

# Establishing a Centralized Logistical Triage Platform to facilitate Supply Chain Optimization for Critical Resources during COVID-19 in a Developing Country

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## ABSTRACT

**Problem:** The COVID-19 pandemic has resulted in significant resource deficiencies, especially with regards to basic facilities required for the safety of Healthcare Professionals (HCPs) such as Personal Protective Equipment (PPE). Resource deficiency can be attributed both to inadequate production and to misdirected distribution due to deficits in the global supply chain, particularly in a time-sensitive situation like this. Low-Middle Income Countries (LMICs) face the added burden of economic constraints and underdeveloped health-care infrastructure. Lack of a centralized approach, ineffective rapid communication (especially amongst private and public entities), stockpiling and inefficient resource allocation further exacerbate this underlying issue.

**Approach:** Project Alloy has worked on building a platform for “Logistical Triage” to strengthen the coordination of resource networks in crisis situations. We aim to facilitate supply chain optimization by tackling inequitable resource distribution through a centralized management approach. Through our portal, healthcare organizations in need of personal protective equipment, ventilators, and other key resources would be connected to non-governmental organizations, government agencies and manufacturers to enable time-sensitive and need-based optimization of resource allocation and distribution.

**Outcomes:** We hope to facilitate near-real time tracking of resource consumption, to guide the efforts of rapidly emerging “pop-up” suppliers and manufacturers. This would ultimately feed into three key outcomes: a) to ensure immediate continuity of supplies to HCPs in the frontline against COVID-19; b) to track and preempt the trajectory of resource deficiencies and demands in order to mitigate the impact of the rapidly rising incidence of COVID-19 cases; and c) to establish a centralized network for healthcare specific e-commerce infrastructure in low-middle income countries to facilitate future crisis management.

**Future Steps:** We plan to expand iteratively, to include e-commerce technology to build our supplier dashboard and to develop a crisis specific e-commerce marketplace for healthcare resources.

**Keywords:** COVID-19, Supply-chain, PPE, LMICs, Digital infrastructure

\*See End Note for complete author details

## PROBLEM

Hospitals need a way to characterize their real-time resource capability and capacity, to ensure the safety of Health Care Providers (HCPs) and adequate care provision to patients. The COVID-19 pandemic has resulted in significant resource deficiencies, especially with regards to basic facilities required for the safety of HCPs as well as the adequate provision of care. This primarily includes Personal Protective Equipment

(PPE) and machinery such as ventilators. An in-depth analysis of global trends has shown the resultant outcome to be increased infection rates with Covid-19, a greater burden of disease amongst healthcare workers (e.g. >13% in Spain), and an alarmingly increasing mortality rate associated with this pandemic.<sup>1</sup> Data from pandemic epicenters show that equitable resource distribution is not the answer and the areas hit hardest need to be tackled with increased vigor in order to further curb the viral spread. Therefore, assessing

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and fulfilling the real-time needs of hospitals based on their patient load will enable need-based resource prioritization.

Resource deficiency can be attributed to inadequate production and misdirected distribution due to deficits in the global supply chain, particularly in a time-sensitive situation. Low-Middle Income Countries (LMICs) tend to be even harder hit due to their economic constraints and underdeveloped healthcare infrastructure. Lack of a centralized approach, ineffective rapid communication (especially amongst private and public entities), stockpiling and inefficient resource allocation all further exacerbate the underlying issue. Thus, in order to optimize PPE availability, there is great emphasis on coordinating the PPE supply chain by ‘promoting the use of a centralized request management approach’ amongst other coordination measures (**Figure 01**).<sup>2,3</sup> The WHO’s “DCP Harmonized Ebola” response is an example of a successful application that has fulfilled this purpose.<sup>4</sup>

The status quo’s attempt to deal with the mammoth need that has arisen for healthcare-associated resources with limited influx has resulted in the emergence of multiple small companies/donors/NGOs that collect and supply these resources. This system, whilst being partially helpful, is limited in its effectiveness due to a lack of coordination between suppliers/relief providers resulting in a demand-supply mismatch. The lack of a centralized approach results in both unclear and potentially inequitable distribution policies at the level of government agencies and Non-governmental Organizations (NGOs) alongside a lack of accountability and documentation at a granular level.

