

The bottom of the pyramid **Innovations in financing for low-price markets**

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Economists see a direct relationship between technology change and economy growth. Management gurus base their theories of competitive advantage on innovation. The World Bank spreads the gospel of social development driven by knowledge adoption. Altogether, the role of innovation in a national economy is getting increasing attention. This article looks at one segment of innovations; those that are aimed at meeting the needs of the bottom of the economic pyramid and the challenges in financing them. The cases cited are drawn from innovations funded by the Government of India under its Technopreneur Promotion Programme (TePP).

Socio-economic goals

Science and Technology (S&T) is now much more concerned with development as an instrument to improve the lot of the poorer people. This type of concern has not always been there - great astronomers of the past and scientist discoverers of the industrial era did not directly work to improve the living standards of the societies they lived in. Now, however, it is increasingly being realized that progress in S&T needs to be related to the twin objectives of eradicating poverty and promoting rapid socio-economic development.

Attempts to relate S&T to development started after World War II, when the UN institutionalized the cause of development, especially through specialized agencies like UNIDO and UNESCO. Of more recent origin is the adoption of *Millennium Development Goals* at the UN Millennium Summit in 2000. These have become the international standard of reference for measuring and tracking improvements in the human condition in developing countries.

Echoing this concern, India launched its *Bharat Nirman* programme with the objective of unlocking potential, equalizing opportunity and making rural India the new growth opportunity.

The challenge is to orient S&T to meet the nation's socio-economic goals. This involves a shift in the relationship that technological innovation has so far had with society. Technological innovation can no longer be concerned with simply installing devices. Instead it must transform society and its value systems. Table 1 lists the policy issues and policy instruments used by GOI (the Government of India) over the years.

Table 1: Policy instruments (Government of India)

Period	Policy issues	Policy instruments
1960's	Foundation for science	Science policy
1980's	Self-reliance in technology	Technology policy
1990's	Competitiveness	Funds for commercial innovations
New millennium	Innovation for global leadership	Targeted NPD (New Product Development)

Table 2: Source of funds for innovation

Stage of development	Activities	Source of funds
R&D	<ul style="list-style-type: none"> • Literature study • Patent search • Proving at prototype stage • Proving at pilot plant level • Patent registration • Market feasibility study 	<ul style="list-style-type: none"> • Own funds • Angel funds • Government grants
Start-up (starting from proven technology to business break-even)	<ul style="list-style-type: none"> • Establishing production facilities • Product launch 	Venture capital (private and public)
Initial growth	Product expansion, developing 2 nd generation of products	Joint funding by several VCs
Take-off	Consolidation Achieving economies of scale in production and sales.	Development financial institutions like IDBI
Maturity	Broadening technology base and management capabilities.	Stock market

Funding for innovations

Funding can be related to stages in the development of new technology as shown in Table 2.

Following the example set by the triad nations (USA, EC, Japan) most developing countries initiated programmes to support local innovations to meet global competition. Research and technical institutes were provided grants to carry out basic and applied research; public-private partnerships were established to transfer lab work to commercial firms; and commercial firms were further supported to upscale the technology to a pre-commercial stage and at times even to the commercial stage.

In India several programmes are currently in force, one of which is the TDDP (Technology Development and Demonstrated Programme) of the DSIR (Department of Scientific and Industrial Research).

One success story under this programme was the development of a high-speed auto clinical analyzer. Transasia Bio-Medicals Ltd. (TBM) was started in 1985 to market biomedical instruments and in the process developed a strong service team. Manufacturing had started with low cost affordable blood cell counters of Japanese origin to small and medium pathology laboratories in Mumbai and other metro cities in the 1980's. The firm made a mark on the international scene by developing XL 600, a completely automated computer-controlled biochemistry analyzer. XL600 is available in Spanish, Italian and French. XL600 is now sold in 28 countries, including Portugal, Spain, France, Germany, Hungary, Italy, Russia, Greece, China, Syria, Egypt and Turkey.

The firm was supported by the government to develop XL 1000, which had a larger capacity and a surfeit of product features. It was a successful catch-up effort by the Indian firm in responding to the late entry strategy of innovative imitators. The firm is now firmly poised to move fast to a second innovation strategy.

