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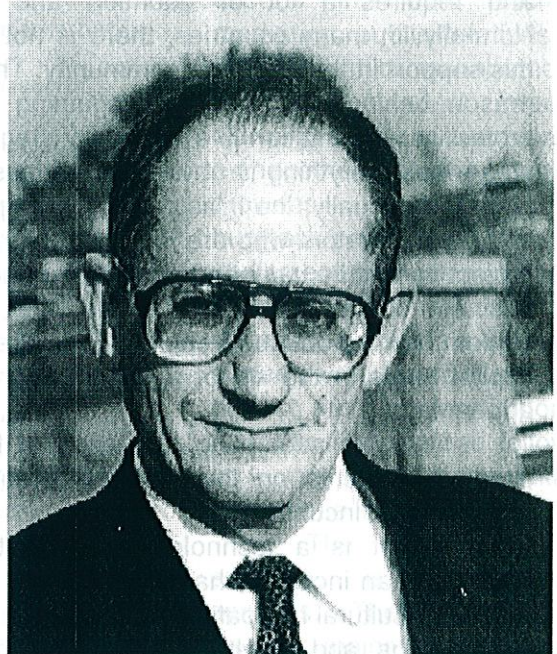
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INTERNATIONAL EXPERIENCE WITH TECHNOLOGICAL INCUBATORS AND ITS IMPLEMENTATION IN ARMENIA

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The Government of Armenia has requested the World Bank to support the preparation of a medium-term strategy for the development of the private sector. An important element of this strategy is the entry of new types of business activity through the development of the high-tech industry. We are well aware of the highly qualified and skilled human resources available in Armenia. We are well aware, however, of such obstacles as the disadvantageous geographical position of Armenia, and difficulties with transport and communication. We are also well aware that there are good opportunities for foreign investments, especially those from the Armenian Diaspora. Considering these factors, the possibility to establish an incubator in Armenia has been explored.



We are not speaking of incubators for eggs, but incubators for scientific ideas, concepts, and innovations. We will later explain to you what a technological incubator is. I would just like to point out that, so far, we are only carrying out a feasibility study for such a project.

In order to carry out this feasibility study, we have invited experts from Israel, considering the two factors that these countries (Israel and Armenia) have in common. First, as you know, a large number of Jews immigrated to Israel from the USSR. During

the '90s, around one million people immigrated, as a result of which the population of Israel grew by 20%. Among the immigrants, there were a large number of scientists and engineers who couldn't find appropriate jobs.

What does the incubator offer the entrepreneur?

- ✓ *Financing of R & D and initial marketing expenses.*
- ✓ *Proper facilities.*
- ✓ *Professional guidance, mentoring and management assistance:*
 - R & D services.
 - Business development services.
 - Administrative services.

BENJAMIN BACHRACH***Managing Partner of "BSA"***

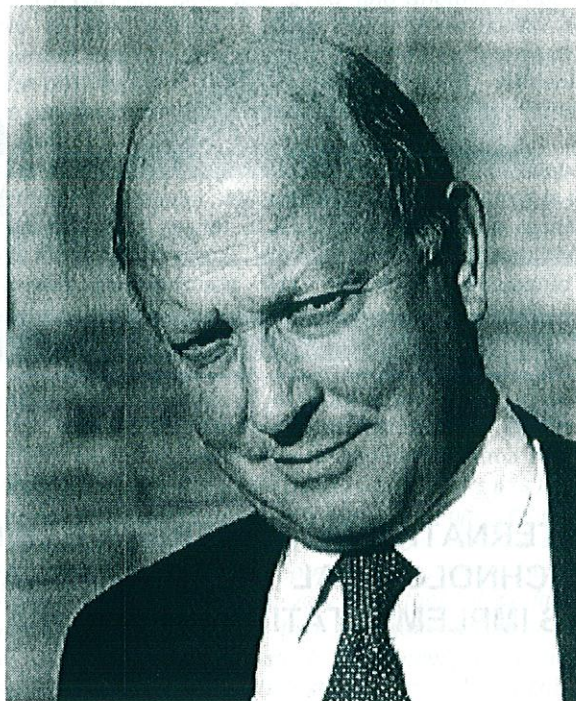
We will try to present in general the idea of a technological incubator. There is a time in the life of people and businesses when utmost care and attention is required. It is the early stage -- the infancy of a project. Or, as it is often called in business, the stage of planting seeds when we make investments and perform activities so as to gather crops later. This is a very sensitive activity and requires a lot of attention and support. Normally, in many countries, there is not much of this support in the business community. The simple reason behind it is that the beginning stage of project implementation is a very risky stage. At this stage, not everything is obvious; the ideas are still ideas and usually, the initiators, the entrepreneurs, and the innovators who are the driving force of the project cannot be independent in their financial and business communities. Even in the west, we very seldom hear about seed capital. Even the venture capital funds in the life of a company or an idea appear later.