All this has been seen before in previous natural disasters or other relief efforts, especially in LMICs. Subsequently, more effort is being put in than the subsequent dividends receive. This is not only unfair to all parties involved but is also increasingly ineffective to curb the pandemic spread.

## APPROACH

To tackle the aforementioned need we designed a Logistical-Triage portal that could connect hospitals, Community-based Organizations (CBOs) and isolation centers (henceforth referred to as “Recipients”) to NGOs, government welfare groups and even to manufacturers (henceforth referred to as “Suppliers”). Amongst the methods for optimization presented by WHO, we decided to primarily focus on coordinating the PPE supply chain, specifically piloting in the city of Karachi, and then expanding iteratively across the nation, followed by neighboring low-middle income countries (LMICs).

In the Alloy platform (**Figure 1-2**), Recipients can present data showing their current stock and daily utilization with the ability to highlight any acute deficiencies and urgent needs. This data can be entered into an excel sheet for our Google Data Studio system during our first iteration or can be linked from in-house inventory management platforms to our centralized system in future iterations. This dashboard would be visible to Suppliers on the network, who would then be able to respond to Recipients’ real-time demand as per need. Recipients may also initiate outreach to Suppliers

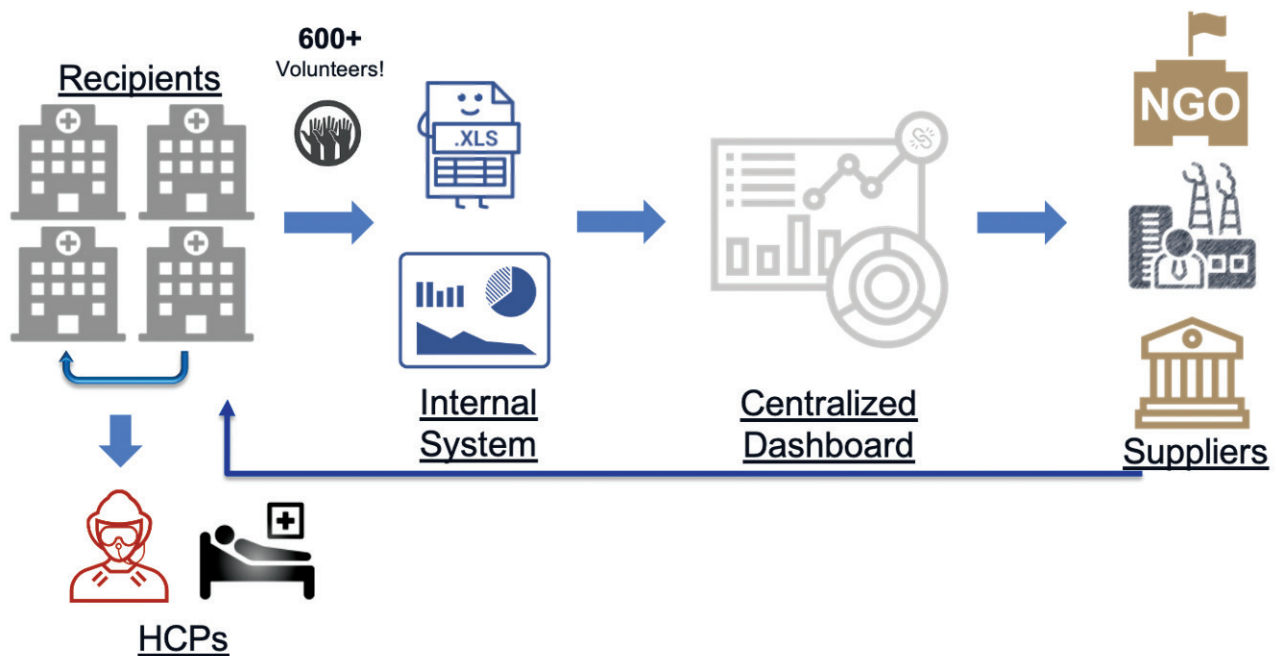


Figure 1. Process Flow for the Alloy Platform

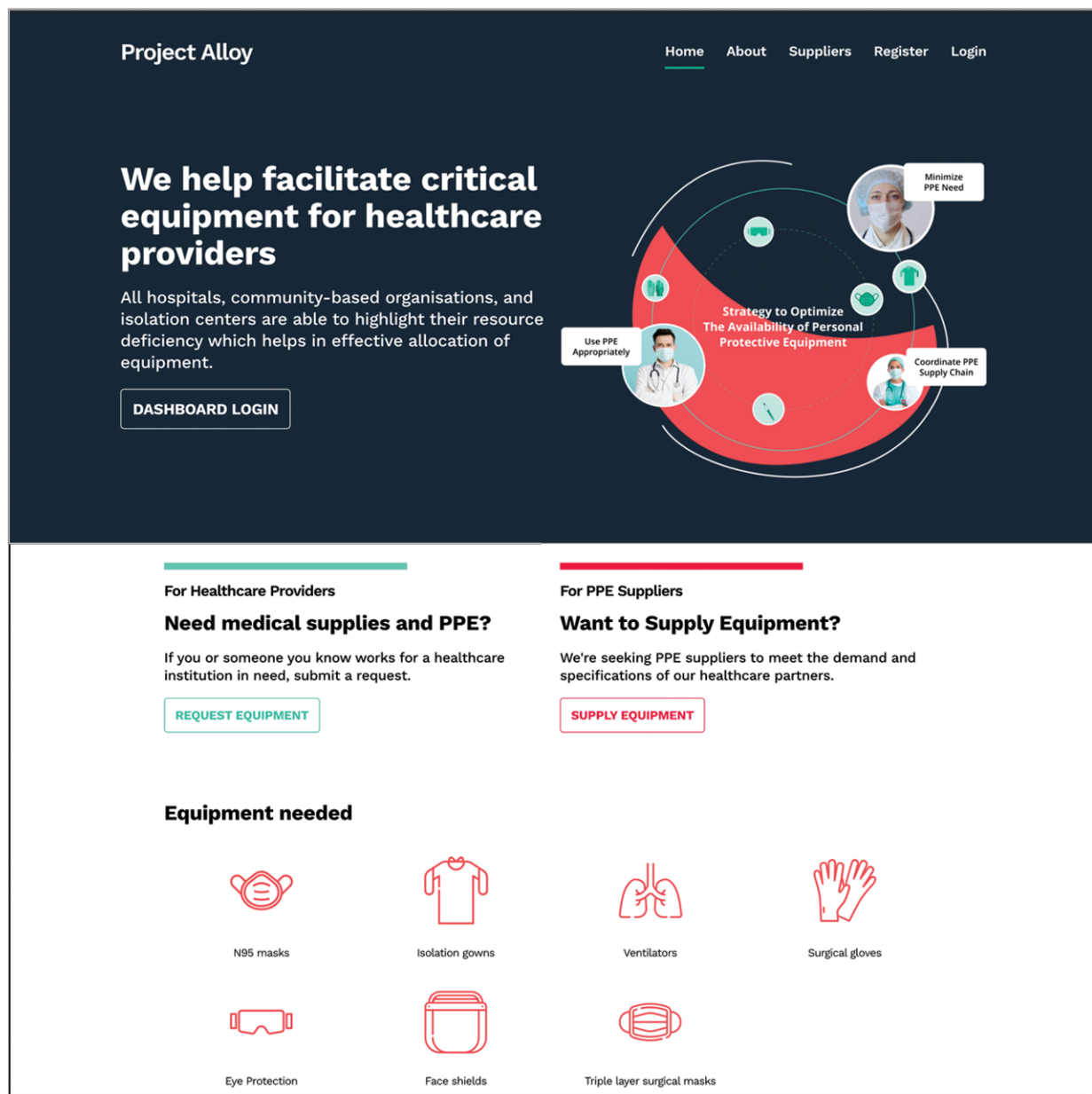


Figure 2. Overview of the Alloy Platform

through the marketplace established within the platform. In our network, we also encourage hospital-to-hospital sharing for items such as ventilators.