The bottom of the pyramid (BOP) market

Globalization is changing the ways by which companies can create value. For developing countries it is not an extrapolation of the past experiences of developed countries, nor is it just about low costs and outsourcing. The real opportunities lie in the proliferation of ways to design a better business. Management guru C. K. Prahlad, laying the framework for the BOP market, argued that “sustainable product innovations initiated in Tier 4, and promoted through consumer education, will not only positively influence the choices of people at the bottom of the pyramid, but may ultimately reshape the way Americans and others in Tier 1 live”.

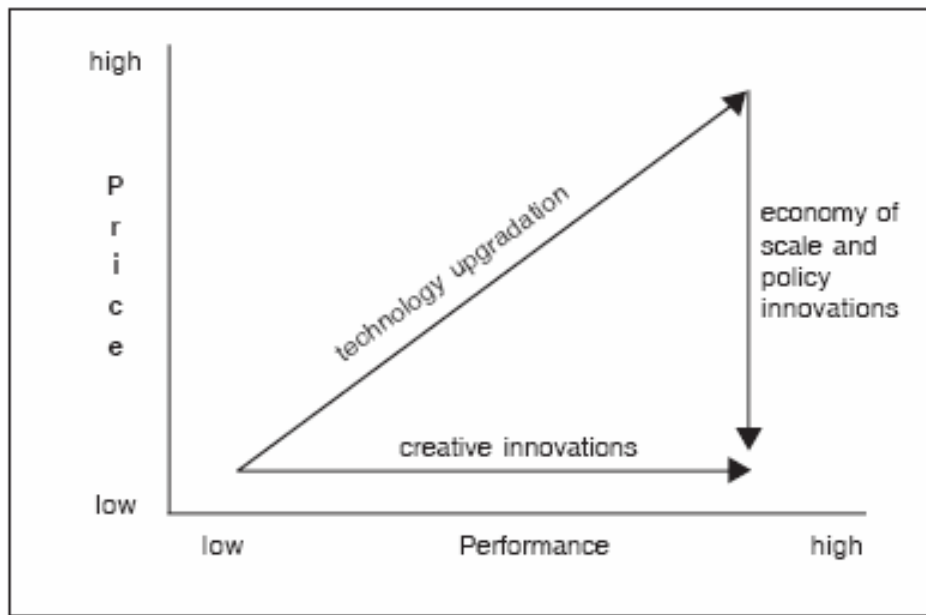
Prahlad outlined 12 principles of innovation for the BOP markets:

- Create a new price performance envelope.
- Creatively blend existing technologies with the new technologies;
- Ensure that the solutions developed are scalable and transferable across countries;
- Use minimum resources;
- Develop the product on the basis of functionality and not just of form;
- Process innovations to address logistics constraints;
- Deskill the work content;
- Educate customers;
- Ensure that products will work in hostile environments;
- Ensure research on interfaces – this is critical;
- Design methods to make innovation reach the user; and
- Focus on the broad architecture of the system.

