*V. Kasturi Rangan*

# Making Healthcare Affordable for All
## A Proposed Model for Transferring Technology

*Innovations Case Discussion: Aurolab*

Aurolab is an amazing success story, made possible partly by the foresight and vision of its founder Dr. V, and its committed and talented senior management. A significant reason for its success is its large captive customer, the Aravind Eye Care System, which give it the scale needed to commercialize its innovations. With such a ready-made market, Aurolab's entrepreneurial managers were able to re-engineer technologies available in the West to suit local conditions, and design manufacturing systems that allowed it to provide inexpensive lenses for Aravind's low cost cataract surgery.

Almost 60 percent of the nearly 200,000 surgeries that Aravind performs annually are highly subsidized—most patients pay a basic fee (about half the US$18 cost of surgery), and the other 40 percent, who are provided with additional service features (such as a private room or a hot meal), pay a market price of nearly US$50. The surplus margins gained from this 40 percent of the market provide the fuel for the scale and reach for Aravind's charitable mission-to-provide eyesight for those in need, regardless of their ability to pay.

The average income of an Indian citizen is US$600 and Aravind was able to provide cataract surgery for US$18(cost), or 3 percent of the average income. In the United States, where the average income is US$32,000, the cost of the surgery is US$1,800, or 6 percent. So Aravind's system innovation is all the more impressive, the surgery is twice as affordable (using a cost benchmark) for the average Indian citizen than his or her U.S. counterpart. At 6 percent of annual income, an Indian surgery at about US$36 or so would still be affordable to the Indian poor. Even so, the price of the lens could not exceed about US$10 to be within the 40 percent cost of supplies for a cataract surgery in India, as shown in Figure 2 of the

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lead article. Much of Aravind's innovation is process-driven, with the huge cost advantages that come with indigenous wage rates for doctors and support workers. But the cost of the lens could have broken the back of Aravind's service model, and Aurolab's innovation has been at the heart of the system's success. Bringing down the cost of the lens to US$5 was an astounding accomplishment.

In this commentary we reflect on what could have happened for cataract surgery in India had not an innovator like Aurolab emerged. In the limelight of Aurolab's achievements, we would like to draw attention to an alternative scenario, one that is far more prevalent than we care to acknowledge in many poor countries, especially in healthcare. Such disparities are only likely to worsen as the pressure toward worldwide intellectual property adherence gains momentum, and as countries like India enter the WTO. Our analysis and recommendations have implications for Aurolab as it attempts to grow as a medical device supplier in the Indian and world markets, and also for a host of other such organizations including pharmaceutical manufacturers in developing countries. More importantly, our argument has implications for technology owners: we recommend that such companies boldly seek appropriate licensees in order to diffuse their technologies quickly, rather than slowly.

Here's why.

## BASIC ANALYSIS

There are 12 million blind people in India (and considerably more blind eyes, because many blind people lack vision in both eyes). Almost 80 percent of the blindness in India is caused by cataracts. India can currently perform about 2 million cataract surgeries a year, but the problem each year is the inflow of 4 million more people who develop cataracts. It has been estimated that to clear the backlog of blind eyes, India would have to perform nearly 5 million surgeries every year for the next ten years or so; nearly 50 million surgeries. How feasible is this, especially in a world without Aurolab?

*Scenario One:* If western companies insisted on selling their lenses at the price they fetch in western markets—US$100—then only a fraction of the 50 million blind people would be able to afford the surgery, and the rest would go blind or receive the inferior ICCE surgery (with aphakic glasses), and the accompanying poor quality of life. The Indian patients would have been taken off the market, and as a result the company would have lost an opportunity to sell many lenses. Once an eye has been operated on for cataract and the lens removed, it is surgically hard to go back and reinsert a new lens. The technology diffusion argument often applied to electronic products such as computers does not apply; there is no large waiting pool of potential "customers" who will patiently wait for the second-hand technology to become affordable, after it has run its course in the developed markets.