We are attempting to present a feasibility study in Armenia on the idea of establishing a technological incubator.

What is a technological incubator? The concept of an incubator has in fact come from that of the agricultural incubator. An incubator is a place where eggs and newborn chicks are raised. A technological incubator is a structure that provides a supportive and protective atmosphere for animals and for human ideas. In business, we use the concept of an incubator for many different purposes. It would be better if we specified now what type of incubator we are not referring to because the one we shall speak about has a much broader sense than the better-known one.

Very often, there are organizations, governments, and private enterprises that build or rent premises. This is more common in former Soviet countries. In this case, we find buildings, plants, and properties; we categorize them and include them within one building by having one group of enterprises share services and structures. The incubator is this all-inclusive building. This is the business incubator, or the real-time incubator. Here, we save in terms of low rent and through sharing services. Even in Washington, DC, we have carried out similar studies with support from the World Bank.

There are certain models of incubators that physically do not exist, and although they render



their services to business people, they do not unify them. A good example is TACIS. These are not the kind of incubators we are discussing today. We will be speaking rather of technological incubators. The technological incubator is a system where a group of high-tech inventors or entrepreneurs, who are in the earlier stages of developing their ideas, are brought together. You would receive in the incubator preliminary financing for R & D activities, marketing expenses, as well as appropriate capacities for carrying out research work. Professional support is also provided in incubators. Other than financing, which is the most important, there is also marketing and other support, as well as appropriate services for an acceptable project to be part of the incubator.

First of all, what kind of relationships does the incubator provide for you and your partners? The first group of services that the incubator provides is R & D services. These are crucial at this stage in the life of the project if it is to develop further.

Project management is very important. It must not necessarily be carried out at the will of the inventor or owner of the idea. Project management is the activity where the manager of the incubator has a great influence over the project. Normally, entrepreneurs come to the manager of the incubator and say, "Give me money. I know what to do with it. I know how to manage the project, how to handle it, and how to find markets." Very often,

however, it turns out that the owner of the idea does not succeed, and the main reason is that the same people who are the inventors, the developers, and the scientists manage the project. Perhaps they are really the best scientists, but not the best businessmen. In this sense, project management is very important.

The next phase of R & D services is technological support and consultation. The relationships between businessmen and scientists are quite complicated. The scientist says that s/he does not want to share her/his idea with anyone because s/he is afraid that it would be copied, transferred to another person, stolen, or otherwise lost. The legal and psychological atmosphere in the incubator is such that the scientist or the entrepreneur who is the owner of the project is well prepared and well trained to be managed by the incubator, to be given advice, and to cooperate with the consultative board. This is a group of scientists who support the incubator and the projects that come into it; they are well aware of the possibilities for project implementation and perform important functions. Consultation is a very important factor during project development. The inventor needs much more than the idea and what is written on paper. At this stage, the consultation provided by the incubator becomes one of the main elements of the future life of the project.

Intellectual property protection plays a significant role among R & D services. Naturally, scientists are concerned about protecting their inventions. One of the options they have for doing this is licensing or registration. But sometimes, licensing is not the best way out because, at that time, everyone gets to know what your idea is. If someone else has a similar idea, other problems arise. The question is where, when, and whether you have licensed the idea. This is why intellectual property protection is a difficult matter that requires legal, as well as scientific and technical consultation. We are speaking of registering the idea not only within Armenia, but also of exporting it to Europe, the USA, and other foreign markets. The aforementioned is the last element of R & D services management.

