# Earthquake Project

IE482

Group 2 - Supply Management

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Supply management is defined as the process of locating, acquiring, allocating, and monitoring resources as well as suppliers for any sort of operation. Predictably, its scope is quite broad, covering everything from efficiency in allocation to transportation optimization. Therefore, we, as a group, chose to focus on one of its major subtopics, which is donation pollution in the context of disaster relief procedures.

Donation pollution refers to the overwhelming amount of donations or the failure or handling of them, specifically during crisis relief operations. It may cover several different types of failures and appear in different forms. Uneven and/or irregular allocation of material is an example of these forms, where materials are not distributed with respect to regional demands, such as having too many sanitary towels but not enough potable water in a region, for example. Another type of donation pollution is unnecessary/unreasonable donations, such as high heels or swimming suits. The third type is the wrong classification of materials, where the donation boxes are not labeled (or classified) properly, which may cause falling short of critical demands in critical cases. All these types of failures were unfortunately observed in the South-Eastern Anatolia earthquake. Our aim is to reduce such failures, improve efficiency in systems, and improve crisis management. Therefore, in light of this information, our main motivation is to allocate the donations with minimum waste, maximum coverage, and a minimum time frame.

Our solution revolves around a comprehensive decision support system. Data, or specifically accurate information at the right time, is the most valuable resource in times of crisis. That being said, our solution aims to provide the most accurate data to manage the supply chain. This purpose requires a variety of properties in order to be achieved.

Firstly, information must flow through one single channel. Assume that 50 blankets are needed. And this information is spread through 3 different channels. Although not certain, there is a great chance that 150 blankets will be sent to the site due to the multi-channel nature of the system. This can be eliminated through a one-channel property. Furthermore, it is important that this channel is enforced and regulated by an authoritative force for fair and proper regulations.

Proper classification of materials is the third property, where the materials needed are collected, stored, and properly classified in regional centers, in a systematic and consistent manner, which would increase the sense of order.

Regarding the said decision support system, it is crucial to focus on real-time inventory levels. To understand the criticality of it, assume that 30 of the 50 blankets needed in the disaster region are already allocated, yet they are not communicated accordingly. Then, it is not surprising that 50 more blankets might be allocated to the site, which is directly defined as donation pollution. Therefore, real-time (as frequently updated as possible) inventory data is crucial for a more efficient and less-wasteful donation allocation procedure.

Moreover, forecasting is the most crucial step in this project. The decision support system (DSS) is expected to forecast demand for products or services with respect to population data, demographics, infrastructural risk, etc. For instance, if there are no children in a region, it is not logical to send child-boots to that site, in order to prevent donation pollution. Or, risky neighborhoods would have greater weight on predictive regressions for more accurate forecasts.

Lastly, it is critical to understand that this DSS must be implemented before the disaster as it wouldn’t be possible to work with such a large dataset in an emergency. Therefore, these solutions are presented assuming that they are pre-implemented and ready to use in case of an emergency.

We already know that it is not possible to fully prevent donation pollution. Therefore, we aim to minimize it. For further minimization, it is important to be able to communicate through disaster sites as well. To concretize this, let’s assume that donations are packed in Ankara and sent to Hatay and Antep. The forecasted demand is 50 blankets in both regions. Yet, actual demands were observed at 30 and 70, respectively. For an efficient system, inter-communications are needed so that surplus products from a disaster site can be directed to another one. That is how proper minimization of donation pollution can be achieved.

To sum up, it is proposed that a decision support system based on big-data powered by machine learning to be implemented. Forecasting is aimed at being executed through machine learning tools, and allocation plans are expected to be decided by solvers (optimization tools). Obviously, we keep in mind that a multiscope (database/optimization) project of such scale requires a great deal of resources as well as comprehensive research and detailed simulation in order to be fully and smoothly operational. Please keep in mind that this proposal is presented for an ideal environment.