Price-performance curve

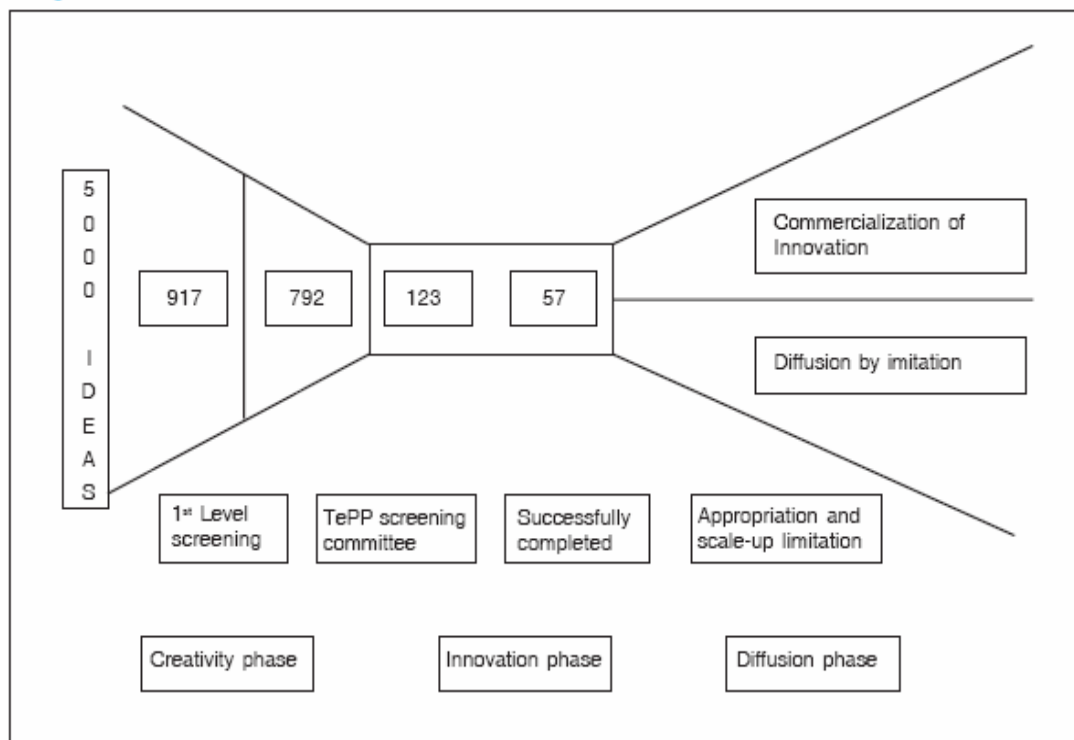
Affordability is a critical factor for low income people, which means that generally they have been saddled with products and services low in price but poor in quality. In recent times, however, it has been noticed that large volume production (as in chip-based products) drove prices down; and that in areas like telecom, prices could be drastically reduced by social and policy innovations (Figure 1).

Figure 1: Price-performance envelope



With the new awareness that low income consumers are not just discounts or seconds markets, the focus shifted to state-of-market technologies for producing low-price-high-performance products and services.

Figure 2: TePP innovation funnel



Technopreneur programme (TePP)

Businesses under-invest in developing innovations for BOP markets as they consider market sizes and penetration unattractive. While it could be argued that the gains to society

from the availability of low cost high quality products are enormous, the private industry finds its own gains illusionary and slippery.

The private investor needs to control knowledge to make it pay, while the government is more interested in the diffusion of knowledge. India does not offer protection to utility patents.

The government's TePP programme supports individual innovators at the ideation stage to prove their concepts as first prototypes. Over 5,000 ideas have been accessed and over 100 supported under this programme. See TePP innovation funnel in Figure 2.

Cases

In the 1950s, Professor Gavril Abramovich Ilizarov devised and developed his revolutionary method for treating fractures, deformities and other bone defects.

Using a circular external fixator he was able to show that controlled, mechanically applied tension stress produced reliable and reproducible regeneration of bone and soft tissue. Prasad Narayan Kulkarni of Sangli was determined to bring this technology to Indian masses and, with limited support under TePP, developed a motorized auto-distractor. Clinical trails showed promising results of bone regeneration, a boon to correct birth defects of short or deformed legs.

An innovative farmer, Bhanji Bhai Mathukia, of Junagadh developed a small three-wheeled 10 HP tractor. TePP supported him to develop an engineered product by networking with ARAI, Pune and CFMT&TI, Budni. The technology was licensed to Pramal Farmatics (P) Ltd, Anand.

Entrepreneur Ramesh Nibhoria developed an environment-friendly solid biomass furnace, installed it at Jawahar Navodaya Vidyalaya, Nafajgarh, and demonstrated savings in fuel (LPG) consumption. More installations are underway in various schools.

Teacher innovator Dr Jagadeesh of Kavaraiputtai developed a unique vertical cylindrical solar water heater with a lotus-shaped reflector. A retired DRDO scientist, R A Yadav, has taken up the re-design of a machine that makes surgical bandage cloth. Mrs. Pragnya Dilip Bhatt, determined to make her visually challenged son feel the shape of flowers, is perfecting a sketching device for use by the visually challenged.

Challenges in financing innovations for BOP

That innovation is a risky business is well documented. In spite of rigorous assessment, a majority of projects fail to earn expected returns. In India, only 15-20 per cent of assisted projects have become successful. The *Guide to Venture Capital in Asia* (published by AVCJ holding limited) identifies the common risk factors as follows:

- A change in industry growth (from what had been assumed);
- A change in competitive pricing;
- Difficulties in adhering to product development schedules;
- Difficulties in obtaining parts and raw materials;
- A change in market structure (e.g. a new entrant or a new technology); and
- A change in the availability of appropriately priced and trained labour.

