Case Brief Innovation Grant Approval

1. Problem Scenario

Problem Statement:
The effective management of medical supplies and prioritized allocation of resources to hospitals is currently a challenge for the Government. There is a need for a system that will function as a one-stop solution.

> **Why is it severe ?** because it is related to shortage of medical supplies and this may lead to critical conditions including death of thousands as well where it could have been stopped by using our platform.
>
> **What is the frequency ?** Number of COVID-19 cases in INDIA are large enough to be critical. As random testing progresses, more people showing no symptoms are diagnosed with Corona. Thus a large number of hospitals(beneficiaries) would be ready to use the platform.
>
> **How widespread is it?** More than 20,000 Corona cases with 600+ Deaths as of April 3rd week in India.

Primary Beneficiaries:

Hospitals - The hospitals that are in need will be prioritized over the others. This is possible because of a system that uses powerful sorting algorithms to determine this priority order after taking into consideration multiple factors.

Suppliers - The manufacturers have the incentive that their outreach will increase , and as a result so will their business.

Government - Government need not have to put in substantial quantities of money and manpower to make decisions regarding supply policy and keep track of the situations of the hospitals in real-time.

Analysis of current alternative solutions:

- In most regions, hospitals communicate with distributors and order the supplies and medical equipment.
- The distributor would then further contact the manufacturer and arrange for the requested goods.
- This multi-party approach is heavily dependent on the fact that all the members of the chain will be able to hold their end of the bargain.
- However there is a large question regarding the capability of this chain to cope up with the rapidly changing scenario during a pandemic.

- In a few places, like in regions of Mumbai, calling centers have been set up for matching the demand with available supply.
- This attempt might be able to collect data regarding the current situation of local hospitals, but the process behind resource distribution is still man made
- The utilization of this information to efficiently allocate the supplies can still be improved upon with the use of computational power.

  On the other hand, a web application that collects and stores real-time data and can run its own powerful sorting algorithms has the potential to accommodate all the hospitals and manufacturers across the country on a single unified platform.

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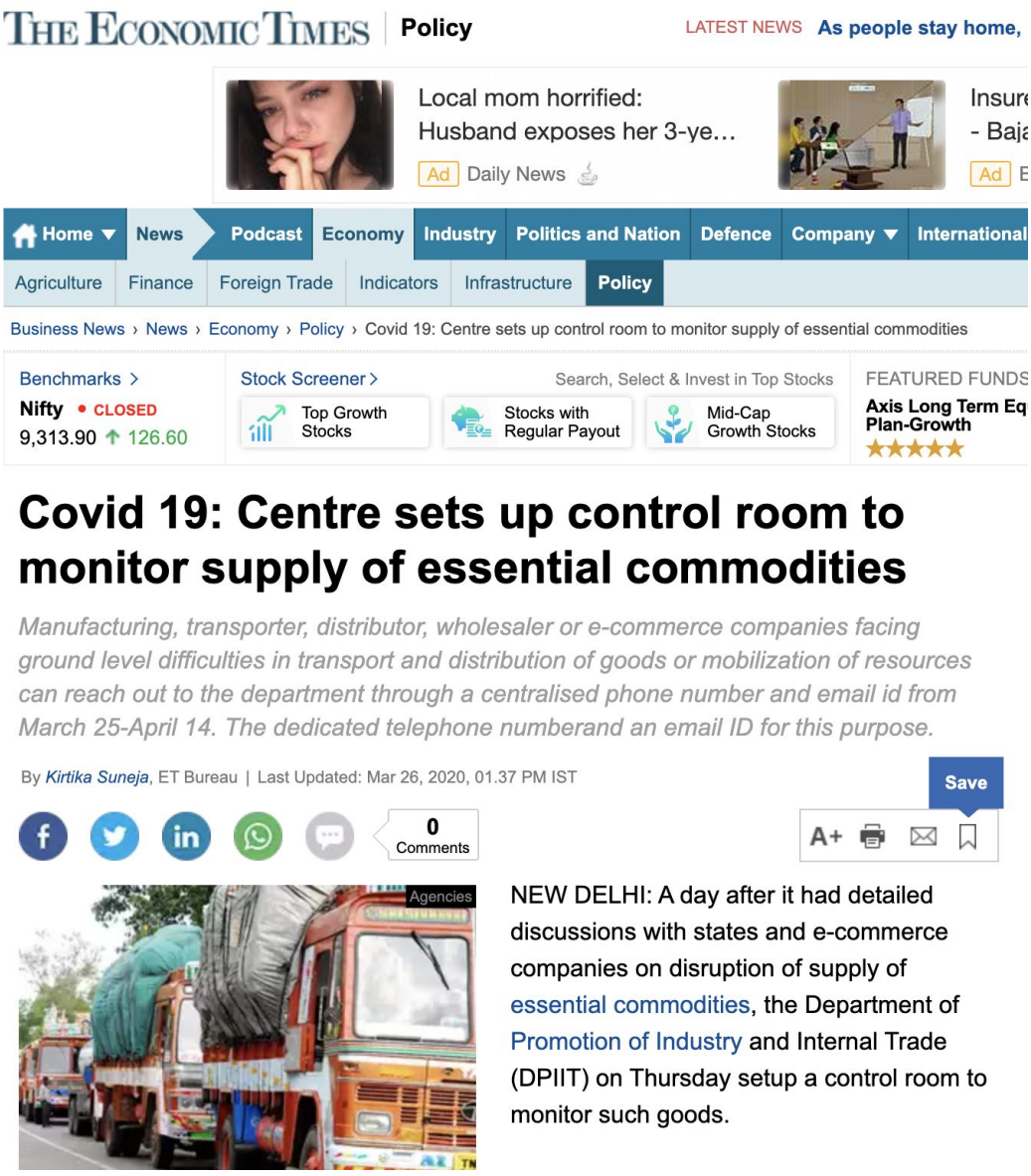
2. Problem Significance (Necessity, Severity & Incidence)

