

Table 2.1 - Graduating Projects that Succeeded in Securing Financial Support, by Location

Source: Shefer and Frenkel (2002)

7. Financial support securement by industrial sector

Table 2.1 shows financial securement by industrial sector. As can be seen, the most successful projects are those in the fields of pharmaceuticals (drugs), biotechnology and software. In general, Table 2.1 shows how the structure of the Technological Incubator may be suitable for a wide variety of sectors.

8. Contribution to the variety of the economy

Variety has always been considered an important feature of any economy. This has been seen very clearly in the last two years (2001-2002), where regions whose industry was too strongly focused on the telecommunication sectors (like Israel and California) suffered strong recession. The T.I.P. appears to contribute to variety within the Israeli industrial structure by giving opportunities to entrepreneurs operating in sectors that are not part of the strongest in the country. Indeed, as shown by Table 2.2, the distribution of incubated projects among various sectors is considerably different than that of a general sample of the Israeli high-tech startups. It appears that firms operating in the major sectors of Israeli industry (telecommunications, software, etc) did not need the support of the incubators as, in all probability, private venture capitalists/investors were able to evaluate those firms' potential and invest in them. On the other hand, initiatives that were not part of the "mainstream" sectors could find start-up opportunities in the incubators, thereby contributing to crucial variety within the national industrial production.

Field	Incubators		General	
rielu	Number	%	Number	%
1. Drugs	19	9.1%	1	0.7%
2. Medical equipment	44	21.2%	15	10.7%
3. Chemicals and new materials	26	12.5%	4	2.9%
4. Mechanical engineering and industrial automation	24	11.5%	5	3.6%
5. Hardware, communication, and electronic components	17	8.2%	36	25.7%
6. Optical and precision equipment	18	8.7%	10	7.1%
7. Biotechnology (excluding drugs)	26	12.5%	10	7.1%
8. Energy and ecology	21	10.1%	0	0%
9. Software	13	6.3%	59	42.1%
Total	208	100%	140	99.9%

 Table 2.2 – Sectorial Distribution of Incubated Projects as Opposed to a

 Representative Sample of High-tech Firms in Israel

Source: Data on incubated projects are taken from Shefer and Frenkel (2002), whereas data on the sample of Israeli start-ups are due to Sadovski (2001). The surveys were made consistent (and compared in Modena, 2002) as they were both carried out in the framework of the IFISE project.

9. Incubated projects initiator's level of satisfaction of the incubators' services

Table 2.3 provides for a subjective evaluation of the incubator's services made by a project's initiator. In order to evaluate which features really matter in a technology incubator, both the effectiveness of each service provided by the incubator (column A in the table) and its actual importance for the setting up of a new firm incubator (column B) were evaluated. To verify the importance of the incubator services more strongly, a sample of Israeli high-tech entrepreneurs who were not linked to the incubators were asked to evaluate the importance of each of the aspects in an incubator (column C). Moreover, they were asked to state whether they would expect government incentives to help for each of the incubator items (column D). From the comparison of the responses we can spot those functions (services) that are perceived as most important, and to which functions the T.I.P. does not give serious enough response. These main services are: help in marketing and in links with international collaborators, networking with strategic partners, and links to financial sources. From this brief analysis we come to the conclusion that the T.I.P.

programme cannot be validated with respect to these functions. The importance of public financial support is also easily inferred from this table.

Service (function)	A - Inc. Initiators – Satisfaction of incubator service	B - Inc. Initiators - Importance attached to services	C – Generic sample- of initiators - Importance attached to services	D - Consider government intervention appropriate
	Score (5 most satisfied – 1 least satisfied)	Score (5 most satisfied – 1 least satisfied)	Score (5 most satisfied – 1 least satisfied)	Percentage of interviewees answering positively
Available suitable space	3.72	2.31	1.8	13.2%
Legal counselling	3.46	3.35	2.1	9.1%
IPR Protection	3.43	3.32	2.8	22.4%
Management support	3.43	2.74	2.2	11.9%
Financial support	3.36	4.68	4.2	40.6%
Strategic counselling	3.11	3.47	2.5	11.2%
Access to labor pool/ recruiting	3.06	2.63	3.2	13.3%
Links to financial sources	3.04	4.42	2.9	30.7%
Connections with suppliers	3.04	2.27	1.9	4.9%
Networking with strategic partners	2.98	4.08	3.5	25.9%
Professional network	2.90	2.82	2.4	4.9%
Market information	2.81	3.31	2.4	16.8%
International collaborators	2.80	4.15	3.3	34.3%
Marketing	2.74	4.17	3.8	31.5%
Source of technological information	2.56	2.78	2.0	15.4%
Advanced studies and re- training	2.46	2.52	1.8	18.2%
Number of projects	109	109	143	100% (143)

 Table 2.3 - Project Initiators' Level of Satisfaction from Services Provided vs.