Let us speak about the most important element of business development services. Incubators offer a range of services to scientists and businessmen. Incubators develop business policy and an atmosphere that is necessary for the implementation of this policy. When the project is still in its initial stages, it is important to recruit management. It is not obligatory that the author of the idea also become the project manager. Sometimes there is a need for other technical experts in fields such as marketing, public relations, etc. Recruitment of management is one of the most important elements of the support that the management of the incubator provides. Financial and business policy formulation and implementation, as well as the development of strategic alliances, with marketing partners who would like to join a project, are also very important. It is also important to follow up on project implementation outside the incubator.

The last group of services is administrative services. They exist in all institutions and are of major importance in incubators. These services are rendered directly by the staff of the incubator: lawyers, auditors, licensing specialists, etc.

This is a brief outline of all the services that are provided to those projects that have been accepted into the incubator. Now, let me say a few words about the main features of an incubator. We will now try to link the external side of the incubator with the economy and those branches in which the World Bank is working in Armenia.

First of all, an incubator must be an independent legal entity. If this feasibility study is successful, we will look for a type of legal entity that will be most appropriate for reaching the goals of the incubator. Having a skilled and experienced staff is a guarantee for success in this project. An incubator is an active institution and is run by the General Manager in an appropriate, efficient, and effective manner. The General Manager is the most important element in the success of the incubator. That is why it is important to have a skilled and experienced person who will not only understand the business atmosphere, but also the psychology of entrepreneurs. S/he should understand how to

The main features of an incubator

- ✓ *Skilled and experienced General Manager.*
- ✓ *Supportive dedicated and highly competent Evaluation Committee and Executive Committee.*
- ✓ *Suitable facilities for R & D activities.*
- ✓ *Total number of projects – no more than 15.*
- ✓ *Acceptable projects*
- ✓ *Technologically innovative.*
- ✓ *Product targeted at specific commercial markets.*
- ✓ *Suitable for the size, budget and time framework of the incubator.*

operate in an atmosphere in which there is pressure by business people who constantly insist that there is no need for such institutions. A great deal of understanding of new concepts, initiatives, and the business environment is required. It is necessary to understand how to perform disciplined activities. In Israel, the incubator has been successful because every cent is accounted for and monitored. Money cannot be spent frivolously because funding is not simply given away; it is designated for specific purposes.

The evaluation committee that chooses and prioritizes the projects is very important for the incubator. This group normally consists of scientists, business people, representatives of other fields, and those who have returned to the country from abroad. If this group functions properly, then things may run smoothly. It is an important factor for the creation of the portfolio of an incubator that guarantees the success of the institution. This is why the correct selection of the evaluation committee is very important.

Experience has shown that the maximum suitable number of projects for the success of an incubator is 15, and the minimum is five. If there are more than 15 good ideas, it becomes necessary to build a new incubator.

Let me specify what kinds of ideas are acceptable for technological incubators, what projects we would like to see as components. First, these are technologically innovative projects. It is necessary that the final products of the R & D projects are marketable. These can include technologies or processes. In any case, it must be an economic product for which there is a market demand. It must also have value, be profitable to investors, and be targeted at specific commercial

markets. Very often, projects are innovative, but lack a market. The proposed projects must be suitable for the size, budget, and time-lines of the incubator. I will now speak of the operations of the incubator in the technical sense. The project that has been selected will, after some time, become part of the incubator. The project must move from the early stage of an idea's development, to a solid market product. I am first of all referring to business partners, marketing companies, financial partners, and venture capital funds. These are the kinds of projects that we are looking for. If they are consistent with the standards of the incubator, and fall within a two-year time frame, then they become a part of the incubator. The concept is that every project that has been accepted must receive the same amount of funding. The criteria are similar, and if a project is accepted, it will get a certain amount of funding which is mainly used for human resources, technical, and other expenditures. If the project is expensive and requires more than the amount of funding defined in advance, then the author need not apply to the incubator.