Alloy’s primary users are the Recipients and Suppliers as described above. To use the Alloy platform and to get access to the resource dashboard, each entity will be required to establish a User log-in. Initially, to bring these stakeholders on-board, the central unit linking these three stakeholders involves the 600+ volunteer force of the Student Taskforce Against COVID-19 (STAC-19) consisting of medical, nursing and allied health students from across Pakistan. These liaisons have been individually paired either, with

the hospitals (specifically under Purchasing Divisions) that their education systems are affiliated with, or to donor agencies they choose to affiliate with, to ensure efficacious and accurate access to emerging data on a day-to-day basis from each healthcare facility. Currently, every volunteer is undergoing a mandatory centralized training program to ensure that inconsistencies and confusions are minimized from an organizational perspective. As our reach and catchment increases, we will be bringing on permanent human capital to facilitate expansion and sustainability.

In keeping with the theme of sustainable expansion, we acknowledge the nuanced challenges involved in creating

a database system where such large users will enter data and a large amount of input will require strong computer, server and programming knowledge. For this reason, it might become necessary to pre-arrange the database through a PostgreSQL server with a powerful central computing source such as a virtual Graphics Processing Unit (GPU). We believe this can be accomplished via interdisciplinary cooperation with computer engineers who be financially leveraged. Additionally, when a large-scale project that will enable a state-wide development is considered, the status quo systems of other major world countries that have already established this system, will provide a template and avenue of discovery to inspire the protocols and pathways in our system.