 Level of Importance Attached to these Services

Source: Data on incubated projects are taken from Shefer and Frenkel (2002), whereas data on the sample of Israeli start-ups are due to Sadovski (2001). The surveys were made consistent as they were both carried out in the framework of the IFISE project.

10. Incubator managers' level of satisfaction

Incubator managers' level of satisfaction of the program varies according to the different proposed functions made available by the incubators. On a scale of 1 to 5, with 5 showing the highest satisfaction, the average score given by 21 out of the 23 incubators' managers for each service is shown in table no. 2.4. [Shefer and Frenkel, 2002].

Variable	Score	Std. Deviation
Available suitable space	3.81	0.98
Legal counselling	3.81	1.17
IPR protection	3.67	1.20
Management support	3.67	0.97
Strategic counselling	3.52	1.17
Market information	3.48	1.03
Connections with suppliers	3.33	1.24
Access to inputs	3.29	0.90
International collaborators	3.24	1.22
Professional networks	3.19	0.81
Networking of plants	3.19	0.98
Sources of technological information	3.14	1.20
Networking with strategic partners	3.10	1.00
Financial support	3.00	1.26
Marketing	2.81	1.12
Links to financial sources	2.76	1.30
Access to labor pool	2.67	1.11
Advanced studies and re-training	2.52	0.87

Table 2.4 – Incubator Managers' Level of Satisfaction

Number of incubators' managers: 21 Source: Shefer and Frenkel, 2002

When asked to point out the major barriers in running projects in the incubator, the managers mentioned budget limitations and the lack of management knowledge [Shefer and Frenkel, 2002].

2.2.2. Economic Impact - Outcome Indicators

This section presents the indicators of validity as measured 11 years after the T.I.P. inception and which relate to the larger impact produced by the programme. Some

of these indicators may well be influenced by factors other than the programme itself.

1. Percentage of incubated firms as a share of total high-tech firms in Israel

Sadovski [2001] has shown that 14.7% of the existing high-tech companies in Israel in 2001 were supported by the Technological Incubators Programme. This percentage is quite significant when one takes into account that Israel has a huge number of high-tech start-ups (according to some, it has the largest absolute number in the world after the U.S.).

2. Percentage of entrepreneurs coming from academia (helping technology transfer from academia to industry)

Table 2.5 and 2.6 are concerned with the (at least partial) validation of the T.I.P. as a means of technology transfer from academia to industry. It is easily noted that many founders of firms that pass through an incubator are much more likely to come from the world of academia than founders of the rest of Israeli firms.

Previous occupation (% of total)						
	Industry	Academic and research institution	Other occupations	Total Number of Companies (100%)		
Incubators Graduates	41%	36%	23%	22		
Sample companies	78%	12%	10%	98		

Table 2.5 - Previous Occupation of the Founders - "Incubator" Companies vs.Generic Sample Companies

Source: Sadovski, 2001

3. Percentage of firms whose ideas came from academia (helping technology transfer from academia to industry)

A second indicator was aimed at checking the contribution of the T.I.P. towards the transfer of technology from academia to industry. Sadovski [2002] has checked the environment in which the basic idea of the new product was conceived. Table 2.6 shows clearly that an incubator graduate's new technologies are much more likely to have stemmed from university research than from other high tech companies.

Table 2.6 - The Working Environment for the Genesis of the New Idea

	Companies (% of total)					
Environment	High-tech industry	Traditional industries	Academic institutions	High-tech & academic institutions	Total	
Incubator graduates	28%	11%	50%	11%	100%	
Sample companies	63.5%	20%	15%	1.5%	100%	

Source: Sadovski, 2001

4. Total private investment in incubated or formerly incubated firms as opposed to total public expenditures

As of the end of 2001, a total of \$627m had been invested by private entities into incubator projects, versus a total governmental investment of \$254.1m; a ratio of 247% [Pridor, 2002a].