SEVERITY

There have been many media reports that speak about the necessity of developing an improvised medical supplies distribution system to handle the crisis situation.
For example - Hindustan Times article here

VALIDITY

There have been reports that the Centre has set up a Control Room to monitor the manufacturing, delivery of medical commodities and various other processes.
The Economic Times link [here]



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Covid 19: Centre sets up control room to monitor supply of essential commodities

Manufacturing, transporter, distributor, wholesaler or e-commerce companies facing ground level difficulties in transport and distribution of goods or mobilization of resources can reach out to the department through a centralised phone number and email id from March 25-April 14. The dedicated telephone numberand an email ID for this purpose.

By *Kirtika Suneja*, ET Bureau | Last Updated: Mar 26, 2020, 01.37 PM IST

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Agencies

NEW DELHI: A day after it had detailed discussions with states and e-commerce companies on disruption of supply of essential commodities, the Department of Promotion of Industry and Internal Trade (DPIIT) on Thursday setup a control room to monitor such goods.

These reports serve as further validation that there is a **need to have an automated centralized system for the efficient distribution of medical supplies**.

The problem can be rated as critical.

TESTIMONIALS FROM LEADING DOCTORS:

Dr name : Princika Jaiswal
Hospital: KEM, Mumbai
"Healthcare facilities would receive a huge boost with a robust one-stop solution like CoroMed which is not only easy to implement but also easy to use. This will help reduce our operational time and let us focus better on patient care."

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3. Solution Requirements

- Basic essential features:
  - ❖ List of hospitals and their requirements in real-time
  - ❖ Prioritization of hospitals
  - ❖ List of available suppliers having the required commodities stock
  - ❖ Region-wise filter

- Pilot-Production:

Trials with the corona hospitals in specific regions of one city, preferably Pune, and suppliers throughout the city

- Scaling up and distribution:

Technologies used are capable of handling huge amounts of data. Our service is scalable without any complications.

Since it's a software service, distribution in this context is creating awareness among our target customers.

- ❖ Advertising through authentic media sources.
- ❖ The initiative can be conveyed to the masses through addresses by the Government also.

4. MVP Concept & Design

Hospitals will sign up onto the web-portal and enter the number of supplies and medical equipment required by them and other details about the number of patients admitted. Similarly, the Manufacturers will enter the details of supplies available with them. Other details like location, transportation radius, etc will also be taken.

The distinguishing feature of our application is prioritization of hospital's requests according to severity. We have designed a sorting algorithm that considers multiple factors like the quantity of supplies needed, number of patients admitted and the amount of them that are critical.

Suggestion algorithms map this prioritized list of hospital's requirements with potential suppliers who have availability of supplies and are in proximity of the hospital. The supplier can then proceed to initiate the delivery.

Core Technologies used:

1. Frontend
   The front end part of the website is created using the framework - React.js. The main reason to use react.js is that react allows the user to make reusable components which can be reloaded without refreshing the entire webpage. This particularly is an important feature for the website as hospitals and manufacturers are going to be continuously sorted and displayed on the website. Hence react allows the website to be fast and extremely efficient.

