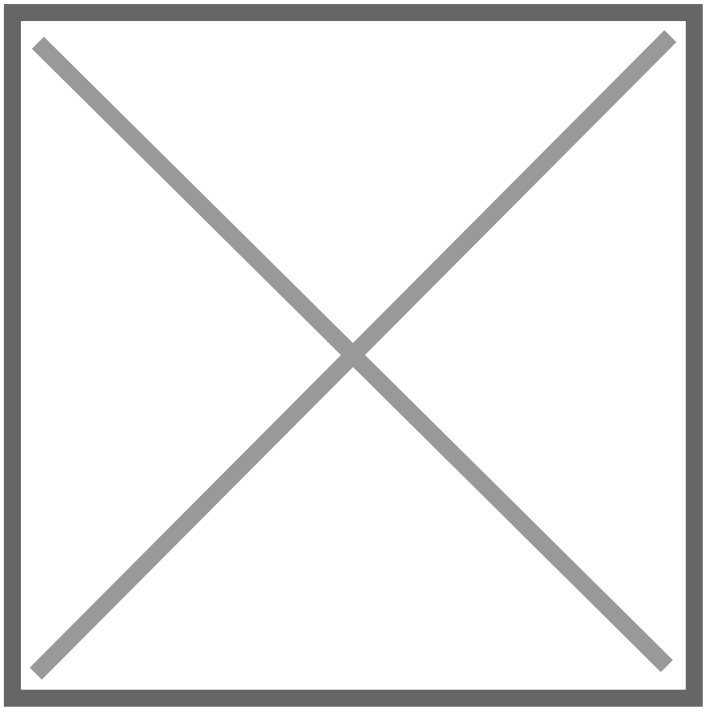
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We need new funding sources for innovations

19 May 2003 | News



The government has been the major financier of science and technology (S&T) based innovations in India, with around three fourths of the research and development (R&D) expenditure coming from government funding. However, as India awakens the scientist in an entrepreneur and entrepreneur in a scientist, we will require significant funding sources for taking Indian innovations to the market place.

Take, for instance, the drugs and pharmaceuticals industry. In the old patent regime, where we did not accept product patents, Indian industry could build itself by copying the molecules developed in the west, sometimes with innovative processes and sometimes with not so innovative processes. But with the product patents being accepted from 1st January 2005, Indian industry will lose this luxury of copying and it will have to get into the game of discovery of new molecules. In the current context, taking a single molecule to market place required 10 to 12 years and about $500 million dollars; which is approximately the size of our entire space research program. Therefore, new sources of funding will have to be sought.

Let us focus on venture capital. In the west, it is specifically defined as equity linked investments in young privately held companies, where the investor is a financial intermediary, who is typically active in the firm. The venture capitalists provide equity investments in companies that are not mature enough to get access to capital market but have high growth potential to compensate for the concentrations inherent in such ventures. It is the availability of such a venture capital that has led to the spectacular growth of technology driven enterprises around the world. Indeed, Apple in computers or Genentech biomedical products would not have seen the light of the day, but for the availability of such venture capital.

There are both tangibles and intangibles in venture funding. One of the crucial sources of value provided by venture investors is their ability to certify companies to other investors. For instance, venture-backed firms are much more likely to attract the interest of a reputable investment banker and complete an initial public offering. Similarly, corporate business development groups are much more likely to invest in new firms backed by venture investors. Thus, the financing contributed by the venture investor is often relatively modest compared to the total amount that the venture-backed firm finally raises.