5. Sales revenues of incubator-graduate companies as opposed to sample companies

Table 2.7 shows the sales revenues of a sample of incubated companies as opposed to a sample of high-tech companies in Israel. Incubator graduates seem to perform more poorly than average.

Table 2.7 - Sales Revenues (20	00) of Incubator-Graduate Co	ompanies vs. Non-
Incubator Sample Companies		

Respondents (% of total)					
Sales	Incubator Graduate	Non Incubator Graduate			
No sales	63%	52%			
100k\$-1m\$	37%	22%			
>1m\$	0%	26%			
Total	100%	100%			

Source: Sadovski, 2002

2.3 - Evolution of the Technological Incubators Programme Over Time

In the course of its 11 years of existence, a few changes have occurred in the regulation and organization of the T.I.P., as follows:

- The initial effort of the public sector has proven to be successful in attracting private investors. Figure 2.2 shows the cumulative investment of the private vs. the public sectors. The latter reached the "break even point" (a situation where the private investors endow as much money as the public) in 1998, and the gap seems to be widening [Pridor, 2002a].
- 2. The number of incubators has diminished from 28 to 23, with 5 incubators having merged with others.
- 3. Rules for the acceptance and management of projects, which are revised every few years, have become slightly more flexible. In particular, the previous rule by which at least 50% of the entrepreneurs had to be new immigrants has been lifted. In addition, rules that posed limits to the wages of the workers have been softened.
- 4. The rule that prevented the sale of intellectual property to foreign entities or transfer of the company abroad is being substituted with a rule whereby if the shareholders pay back to the state twice as much as their company was granted, they are freed from such restrictions. This rule will apply to all governmental high-tech programmes.
- 5. In spite of the success of the biotech and pharmaceutical (drug) related projects within the existing incubators, the T.I.P. has found that the existing potential in the country was not exploited, and that in order to do so it would be necessary to create a new ad hoc programme. As a result, a tender for three biotech incubators has been launched with some important new features: (1) Incubators will include research equipment to be used by the projects. (2) Projects will be permitted to receive the loan for three years (as opposed to only 2 years in regular incubators). (3) The maximum governmental loan will be \$1.8 million for these projects. This is done by means of convertible bonds, i.e. if the incubator is not able to refund the debt, the state will have the option to turn it into shares of the relevant companies. (4) Contribution to management companies is only for the acquisition of new equipment, up to 50% of the approved budget [Web-Site Technological Incubators, 2002].
- 6. A pilot project for partial privatisation is being tested parallel to the T.I.P. programme [Web-Site Technological Incubators, 2002]. According to this new

proposal, incubators will be for-profit entities which will not receive any budget for management. They will be entitled to state loans for projects, the loans will become equity, in case the incubator is not able to refund it (convertible bonds). The state loan is under condition to a series of rules, including that the equity held by the incubators should range between 30-70%. The new framework is being proposed first to the existing incubators [Web-Site Technological Incubators, 2002].

Figure 2.2 - Government Investment vs. Private Investments in Incubator Graduate Projects



Source: Pridor, 2002

2.4 - Success Factors, Lessons and Planning Issues from the Technological Incubators Programme and its Evolution

1 - Importance of strong public support for seed finance

In spite of the enhanced involvement of the private sector, state contributions still account for 64.4% of the incubated firms' budgets. Venture capital funds, which are supposed to be the most natural source of co-financing, entered in only 2.4% of projects as they started and in 14% of projects after incubation. This data is especially significant in Israel, where 52% of high-tech firms are VC invested. It

also worth noting that in spite of very generous state contributions (up to 85% of the budget; up to \$350,000), both project initiators and incubators' managers agree that the provision of seed capital is the most important and necessary function for setting up new high-tech start-ups. This finding is in line with extensive international literature dealing with market failure in early stage financing of high-tech ventures (Hall, 1989; Murray and Marriott, 1998; Oakey, 1995).

As we have seen in Chapter 1, public intervention for the creation of start-up capital sources (\$1-2 million) does not have to be continuous, as it only needs to trigger the establishment of private sources that would become self-sustainable after some time. The provision of seed capital has to be strongly supported by the public sector, although private sources participate in the investments.