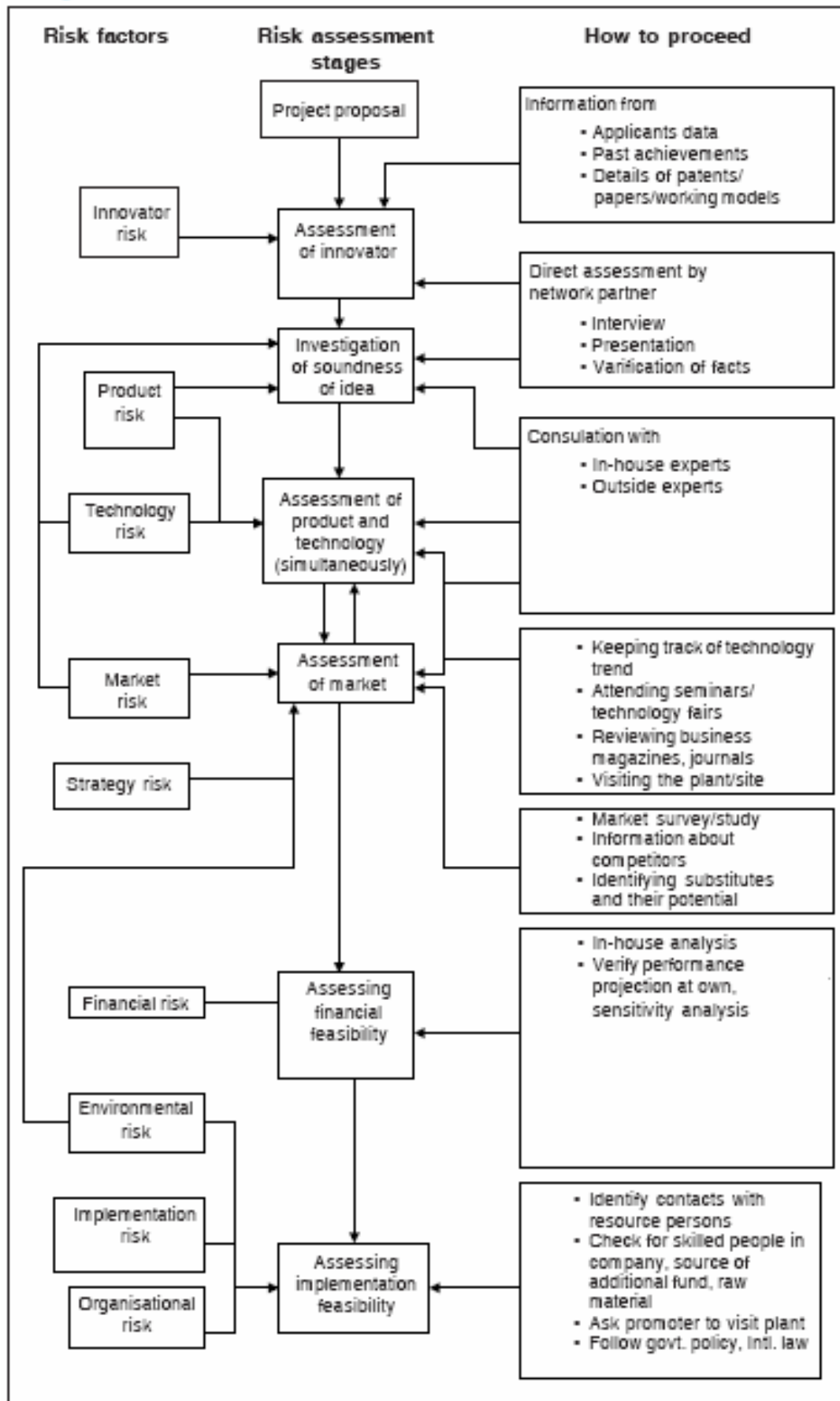
The overall risk factors can be grouped into nine categories, as shown in Table 3.