## OUTCOMES

Existing health dashboards include clinical, patient, physician, quality and risk management dashboards and internal Enterprise Resource Platforms (ERPs). While each occupies its own niche in coordinating healthcare tasks, our focus was on an amalgamation of two functions of the hospital and clinical dashboards; namely the ability to a) assist in tracking public health outbreaks to plan staffing needs effectively, and b) highlight expenses, inventory, and in-house resource management. Current solutions are primarily intra-hospital or intra-consortium, which do not provide tangible links to donors or manufacturers in real-time. This solution would enable near-real time tracking of resource consumption, which would be especially helpful to guide the efforts of rapidly emerging “pop-up” suppliers and manufacturers. This would ultimately feed into three key outcomes: a) to ensure immediate continuity of supplies to HCPs working at the frontlines; b) to track and preempt the trajectory of resource deficiencies and demands in order to mitigate the impact of the rapidly rising incidence of COVID-19 cases; and c) to establish a centralized network for healthcare specific e-commerce infrastructure in low-middle income countries to facilitate future crisis management.

## FUTURE STEPS

We have launched a baseline excel-based Google Studio dashboard as a pilot in Karachi’s COVID testing/treating hospitals. We plan to expand iteratively, to include e-commerce technology to build our supplier dashboard and a crisis specific e-commerce marketplace for healthcare resources. Short term goals include the allocation of volunteers to health-care facilities, implementation of a pilot

study in Karachi, incorporation of feedback and outreach to public sector hospitals and local government to assist in scale and expansion. Medium-term goals include nationwide implementation, and long-term goals revolve around the creation of a centralized network for healthcare specific e-commerce that can connect hospital and manufacturer ERPs during and post-COVID.

## END NOTE

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**Conflict of Interest:** None declared

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