2 - Private funding to the incubator management team increases over time, which means public intervention may be reduced over time (although not stopped)

Table 2.8 shows incubator budgets according to the nature of the sources (private or public). Keeping in mind that state contributions accounted for 100% of the budget at the beginning, these data show how the state's contribution has diminished over time in relative terms. This can be explained by the fact that private sources would not be interested in joining a new programme before they have at least an initial record of it. On these grounds, we came to the preliminary conclusion that when a new public programme is launched, there might be a point in planning for a strong incentive at the beginning, which may then be reduced with time.

	Total	Location of incubators			
Sources of funding		Metropolitan region	Intermediate region	Peripheral region	
Total budget per average incubator (in \$)	\$565,381	\$602,111	\$498,000	\$566,286	
Government funding (%)	38.0%	30.4%	36.9%	49.1%	
Other sources of funding (%)	62.0% 69.6% 63.0%		50.9%		
Number of incubators	21	9	5	7	

Table 2.8 - Average Source of Funding of Incubators, by Location

Source: Shefer and Frenkel, 2002

3 - Locational factors and the need for background conditions

The question of location is of extreme importance when we consider the problem of where to locate facilities such as incubators or seed capital funds. Indeed, economic policy oriented to the development of the high-tech sectors is often confused (or wrongly combined) with policy aimed at the development of depressed areas. It was pointed out (see section 2.2, point 6) that the T.I.P.'s peripheral incubators performed less successfully than others. This could have been linked to the lower number of proposals submitted to this kind of incubator, or to the less stringent selection process (see table 2.9). The real issue turns out to be that, in order to launch successful programmes, it is necessary to check the existence of background conditions. *It is imperative* that there be a critical mass of potential entrepreneurs (deal flow) and that subsequent sources of financing exist, usually private venture capital funds.

Filtering	Tot	al		Location					
Process (ner average	Number	%	Metropolitan region Intermediate region Peripheral regio				l region		
incubator)			Number	%	Number	%	Number	%	
Number of inquiries	345	100%	397	100%	372	100%	259	100%	
Number of proposals submitted	194	56%	232	59%	252	68%	104	40%	
Incubator manager's selection	126	37%	145	37%	152	41%	84	33%	
Expert committee's selection	38	11%	40	10%	30	8%	40	15%	
Chief Scientist's approval	21	6%	24	6%	17	5%	20	8%	
Projects admitted into program	18	5%	18	5%	17	5%	20	8%	
Number of incubators	21		9		5		7		

Table 2.9 - Project Selection Process in the 21 Israeli Incubators, by Location

Source: Shefer and Frenkel, 2002

If background conditions exist, it appears that there is quite a good probability of graduate projects remaining in the vicinity of the incubator, thereby contributing to industrial development at the local level. This, at least, has been found to be the case in Israel [Shefer and Frenkel, 2002; see also Modena and Shefer, 1998].

4 - Neutrality vs. sectoral specialization

The dilemma of whether to encourage sectoral or neutral incubators can be phrased as follows. On the one hand, an incubator (or seed fund) focused on a particular sector seems to be more efficient than one which accepts initiatives from any sector. Indeed, the management team of a sectoral incubator/seed fund would come from that same sector, and would be more competent both in the evaluation of the proposals and in helping entrepreneurs network with partners to better define their own product. On the other hand, a sectoral incubator automatically rules out the opportunity for a wide range of initiatives, among which valuable ones may be found. In other words, the deal flow of the sectoral investor is strongly limited.

From a public point of view, a sectoral incubator appears not to respond to the criteria by which the opportunity to set up a new company must be given to any valuable entrepreneur.

The question becomes even more difficult when the region for which the incubators are planned is a small one, and only a few funds can be set up. Shall one concentrate efforts into the one or few sectors that have the potential to grow and to create the necessary critical mass, or just be neutral and let the market drive the incubators' deal flow and choices?

In the framework of the IFISE project, Shefer and Frenkel [2002] have shown that in spite of the trend of most incubators' managers to support specialization, and in spite of a slight trend of existing incubators to actually specialize in two or three sectors, no major differences were found between the performance of the more specialized versus the neutral incubators.

The conclusion we reached is that there should be no restriction by the state as to whether the incubator/seed fund should focus on one or more sectors, or be totally neutral. However, extreme care should be taken in checking that the proposal is consistent, i.e. the proposers should show why they decided to focus on particular sectors (e.g., what is the potential of the area in that sector? How is the management team track record consistent with that choice?).

