



Aravind Eye Clinics

Medical science has achieved some amazing breakthroughs in terms of innovation, pushing the frontiers of surgery, drug therapy, transplant technology and a host of other research fields to enable more of us to live healthy and dignified lives. Impressive though such radical innovation is, we shouldn't forget that a great deal can be achieved through more modest change but systematically applied. That's the story of the car industry, for example, where the most successful performer in terms of productivity and sales has been Toyota – a company which has built its strength on systematic and largely incremental *process* innovation. The demonstrable and continuing success of applying the Toyota Production System in everything it does has helped it build strong foundations on which more radical developments – like the Prius hybrid car - can be explored.

In the healthcare area one of the powerful examples of such systematic attention to the small stuff which has led to a significant impact are the Aravind eye clinics in India. Back in 1976 the head of the Department of Ophthalmology at the Government Medical College in Madurai, Dr G. Venkataswamy, retired. Dr V (as he is popularly referred to) had worked for many years on providing eye care – eye tests, glasses, cataract operations, etc. – in rural communities and rather than give this up and potter around his garden he decided to use his retirement time to carry the work on. He provides an excellent example of the principle that there is no age limit to entrepreneurship – the key is passion, energy, enthusiasm and a clear sense of what he wanted to achieve. In his case it was nothing less than eliminating unnecessary blindness in his home state of Tamil Nadu – and perhaps after that, across India itself.



Whilst there are many complex optical disorders, cataracts are not generally regarded as a difficult challenge in eye care. Yet for nearly fifty million people around the world – nine million of whom are in India – cataracts mean blindness. Dr V's vision was to target and treat this group, using the simple tools and techniques which he and colleagues had worked with over many years but bringing them into the reach of everyone. This was not an insignificant problem – whilst the treatment itself – diagnosis, operation and after-care – is well-developed in the eye hospitals of the world, it comes at a price. In the USA, for example, treating cataracts costs between \$2500 and \$3000 and even in an Indian hospital the cost works out around \$300. For a country like India where most people, especially in rural environments, earn less than \$2/day such a price tag puts treatment out of reach. What Dr V wanted to do was find a way of making it available to people like this at what C.K. Prahalad calls, *'the bottom of the pyramid'*.

That vision drove a programme of innovation which persists today – and has already achieved significantly against the original goals. The Aravind Eye Care System is the largest and most productive eye care facility in the world – for example, in the year 2007 /2008, about 2.4 million persons received outpatient eye care and over 285,000 underwent



undergone eye surgeries at the Aravind Eye Hospitals at Madurai, Theni, Tirunelveli, Coimbatore and Puducherry.

The innovation challenge here is significant – how to carry out a high quality process at low cost? But it also reminds us of a key principle – whilst different sectors may appear to have little in common, there is often a rich opportunity to learn across these worlds. Dr V. looked long and hard at other fields where the same challenge of carrying out activities systematically, reproducibly and to a high quality standard – but at low cost – and eventually developed a new approach to the eye care problem. He found inspiration in McDonalds, the fast food company which has managed to spread its golden-arched empire across the planet based on systematic, high volume production of a range of meals offered at low cost. Central to their success is the idea of reproducibility – despite huge variations in the context in which they are located, all McDonalds outlets operate on the same model, and staff are trained in a core set of skills which are common to all its operations. It's a model which the Croc brothers developed back in the 1950s - but one that was borrowed from an earlier exponent, Henry Ford. When he and his team of skilled engineers were setting up the business back in the early 1900s they faced the same challenge – how to make a complex product (the Model T Ford) systematically and reliably but at a low enough price that it could become 'a car for Everyman'? Their solution was to design a *system* which standardised as much of the process as possible and reduce the key skills and discretionary elements to a minimum – and then apply this across a high volume of production. In turn these ideas weren't new – the principles of division of labour go right back to the 18th century and the observations of Adam Smith on pin-making in the early days of the UK's factory system – but they represent a powerful model which Dr V. was able to adapt.

The basis of the Aravind eye clinics is standardisation and 'engineering' cataract surgery for high volume production. He opened his first hospital in 1977 with 30 beds and managed to generate a surplus in the first year of work so that a second 70 bed hospital could be opened catering exclusively to the poor and offering operations free of charge. In 1981 a fee-paying hospital with 250 beds was opened and another free hospital with 350 beds followed in 1984; by the turn of the century there were around 1500 beds (of which the majority were free) in Madurai. The model spread out to other locations across Tamil Nadu so that by 2003 there were five Aravind hospitals with a total of 3649 beds of which 2850 were free.