What I have just presented was based on the experience of several countries. At any rate, while creating an incubator, one must consider what kind of social and economic impact it will have for the country. The incubator creates a system of support for the initial phase of technological initiatives; promotes the development of the private sector in general, and the technological industry in particular; enhances private investment; creates new jobs; and gives the scientific mind a chance to express itself. The incubator will reduce the "brain drain" from Armenia, new ideas will be identified and promoted, and finally, former organizations of the military-industrial complex would be utilized.

Itzhak Goldberg received his Ph.D. from the University of Chicago. He has conducted research in economics under the guidance of two Nobel laureates. Before joining the World Bank, Mr. Goldberg was a member of the board of one of the largest companies in Israel. He began his career in the World Bank as an expert in countries in transition. He has worked in such countries as Poland, Romania, Russia, Uzbekistan, Turkmenistan, and Armenia. His specialization is privatization and business development. He is fluent in English, Polish, and Russian.

Benjamin Bachrach represents the Israeli "Ben Shazar and Associates" (BSA) company. Professor Ben Shazar, who was formerly the Director of Tel-Aviv University, founded BSA. Mr. Bachrach is a managing partner of the company.

Dr. Hanan Geist is a manager of a technological incubator in Israel. He is also in charge of managing private venture capitals designated for investments and technologies. Prior to this, he worked as a chief scientist in the Shile Military Industry Department.

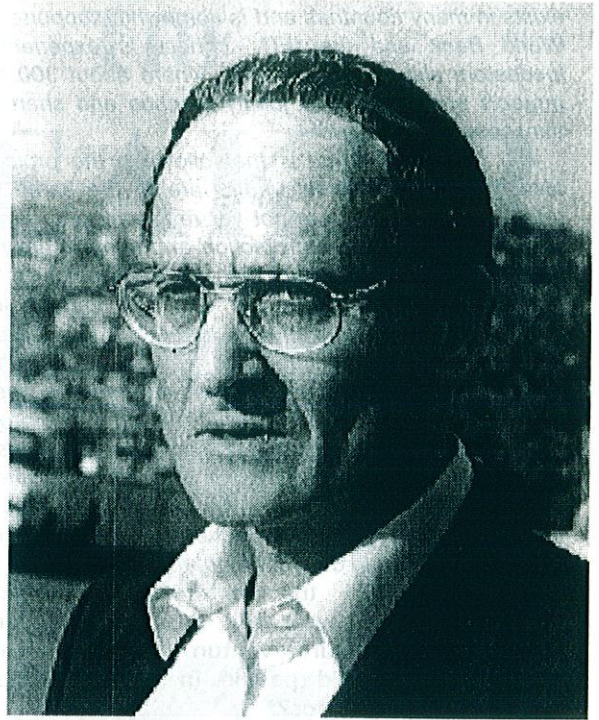
HANAN GEIST**Manager of the "Orit" Technological Incubator, Israel**

Currently there are twenty incubators functioning in Israel, and I am the executive director of one of them. I would like to tell you about one of the projects in our incubator. It includes many issues that are also present in Armenia.

It is known that heart physicians use certain equipment to come up with a graph of the functional heart to make appropriate diagnoses and measure relevant indicators. The innovator came to us with the idea that, if he could obtain the heartbeat's record (electrocardiogram, ECG) over twenty minutes, he would have the possibility to decide whether or not the patient should undergo surgery. The person simply gave us his idea. Later, we consulted with cardiologists and other physicians; we did an Internet search and confirmed what the innovator was suggesting -- his idea was reasonable.

In order to move the project forward we hired a professional scientist who had a military background and made him responsible for the mathematical part of the project. We found an electronic engineer who had some experience in working with precision instruments; he had worked in an atomic plant. Later, we felt the need for a programmer to write the appropriate software. We hired another specialist whose previous experience was in the Russian space industry. The general manager of the incubator handled these activities because the innovator, who came to us and had an interesting idea, did not know anyone in this field. Later, we found a cardiologist who voluntarily offered his expertise towards the success of the project. In order to motivate him, we gave him some shares in the project.