An exception should be made for sectors that need specific infrastructure, as in the biotech/pharmaceutical sector, which should be dedicated through an ad hoc programme.

5 - Integrative approach vs. division of functions

Generally the T.I.P. provides for a one-stop shop for high-tech entrepreneurs. It includes all necessary functions such as seed money supply, professional consulting and office space. According to Rina Pridor, T.I.P. Director [Pridor, 2002], this is of particular importance as it creates the necessary trust atmosphere, involvement, and discipline necessary for the inexperienced entrepreneur. Also according to Pridor [Pridor, 2002a], these are also essential factors in light of the finding that 70% of project failures are attributed to the personality of the entrepreneurs (20% to misunderstanding of the market, and only 10% to technical failure).

6. - Evaluation by an expert network

The Technological Incubators Programme has set up a national database of experts in almost all fields of science and technology. This is of crucial importance, as the incubators are submitted for evaluation along with ideas that come from widely varied fields, and it is often difficult to find an expert able to evaluate them, especially at the local level. It is strongly recommended that incubators be networked, and that they share the opportunity to get professional advice from a large national database of experts.

7. - Transferring the firm abroad or selling the intellectual property

In general, the public authority that launches a support programme to high-tech start-ups is usually interested in developing the economy of its area of jurisdiction. Consequently, some authorities such as the Office of the Chief Scientist in Israel have historically imposed various limits on the companies that received grants from the government. These limits have caused considerable distress among entrepreneurs, as the sale of either a company to foreign entities, or the sale of intellectual property for a certain product, is common practice in the high-tech sector. Israeli authorities have coped with this problem by introducing the rule by

which a company is completely free to do as it wishes concerning the matter, provided it refunds back to the state a sum which is the double of its financial grant.

8 - The importance of the entrepreneur's share

One of the most important rules of the newly incubated projects is that the entrepreneur team owns at least 30% of the shares after the first round of investment (entrance into the incubator). Indeed, according to Rina Pridor [Pridor, 2002], it is very important to keep the inventor, who has the necessary know-how on the new technology used by the firm, motivated. By the same token, he should be working as much as possible on the project, up to the ideal of his full time employment.

9 - Enterprise governance and entrance of new investors

If the entrepreneur is crucial in the first stages of the venture, he can become a burden after some time, when the firm should insert new investors, and by doing so, make the entrepreneur less influential. Indeed, it has been shown that many entrepreneurs are reluctant to relinquish control of their firms, thereby limiting its growth. In order to cope with this, some incubators have been authorized to act as trustees, and keep 20% of the shares in their hands with the power to sell them to an external investor, without the prior acceptance of the other shareholders [Pridor, 2002].

<u>10 - Importance of the incubator's manager</u>

Shefer and Frenkel (2002) have shown that the capability and motivation of the incubators' managers is crucial. "Growing" a new initiative is no easier than running an existent and established one; therefore the manager and his team are to be carefully chosen and adequately remunerated and motivated.

11 - University incubators and seed funds

Proximity to a university research centre has been shown to be a significant factor for entrepreneurs in the field of biotechnology, pharmaceuticals and medical devices [Shefer and Frenkel, 2002]. This can also be linked to the higher academic level that is usually held by such entrepreneurs.

Moreover, when establishing a university incubator or a seed fund, one should take into account a few problems that are likely to arise: <u>11 A - Conflict of interest.</u> It may happen that due to research aspirations of the university, researchers are tempted to use seed capital for funding their research even though it is not market-oriented. For this reason, it is sensible to avoid a university's control over a seed fund, although it may participate in that fund. Also, to avoid conflicts of interest, it is important to avoid either the incubator's management or the seed fund's dependency on university management [Pridor, 2002].

<u>11B - Professors as entrepreneurs</u>. It is quite common that university researchers do not have the managerial skills needed to set up and run the new company. There are two ways to deal with this problem: (A) a professional manager coming from the industry (possibly the same sector as the entrepreneur) is put in tandem with the researcher, and becomes the firm's manager. The researcher invests the necessary time (typically one or two days per week) to provide needed technical advice, but is still able to keep his position within the university; or (B) ad hoc business courses are established for the inexperienced entrepreneur, and he has the possibility to refine his business plan within their framework [Pridor, 2002].