Just as Ford, McDonalds and Toyota focused on continuously improving and extending their system models, so the Aravind Eye Hospitals gradually shifted to become the Aravind Eye Care *System*. Key elements were added – for example, a dedicated factory for producing lenses, a training centre to provide key skills, specialist ophthalmic research centres, and an international eye bank. Of particular importance has been the Aravind Eye Camp model which takes the system out to rural locations, offering advice and diagnosis and feeding patients into the core hospitals where the high productivity model can treat them. This brings an element of preventive medicine into the system – by identifying early symptoms, particularly amongst children, relatively low cost measures (such as corrective glasses) can be implemented. There is now an extensive education programme linked to the camps which reaches out to rural communities. (For example, in 2002 around 70,000 children were screened and 3000 given glasses to correct refractive errors).

Another important element in the system approach is the attention given to training to ensure an adequate supply of key skills. 900 ophthalmic assistants are taken on and trained each year to support the specialist doctors, whilst other skills such as counselling and education are also developed via dedicated training courses. Significantly recruitment and motivation are still strongly linked to the core values of Dr V – there is a strong social welfare



commitment which means that staff often work for less than they could earn in other parts of India's health system.

Central to the success of the model have been the economics. Target costing is a well-known tool in product innovation for engineering the design of production systems, and in the case of the original cataract operation Dr V. set this as being around \$50/operation (assuming no complications ensued). This compares to around \$300 as an average cost for treatment in a conventional Indian hospital (and \$1650 in a US hospital). Developing and refining the system has meant that the average cost in the Aravind system is \$25, based on a proportion of patients paying between \$50 and \$300 but over 60% being treated free. In 2003 Aravind became the largest single cataract surgery provider in the world. The key is in the volumes – around 200,000 patients are treated each year, based on the high volume/low margin kind of business model which Henry Ford used on the Model T and which now drives the low cost airline industry.

Inevitably the approach involved rethinking the underlying model. In a conventional Western hospital an eye operation would typically take 30 minutes – yet the Aravind system needs only 10. This high productivity is achieved by significant process innovation driven by close analysis of value adding time. For example, each surgeon works on two operating tables alternately, and is supported by a team of paramedics to carry out less-skill dependent aspects such as washing the eye, putting in sutures, giving anesthetic injections etc. 70% of activities are carried out by a team of 4 nurses supporting the surgeon, 2 assisting directly and 2 acting as 'running nurses' bringing fresh instruments from the sterile area.

Of considerable importance is the fact that this treatment is not provided at low cost by compromising on quality. A key statistic in medical care is infection rate – and the Aravind system actually has better performance than many Western hospitals. For instance in 2004 it was about 4 per 10,000 cases at Aravind, while the UK published rate was 6 per 10,000. (Interestingly the idea of having two patients in the same operating area is prohibited in many US hospitals because of fears of infection). Aravind also operate a very close outcome monitoring system, especially for cataract surgery, where every case sheet on discharge is fed into the computer and then analysed. In turn this feeds a continuous improvement process – measuring, reviewing and then changing. They put in a lot of effort to follow up on every camp patient and around 90% of the patients are interviewed as part of this process which provides valuable feedback on factors like outcomes of cataract surgery, the number of people recovering normal vision, intermediate vision and so on.

The same high volume/low margin model has been applied to hit target costings in other areas. For example early operations often involved fitting an 'intra-ocular lens' which was expensive as an imported product. Value engineering the design and then setting up manufacture within a division of Aravind – Aurolab – now means that the IOLs can be made for a fraction of the import price (\$6 vs. \$100-\$150 for a US made lens of the same quality). In the process Aurolab have become a major producer with about 10% of the global market share.

But there is another important feature to this story. With such a high volume of surgery – 200,000 plus cases per year, with each doctor carrying out around 2600 operations/year (against an Indian average of around 400) – comes a rich learning opportunity. The principles of the 'experience curve' (which demonstrates that the more we do something the better we become at doing it) have applied across many different industrial sectors – and there is no reason to suppose that healthcare is any different. Learning by doing is a



powerful aid to developing robust systems – and in the Aravind case the model is now being looked at by many health authorities around the world. Significantly the core principles can be applied to other operations – and, for example, complex high cost operations like heart by-pass surgery (with a US cost of around \$50,000) are being explored – the Indian equivalent operation costs \$4000.

(For more details on the Aravind model see C. K. Prahalad's book ('The fortune at the bottom of the pyramid') and www.aravind.org where in addition to details of the organization there are 3 detailed case studies of the organization).