United States has been a pioneer in venture capital. The formal venture capital industry in the US dates back to the formation of the first fund, American
Research and Development, in 1946. However, the flow of money into new venture funds for the next three decades never exceeded a few hundred million dollars annually. A dramatic change came with the 1979 amendment to the 'prudent man' rule governing pension fund investments. Prior to 1979, the Employee Retirement Income Security Act (ERISA) limited pension funds from investing substantial amounts of money into venture capital or other high-risk asset classes. The Department of Labor's clarification of the rule explicitly allowed pension managers to invest in high-risk assets, including venture capital. In 1978, when $424 million was invested in new venture capital funds, individuals accounted for the largest share (32 percent). Pension funds supplied just 15 percent. Eight years later, when more than $4 billion was invested, pension funds accounted for more than half of all contributions, and this proportion has been growing over the years.

We know the way the venture capital has spurred innovation in the US, but great results have been shown elsewhere also. For example, the Israel government initiated two programs to encourage the formation of venture capital funds in 1991, these increased from $29 million to over $550 million in 1997 due to a burst of investment by foreign high technology companies in Israeli R&D. We need a serious relook at the Indian situation and provide major incentives for venture financing.

How do we build innovative firms, institutions and organizations? For this we will have to set up truly innovative and proactive mechanisms, that will drive innovation. There is so much to learn from the innovative firms around the world. Some firms set up goals that stretch your mind. For example, Du Pont has defined a set of 'unreachable goals' like immortal polymers, zero waste processes, elastic coatings as hard as diamonds, elastomers as strong as steel, materials that repair themselves, chemical plants that are run by a single chip and coatings that change color on demand. These may sound unrealistic but they are publicized widely and enthusiastically supported. Intel motivates its innovations by saying "Double machine performance at every price point every year".

Risk taking must become a part of the innovation policy of firms. Innovative institutions have no place for those who preserve the systems in a pre-fabricated and unaltered way. A friend of mine, who is a CEO of a company from abroad, once said 'we do not shoot people, who make mistakes. We shoot people who do not take risks. What do you do?' I said, 'In India, we shoot people, who take risks!' We need a change of mind set.

Just as scientists and technologists are risk averse so are in the institutional systems. One must seriously look at the scope of innovation in government institutions and laboratories, which are risk averse. In fact, it is more often than not that such institutions are run by rules and regulations than by objectives. The system of S&T audit in our laboratories needs an urgent relook. One must understand that manufacturing and S&T are two different endeavors, culturally and operationally. In manufacturing, we look for zero defects and no failures, whereas in science, there is a fundamental right to fail. An interesting analysis has been done by Stephen and Burley in 1997 for Industrial Research Institute, which lists out the significant odds facing would be innovators by analyzing consistent data from new product development, potential activity and venture capital experience. It has been shown that there is a universal curve, which illustrates the number of substantial new product ideas surviving between each stage of the new product development process. It has been shown that out of 3000 raw ideas (hand written), 300 are submitted, which lead to around 125 small projects, further leading to nine significant developments, four major developments, 1.7 launches and one success. Continuous assessment by shedding projects along the innovation chain is a rule rather than exception. In India, it is the other way around, since if they are abandoned at an intermediate pilot stage, there is a risk of the dreaded audit para!

I believe we need to create a new set of leaders who are visionaries and thinkers, who believe in discontinuities, who are capable of thinking of the impossible and inspiring people to make it happen. After all, there is a definition of an innovator. They say innovator is one who sees what everyone else sees but thinks of what no one else thinks. Innovator is also one, who does not know that it cannot be done. An innovative leader sets stretched targets.

I have emphasised so far on S&T based innovations but the concept of innovation is a much wider one. It is particularly important to recognize the need of social innovation. Innovation in India's social and economic institutions, in the system of their governance is as crucial as innovation in the products and production processes of its economy. We must also recognize that innovation cannot arise by itself; it is generated and sustained through the efforts of its people. The government needs to create an environment, in which innovation flourishes. Otherwise the innovators will either play safe and not innovate, or they will leave to become a part of other innovative societies, which encourage innovation, as India has seen to its dismay; since a lot of its young sons and daughters have left, not due to the lure of the physical income alone, but because of the psychic income that they gain in those innovative societies. We must reverse this process with speed and urgency.

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