Forbes INDIA

Making vaccine distribution more efficient

By Amar Sapra| Jan 6, 2021

Three principles of capacity management that will be useful to any government agency planning for and implementing the vaccination

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With the approval of vaccines manufactured by Serum Institute of India and Bharat Biotech, the rollout of the Covid vaccination program has started in India. For obvious reasons, the government would like to the administer the vaccine as fast as possible. However, as the slow rollout of the vaccination drives in European countries and the US shows, this is a difficult and challenging task.

All the challenges of distribution and the eventual vaccination can be summarized in one word: capacity, which means only so much can be done in a day or a week. Broadly, five types of capacities are relevant here: to manufacture the vaccines, to manufacture syringes, to store the vaccine in hospitals and health care centers, to distribute vaccine throughout the country and to administer the vaccines. This article will outline three broad principles of capacity management that will be useful to any government agency planning for and implementing the vaccination.

_RSS_The first and perhaps the most important is that capacity is determined not only by the count of assets but also by their utilization. The utilization is determined by process design, which means that capacity is fungible to at least some extent. This is why good companies routinely undertake process improvement initiatives, which are aimed at getting more out of the assets. For example, one of the ways in which more can be extracted out of refrigerated trucks is using them the way express logistics operates its trucks, that is, using two drivers. The use of two drivers who take turns allows a truck to be run more than 20 hours in a day, thus increasing the distance it can cover every day. Their run time can also be increased by designing efficient processes so that they have to wait as little as possible at pick up or drop points. One radical idea is to declare all such trucks as ambulances so that they can cut through the city traffic fast.

The second principle is that for non-perishable products such as syringes, capacity constraint can be gotten around by building inventory. India has many manufacturers that can make syringes. As a recent *Mint* article alluded to, the problem is their existing commitments, which take away a major part of their production capacity. However, it is highly unlikely that all the manufacturers are running three shifts all seven days. This means that with sufficient time, this spare capacity can be used to build inventory of syringes, which will take any capacity constraint on syringe manufacturing out of equation.

The third principle is that only the capacity of the bottleneck process (i.e., the one with the smallest capacity) matters. One implication of this principle is that increasing the capacity of a non-bottleneck process does not yield any benefit. A key challenge in implementing this principle is in identification of the bottleneck process in a fluid and unprecedented situation as Covid vaccination. For example, estimating the availability of health care workers who can vaccinate is not easy since their count depends on the severity of the pandemic. If the pandemic surges again, then many doctors and nurses will be busy in Covid wards taking care of patients.

Paradoxically, the urgency to implement prompt vaccination will also increase in that scenario. Another problem is that the sheer number of people to be vaccinated means that the vaccinating doctors and nurses will have to vaccinate dozens or perhaps hundreds of people every day for months. Although all doctors and nurses routinely administer injections, few, if any, would have administered so many injections every day for several months. A vaccination fatigue is probable, which means that people will have to be rotated. Estimating the available number of vaccination workforce will, therefore, be a herculean task.

Even though the bottleneck process may be difficult to identify, it may be easier to identify the processes that may become bottleneck since this can be done using approximate calculations. Once this step is complete, the next step should be to design processes to maximize the utilization. In general, a bottleneck resource should never be idle. For example, in private hospitals, there often exist two queues for doctors. One is a general queue where patients who are behind in the queue wait. The other is a queue usually just outside the doctor's cabin, where patients who are in the front of the queue wait. This system of two queues ensures that the doctor's time is not wasted waiting for the next patient and his/her time is fully utilized.

To conclude, planning should not only be focused on assets, but also on effective process design, which will bring the most from the assets. Moreover, special attention should be paid to the processes where the capacity constraint is most severe.

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