2. Backend
   As with any React.js project, the backend of the project uses Node.js and Express.js along with a few tools. Node.js being another efficient backend tool works well with react.js. An API using express.js and Firebase database has been created to easily access the database for all the CRUD operations.

3. Sorting Algorithms
   The main part of sorting the hospitals is the priority assigned to each individual hospital. The priority is determined on the basis of factors such as number of patients, number of patients affected by COVID-19, number of patients in critical condition, number of different equipment required by the hospital, etc. A factor is

used in assigning the priority so as to give the right weightage to the important factors.

As for sorting the hospitals, we thought that the binary search tree is the best data structure when it comes to frequent insertion and deletion and updating data also it always gets inserted in a sorted manner only. We tried to implement the same in a javascript environment.

4. Database

   Considering a long list of databases suitable for React and Node projects, we went with the Firebase Database. Firebase provides a real-time database option that is necessary for the website. Without any complicated coding, we get real-time access to the real-time data that is being stored in the database. The database has 2 separate nodes namely Hospitals and Manufacturing. Each hospital and manufacturer is then accessed depending upon the priority number given to them through the sorting algorithm.

5. Secure Login

   The website uses the secure login system that is provided by Firebase along with JSON web tokens to manage when the user is logged in and on which device the user is logged in.

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5. Value Proposition

- **Benefits and outcomes**:
  - **Suppliers:**
    - ❖ Increase in sales and profit
    - ❖ Expansion of business
  - **Hospitals:**
    - ❖ Save time and efforts required to track down dealers having stocks of required products during COVID-19.
    - ❖ Better health care and faster recovery of their patients
    - ❖ Find dealers providing better rates.

- Multiple reports point out the consequences faced by health care centres due to lack of essential support from the supplier industry.

  It highlights the importance of visibility of available stocks, the target of our project.

- **Strength of our solution as compared to alternatives:**

  Each hospital has their particular suppliers. However during COVID-19, this is not enough.

  Our platform gives the needy hospitals access to all suppliers capable of providing the necessary supplies.

  This helps in immensely speeding up the process.

- **Competitive Advantages**:

1. Innovation

   Healthcare facilities would receive a huge boost with a robust one-stop solution like this which is not only easy to implement but also easy to use. We asked leading doctors regarding their opinions and they said that such an innovation will help reduce their operational time and let them focus better on patient care.

2. Technology

   There are no technological difficulties involved in deployment and expansion of this service. It can easily be accessed over any electronic device with an internet connection. Moreover, it has minimal maintenance requirements.

   The high performance sorting algorithms have been designed to incorporate multiple factors to decide which hospital has the most urgent need. The ML based prediction models will help predict future requirement trends. These factors are where we stand out among the crowd and shine.

3. Product

   Our system functions as a one stop solution for effective management and prioritized allocation of supplies.

   The existing alternatives to our innovation are offline channels like call centers and online competitors like e-marketplaces. However, CoroMed offers technological superiority and is easily scalable. Furthermore, our innovation offers efficient, high computational power supported and accurate services.

4. Commercial

   During the course of the pandemic, the web-platform will serve the purpose of being the primary bridge between the hospitals and suppliers.

In the post-pandemic world, there will be a large economical slump across all industries. Our portal can be used as a Government backed trade platform that provides economic concessions to boost their businesses. Furthermore We propose a freemium model in which apart from the free basic services we offer additional premium brand-boosting features to both sellers and hospitals..

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6. Summary Assessment of the Case for Innovation Grant & Product Acceleration

1. Is this problem arising out of shortage of supply of existing solutions, which are proven to be unviable for scaling up manufacturing, distribution etc.?
   Yes
   As discussed previously, the existing methods being used have inefficiencies on both technological and operations management fronts.

2. Is there a clear case for undertaking the design, development and trials of an innovative + technology enabled solution?
   Yes
   This system functions as a one stop solution for effective management and prioritized allocation of supplies. This service has the capability to bring drastic changes and is certainly a potential life saver.

3. Is the nature of the innovative solution a minor/incremental variant of the existing solutions?

   Yes
   The idea is technically a minor variant of e-marketplaces but is much more context specific. The proposed innovative solution is the first to seek to create a unified end-to-end online platform that brings together the requirements from the Hospitals and the availability of supplies from the Manufacturer's side.CoroMed offers technological superiority and is easily scalable. The high performance sorting algorithms have been designed to incorporate multiple factors to decide

which hospital has the most urgent need. The ML based prediction models will help predict future requirement trends.