*Scenario Two*: If the lens company saw the potential incremental market of 50

million cataract surgeries as an opportunity to sell its technology at lower prices than it enjoys in the West,[1] then it could conceivable tap into considerable additional revenue. At a price of US$10 per piece (which we argue would still be affordable to the Indian poor), the company would have revenues of nearly US$500 million over ten years, and because its fixed costs are already being recovered from sales to developed markets, these sales could have very attractive contribution margins of 50 to 75 percent in spite of the low prices. The net present value opportunity could be US$150-300 million. This is a win-win proposition, where 50 million poor people receive high-quality surgery, and the innovation owner would make a substantial, incremental profit.

Scenario two is clearly the welfare maximizing option, yet western medical technology companies, drug makers, and instrument makers are rarely willing to price their technologies at a cost that would maximize social welfare. Sushil Vachani and Craig Smith[2] make a similar point with respect to antiretroviral drugs for AIDS. The drugs, which were initially priced at US$10,000 per year in the United States, hardly attracted any demand, though an estimated 6.5 million people worldwide were candidates for the drug. It was simply unaffordable. They show through a simulated model of demand that when the prices are reduced to between US$750 and US$1,000 for a year's supply, demand would gather steam serving from 81,000 to 100,000 people. At that price the pharmaceutical supplier maximized incremental margins, assuming a variable cost of US$500 for drug manufacture. With donor assistance built into the model, they show that three times as many people could be served with a corresponding contribution boost for the pharmaceutical company. The point of the illustration is that at a lowered price, the pharmaceutical manufacturer could make a handsome incremental profit, and serve the greatest number of people who need the drugs. At the higher price, the nearly 300,000 people would ultimately succumb to the disease, and represent a lost market opportunity.

Why are healthcare companies reluctant to seek the incremental contribution from markets that would be forever lost, rather than maintain prices that are unaffordable outside the healthcare payment system of the West? The answer must be fear of market cannibalization. If those drugs and ophthalmic lenses were reimported to home markets at the fraction of the price at which they were sold in their home environment, this "grey" market would compromise manufacturers' profits in their most profitable markets. A good argument can be made for why the healthcare company would need that additional profit to fund research and development for the next cycle of innovation. This is the main barrier to selling/exporting high-technology products, including pharmaceuticals, at a low price even if there is an incremental profit contribution to be gained.

Here the Aurolab story suggests the solution. While Aurolab has secured the CE mark, which attests to its credibility and quality, it has not received the FDA's stamp of approval, in spite of its own high manufacturing quality and inspection standards. The FDA would need data from Aurolab to demonstrate its safety and

efficacy, and Aravind has been reluctant to set up the longitudinal panel to collect such data and prove its quality standards. It may be concerned about the cash required, which in the view of Aravind managers would be better utilized making and supplying lenses to people who cannot afford to pay. But I suspect that the decision reflects a mature sense of pragmatism. In order for a technology-transferring entity to feel comfortable, it needs strong assurance that the recipient will not bite the hand that feeds it the intellectual property. Of course in Aurolab's case much of the technology development has happened indigenously with great attention to backward re-engineering. Nonetheless, much of the reverse engineering skills that Aurolab has so skillfully acquired and developed in the past, could perhaps be challenged in the future, if Aurolab continues its robust path of growth. So a comfortable equilibrium has to be reached. How long will Aurolab be able to sustain this unique core competence? That is the million dollar question.

## AUROLAB AT A CROSSROADS

Aurolab is poised to become a fully integrated manufacturer of medical devices, supplies, and pharmaceuticals. Aurolab can make 600,000 lenses per year, of which Aravind needs only 200,000. It is not clear if the local market in India alone is large enough for Aravind to be able to sell the rest at a decent profit margin. It would have to look for export markets that did not require the same certification labels demanded by customers in western/developed markets. But Aurolab, however, would need considerable profit from those sales to fund the many R&D projects that would enable it to keep at a cutting edge of innovation and care. For example, Aurolab is considering a Diabetic Retinopathy Laser project. Both its complex design and manufacture is currently outside Aurolab's core competence. It is not even clear at this stage if it would be able to access the various technologies needed to build this product. But if it could bring down its current US$45,000 cost of importing the equipment, many diabetic patients would benefit from it. A similar technology barrier restricts its development of the higher-quality viscoelastic gel, which it cannot currently procure, at an affordable cost. Aurolab has many more such projects under development, and meanwhile has already built a new manufacturing facility that meets international regulatory standards. It has the unique advantage of scale and a ready market of nearly 2 million outpatients and 200,000 surgeries in the ophthalmic area, but there is no reason why it cannot become a broader supply to other eye hospitals in the country. Its suture needle division is looking for extensions outside the ophthalmic market. Such a bold and ambitious expansion, however, is dependent on having access to R & D, whether developed internally or sourced externally.