These four people worked on the project for several months. Then, an American Jew visited the incubator. He had connections with large manufacturers of medical equipment, and he showed interest in this project. Six months after starting the project, we had a strategic partner. Although they were not quite confident in the success of the project, they were ready to invest funds. As a result, we had a group of skilled experts working on the



project, as well as a real scientific and economic, strategic partner. Quite honestly, not all projects are so successful as to have a strategic partner at the initial stage.

Let me present some general information on the Israeli experience. The first technological incubator in Israel was created nine years ago. There are now about 20 of them. About 500 projects and companies are involved in the incubators. According to the most recent information, some 250 of them are currently operational. About a quarter of these projects have successfully obtained investments from various private investors, funds, and companies. This is an indicator of success — somebody appreciates both the technological advances of the product and the market available for it. In the last two years, each of the eight projects in our incubator has received over \$150,000.

QUESTIONS AND ANSWERS

- Is the following project suitable for the technological incubator: new equipment has been designed, and the prototype exists; its production requires high technologies that are not available in Armenia. And finally, it is necessary to organize production, find the required support, transfer the prototype, and find foreign partners who would be interested in the production of the equipment and would turn it into a commercial product.

- Let me say that not in all cases is it required to start the project from the initial stages. It is quite possible that the innovator has already done some work, spent some money, and he might still need new partners and

investments for the final stage. This is also a possibility. As we mentioned, the project receives a certain budget. If, within the framework of this budget, the project can be accomplished, it will become a part of the incubator. Let me remind you that what comes out of the incubator is the prototype of the product. It shouldn't necessarily reach the industrial level; the prototype created in laboratory conditions is also adequate. This is the stage in which the incubator provides links to the possible investors.

- What is the difference between the technological incubators you mentioned and technological parks, real estate and other incubators? Please inform me of the comparative advantages.

- The idea of a business incubator is not new; it exists in many countries and is somewhat supported by the World Bank and the IFC. There is experience with incubators also in South Africa, where about 300 different projects and enterprises jointly function and share certain services under one roof.

- The difference is the following: the projects and ideas that are in our incubator are at the same level of advancement. They are not yet real activities; they are in their fetal stages when protection and support are needed. This is the first difference. The next difference is that the projects in the incubator not only get various low-cost services through the sharing of labor, but also the support, monitoring, instructions and directions from the management of the incubator. The difference between this and the technological park is that the latter has projects at different levels of development. Technological parks, which are within the frameworks of one sub-sector, attempt to render services only within that sector, whereas in the incubator, there are heterogeneous ideas that can be further developed in different thematic directions.

- What are the factors upon which the technological incubator will be based in Armenia? Relevant infrastructures venture capital, or something else? Why should people in Armenia follow the concept of an incubator?

- We have worked in 10 of the former Soviet countries, and I have thought a lot about this issue. There are three sides to the question. The first is the human resources, the human capital. This is more important than being involved in the military industry complex of the former Soviet Union, which was highly technologically developed.

The task now is to find out how much the former links and mutual impact has been preserved, and whether or not they apply to this system. Have the former skills been preserved, and can they be used, or have they been lost?

The next factor is the entrepreneurial spirit. Armenians have proved in different parts of the world that they possess that spirit.

The last factor is the existence of the Armenian Diaspora, which makes Armenia similar to Israel. The Diaspora is very important. As a matter of fact, Israel has been receiving funds for about 20 years. We have already met with certain Armenian businessmen who might be interested in supporting both the incubator and the venture funds. The latter are more important.

- Is the legislation of Armenia adequate for the creation and operation of an incubator?

- We will find the answer to this question during the feasibility study. However, it is an important matter, and this is where the World Bank can be very useful. As it is known, there are discussions under way about the improvements of the legislation, to make it more consistent with the market environment. Laws on entrepreneurial activities, business operations and licensing are very important. If we find out during the feasibility study that a certain article of these laws or the law on joint-stock companies, for example, impedes R & D studies or the establishment of an incubator, then we will surely discuss such questions with the Government and propose appropriate changes in the legislation.

THURSDAY, DECEMBER 9, 1999

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Minister of Health, Armenia

Presents a lecture on

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