4. Is there a possibility of a new solution category to emerge in handling COVID-19 like pandemics in the future?

   Yes.
   Given that the extent technology has no limits, newer, more able innovations are always possible in any domain.

5. Is this proposed innovative solution likely to pass trials, certification in a timely manner after an accelerated phase of MVP development, testing and pilot production?

   Yes
   The software based nature of this service makes it very easy to implement. Successful trials can be conducted by collaborating with a few hospitals and manufacturers/suppliers present in a region and performing a demo run.

6. Is the MVP development schedule and milestones pointing to acceptable Time-To-Market projections?

   Yes.
   According to our calculations, we shall be ready to hit the market in 6 weeks. This is because most of our prototyping is already complete and we are soon planning on conducting the trial run.

7. Is the MVP design suitable for scaling up manufacturing, distribution, and lifecycle product support?

   Yes.
   Our system functions as a one stop solution for effective management and prioritized allocation of supplies. There are no technological difficulties involved in deployment and expansion of this service. It can easily be accessed over any electronic device with an internet connection. Moreover, it has minimal maintenance requirements.

8. Is there a possibility of a core technology or a new product category emerging from this innovative solution with huge potential for applications beyond COVID-19?

   Yes
   As of now, we are not aware of any existing category of systems which bring large corporations such as hospitals and pharmaceutical suppliers under one roof. Our initiative shall serve as a pioneer in this industry that still has a vast scope for development.

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7. MVP (Pilot) Development Plan & Budget

Product Development Plan

Milestones #	Deliverables	Outcomes	Time Period (Weeks)	Grant (INR)
Onboarding of expert full-stack developer	Making the prototype ready for the pilot run	Increasing the efficiency of the website as well as securing all the endpoints of the website.	4 weeks	5L
Deployment and licensing of the website along with copyrights	Hard copy of license/copyright	Will authorize the deployment and prevent any legality/ IP issues	2 weeks	2L
Performing the trials in 2 parts - technical and on-ground trials.	Trial run will give idea to what extent the system handles the load	Ready for hosting the website live	2 weeks	1.25L
Rolling out the finalised product	Final product that has passed all the bug fixing process	Final running product that is ready to enter the market	1 week	1.5L

Total Duration (in weeks): 9

Product Development Budget Template

#	Cost Category	Cost Heads	Product Development Budget
1	**Direct Costs** (Prime Costs)	Prototyping Resources/Materials	1L
2		Design/Manufacturing Costs (Pilot Scale)	1.5L
3		Testing/Certification Costs	50K
4		Professional Services Fees (Technical Experts/Specialists)	1.5L
5		Misc (Design and Development)	2L
6	Primary Overheads	Field Visits (Travel+Others)	50K
7		IPR Fees & Costs	1L
8		Contingencies & Overruns	75K
9		Business Development (Travel + Regn/Booth Charges)	1L
	Total Product Development Budget (MVP Pilots)		**Rs. 9.75 Lakhs**

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8. Dependencies

1. Transportation facility - A tie up with a transportation facilitator will be necessary for delivering the resources to the hospitals in case any manufacturer/supplier cannot provide so on their own.

2. System for payment transaction - At the moment we have not figured out how to automate the process of payments so that they can be done seamlessly over the

same platform. This is something we are working on proactively, and would not be a dependency for long.

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9. Risks & Challenges

a. Capability of Team/Partners

The team consists of competent engineering students that have astute technical skills and have been associated with various startups, thus having pri3or experience of different development stages including research, traction generation and scaling.

However, we would further appreciate the help of domain experts to get an experienced analysis of the scenario. Gathering quality mentors on our own could possibly be a challenge.

b. Competitive threats and market barriers

There arises the question whether all hospitals, even in rural areas would have access to internet connection andr electronic devices? Without that the availing the benefits of this service would be difficult.

c. Commercial execution

The sole question that arises is would hospitals and manufacturers want to continue use of the platform once the pandemic has resided? We have a solution to this question. In the post-pandemic world, there will be a large economical slump across all industries. Our portal can be used as a Government backed trade platform that provides economic concessions to boost their businesses.Furthermore We propose a freemium model in which apart from the free basic services we offer additional premium brand-boosting features to both sellers and hospitals. Thus, this service shall continue to have great usability even after the pandemic is over.