Aurolab's strengths lie in reverse engineering high quality components and supplies, and manufacturing them at low cost. As a result of these virtues, and its scale, the innovative nonprofit entity has provided enormous social value. One can make the argument that the research and development of medical devices and drugs should best be left to companies that have the high profit margins to feed

such activity because of the hit-or-miss nature of innovation and the tremendous costs of testing for safety and efficacy. A charitable institution like Aravind hardly has the room to be extravagant about R&D when the alternative is to provide care for a limitless supply of poor patients. Aurolab would be better off seeking alliances with technology leaders so it can focus on what it does best, re-engineer and manufacture at low cost. If indeed, the technology providers would be willing, there is a very attractive technology transfer model that would enable a win-win. It would create social as well as economic value enhancement, for visionary technology licensors as well as licensees like Aravind

## A MODEL FOR TRANSFERRING INTELLECTUAL PROPERTY

Potential technology licensors should recognize three things. First, it is in a firm's self-interest to serve a market that would constitute a lost opportunity if not appropriately served. Two, to gain as much margin as possible, it should use marginal cost pricing to maximize demand. Third, the technology owner should recognize that it has an obligation to diffuse technologies and patents that could usefully serve the masses of the globe instead of letting the technologies rot on the shelves while people suffer from ailments for which treatment is available. That is where a partnership or an alliance with an institution like Aravind that can bring scale to the operation is critical. Scale ensures market access, and a quick way of treating the maximum number possible.

For technology providers, the most important thing would be to prevent the grey market transfer of products back to the "first" world. The protections available to the technology licensor are many. As in Aurolab's case, the costly process of filing for the FDA or the equivalent EU clearance alone would be a barrier. Further, a licensee that gains access to a technology at a reduced cost should be willing to sign a non-export clause, simply because it would not need the extra revenue for research and development. Its sole role would be to gain technology, reverse-engineer it for local production, and provide market penetration either under its own name or as a licensee, to bring healthcare solutions to the masses of poor customers. To protect the licensor in its home markets, the local product could look different and the name could be different; for example, a drug's capsule size, color, and dosage could be different. In mass markets like India, China, and Brazil, a single entity per country would be able to provide the commercial scale and reach. Of course, an entity like Aurolab would be able to export to other developing countries because of its low cost-high quality manufacturing process. In smaller markets, especially in sub-Saharan Africa, perhaps one would need a regional intermediary for scale. Such local technology-transfer institutions must be social enterprises like Aurolab in order to have the credibility in the eyes of the licensors and legitimacy in the eyes of its customers.

Aurolab is at a critical fork in its highly successful development since its founding in 1992. It can either launch itself into a full-fledged medical supplies producer—whether focused on ophthalmology or not—or it can choose to become the

licensee of choice, if only worldwide technology leaders will rise above their myopia. Technology owners should have the foresight to see the tremendous value that a partner like Aurolab can bring to the table. Not just the opportunity to gain profits, but also a valuable source of feedback built on the base of a large constituency of patients, doctors, nurses, and healthcare workers. If done well, the licensing of healthcare technology could be a win-win for all. Most importantly, it will address the health needs of millions of otherwise excluded people.

*We invite reader comments. Email <editors@innovationsjournal.net>.*

1. Alcon sold its lenses for US$100 a piece. The market for the "soft/foldable" lens was estimated to be about US$1 billion in 2005 at that price.
2. Socially Responsible Pricing: Lessons from the Pricing of AIDS Drugs in Developing Countries, *California Management Review*, Fall 2004, Vol. 47, No. 1.