All these risks have to be minimized by the funding agencies through a due diligence process. Venture Capitalists spend an enormous amount of time and money on this due diligence process, which is why they process few cases, thus economizing their efforts. All funding agencies follow similar precautions in funding innovations for “top of the pyramid” (TOP) markets, like that of funding Transasia for the development of XL 1000. The problem gets complicated when government agencies are involved in financing BOP innovations as in TePP. The numbers increase dramatically from TOP to BOP. And the best practices of neither VCs nor micro-finance groups can be adopted. New mechanisms and processes need to be developed.

Table 3: Category of risk factors

Risk	Component
Promoter risk	<ul style="list-style-type: none"> • Integrity/honesty of the entrepreneur/promoter • First generation entrepreneur • Lack of experience in related field • Lack of contacts with resource persons • Lack of experience about: <ul style="list-style-type: none"> - Market - Technology
Product risk	<ul style="list-style-type: none"> • Development stage of product • Product life cycle • Risk of reverse engineering • Manufacturing complexities • Number of constituent technologies
Technological risk	<ul style="list-style-type: none"> • Availability of superior technology • Unpredictable technology development • Technology life cycle • Investment requirement for assimilation • Lack of organizational capability to assimilate • Source of technology/goodwill of supplier • Level of technology (high or low)
Market risk	<ul style="list-style-type: none"> • New users; uncertainty in market acceptance • Market growth rate • Competitors • Substitute products • Potential entrants • Huge marketing expenditure • Unorganized sector • Lack of an assured market
Financial risk	<ul style="list-style-type: none"> • Capital market situation (e.g. lack of exit opportunities) • Lack of parity of current leverage ratio with industry average • Growth prospect of the company • Foreign exchange risk • Problem with working capital, liquidity • Expected rate of return • Lack of understanding of standard financial procedures
Implementation/ Operational risk	<ul style="list-style-type: none"> • Manufacturing complexity • Capability of producer/organization • Manufacturing set up • Commitment from manufacturing • Unavailability of skilled workforce • Maintenance problem • Lack of contacts with resource persons • Problem in arranging additional fund
Organizational risk	<ul style="list-style-type: none"> • Motivation of employees • Employee turnover • Dependence on few workers
Strategy risk	<ul style="list-style-type: none"> • Loosing competitiveness • Unrelated diversification
Environmental risk	<ul style="list-style-type: none"> • Changes in government policy • Lack of understanding about regulations • Pollution/hazard • Availability of raw material • Legal barriers - piracy/patent, etc.

Figure 3: Risk assessment



In India, in trying to reach out to BOP with value added products and services, new methodologies have been introduced. In place of traditional due diligence processes, a system of experts, mentors and network partners has been established. The expert helps the innovator to chalk out a road map for converting an idea into a product; mentors guide in taking the product to the user and network partners assist on the long march from concept to commercialization. For due diligence of TOP market innovations, the consultants and rating agencies are paid fully for their services; but if a similar system were to be followed for BOP innovations, the cost of due diligence would exceed the support provided to innovators. This problem has been solved by building an eco-system supportive of BOP innovators, with people committed to the cause. Emotions, however, are not a substitute for expertise; so the dependence on these committed people, while keeping due diligence costs manageable, further adds to the risks inherent in all new activities. A framework to manage risks in financing BOP market innovations is given in Figure 3.

Conclusion

Many new financing mechanisms tend to raise expectations but fail to deliver. This is ascribed to poor management of the chasm between the large numbers of “late adopters” and the few “early adopters” whom they follow. This chasm exists because early adopters are bubbling enthusiasts who are prepared to take a chance despite bureaucratic hurdles. On the other hand, the late adopters - the majority - are pragmatists, who demand to be convinced. The tipping point is reached when “critical mass” is obtained. The phrase “tipping point” in sociology refers to that dramatic moment when something unique becomes common. Thereafter the rate at which the process proceeds increases dramatically.

The conditions necessary for “tipping” are:

- The enrolment of network partners who have high connectivity with innovators and entrepreneurs;
- The support of network partners to improve the impact of their services; and
- A focus on communication.

The success of any programme aimed at addressing the needs of a BOP depends largely on the ability to scaleup the model to the point when it will “tip”.

References

1. C. K. Prahalad, “The fortune at the bottom of the pyramid”, 2005, Pearson.
2. “Multicriteria Model for Risk Evaluation for Venture Capital Firms in an Emerging Market Context”, Jyoti P. Gupta; Professor ESCP-EAP, Paris, France.