USE OF DATA PROCESSING IN TAXICAB CONTROL

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The operation of demand-response vehicles (in this paper conventional, radio-equipped taxicabs) may be likened to the operation of a tramp steamer. The tramp steamer moves from port to port—not having a fixed route or schedule, not knowing whether its next trip will be long or short, and not knowing whether its next revenue trip will originate at the termination of its present revenue trip or whether it must deadhead from the planned termination point to the origination point of its next revenue trip.

So it is with a taxicab operation, and therein lies the problem of utilization of manpower and vehicles. This is especially true of an operation in which a master-servant relation is maintained between employees and managers and in which employee benefits, taxes, and the like must be paid by the "master." If such operations are to continue to exist, the dual problem of manpower and vehicle utilization must be solved in order to offer reasonable service to patrons and to secure this profitable utilization.

This problem does not exist for those taxicab operations that are conducted by the individual entrepreneuer, such as the independent New York cabbie who cruises or secures loads at fixed pickup points, or for those companies that lease vehicles equipped for taxicab use but do not maintain a service organization.

However, those operators of demand-response vehicles, be they taxicabs, jitneys, dial-a-ride, or group-loaded vehicles, that offer transportation service, which includes receiving telephone request for service at a specific address, find this problem of matching vehicles and customers to be one of the most vexing.

In the taxicab industry this system—called dispatching—varies by company. It depends on the size of the fleet being dispatched, the size of the service area, the population density, the presence of one or more "walk-up" traffic generating points (such as an airport, bus station, or major hotel), and the topography of the service area.

I am closely connected with taxicab operations that vary in size from 10 to 700 units, in service area size from 6 to 480 square miles, in population density from 1,000 to 25,000 people per square mile, in topography from seashore to desert to inhabited canyons, and economically depressed areas to "millionaires' row".

The statement relative to dispatching difficulties is verified by experience. Small fleets and service areas where there are no major walk-up traffic points require a system that depends on cooperation between the controller and the vehicle driver, and this cooperation is forthcoming because the vehicle driver must depend on the controller for 98 percent of his business. Operations that encompass larger geographic areas, have customers with varying economic situations, serve many 'walk-up' points, and receive more than 10,000 requests in a 24-hour period, require an entirely different system. The taxicab driver tries to "do the whole thing" on his own, and there is difficulty in handling the volume of requests and in matching the requests with available taxicabs when they are also sought after at walk-up points.

There is, however, a consistent thread running through all of these divergent operations. That thread is a recognition that the systems used, even though they are continuously updated and improved, are still deficient in achieving the desired goals of improved service and efficiency.

It is suggested that the following steps are necessary to bring about the needed improvements. It is believed that they are both technically and economically feasible:

1. Data processing equipment (defined as a conventional computer system with conventional cathode ray tube on tape input and output) must be used for (a) receipt, assignment, and retention of orders for service; (b) receipt, assignment, and retention of units available for service; and (c) matching of orders and available units.

2. Digital communications equipment must be used for (a) transmission of messages from mobile units to base, giving vehicle identification and status without driver input, and location by driver input; and (b) transmission of messages from base to mobile units.

3. Automatic vehicle monitoring equipment must be used to relieve driver of the responsibility of vehicle location input.

Our company has moved into step 1 and is conducting discussions with appropriate parties relative to steps 2 and 3.

The area selected for trial use of the data processing equipment is the Los Angeles metropolitan area. It encompasses the service area of the Los Angeles Yellow Cab as defined by its franchise from the City of Los Angeles and from the City of El Segundo; taxicab operations were also permitted in the cities of Beverly Hills, Burbank, and certain specified areas in Los Angeles County. The land area involved is approximately 480 square miles, and the population is more than 2,500,000.

During the preliminary planning, various concepts and system designs were considered. The final configuration was a service area divided into a number of districts or grids (the term grid was used although the areas are not all equal in size or population density). Grid parameters were that grids must not include areas in more than one political entity, have a vehicular travel time in normal traffic conditions that varies from 5 minutes in central city core to 8 minutes in less densely populated areas, have no cross topographical barriers such as range of hills or freeway, and have no more than 1 major walk-up traffic generating point in each grid.

All streets in a grid are defined by beginning and ending street numbers in that particular grid. Wilshire Boulevard, for example, is in 11 grids. Major intersections, hotels, stores, and points of interest are all listed in each grid. More than 22,000 street, intersection, or specific points are listed in the address file, each coded to the grid to which it is assigned.

Automatic call distribution system equipment is used to assist in the internal handling of the requests for service. As orders are received from patrons, they are punched by conventional keyboard, verified by instant readout, and entered into central processing core. The central processor assigns the appropriate grid number to the order and stacks the orders by grid number and by time of receipt. Call-backs from patrons who have not received service within the quoted time receive priority in the order stacks.

As available taxicabs call in on radio channels that are dedicated to vehicle location, the cab identification and location are also entered into the central processing core by means of the conventional keyboard. The appropriate grid number is assigned to the available taxicab, and then stacks are made in order of receipt.

The central unit then processes the 2 stacks—requests for service and available cabs—and displays on the screen the address at which service is desired and the identification number of the first available taxicab in that grid. If a unit is not available in the grid of the order, the central processing unit searches adjoining grids

for the first available unit and displays its number.

When the taxicab driver has acknowledged the call and the order, a copy is printed of the order information including order-taker number, time of receipt, service time quoted, dispatcher number, vehicle number, time of dispatch, and whether the unit dispatched was found in the grid in which the order was located, in another grid, or was located by voice search by the dispatcher.

The program has not yet performed perfectly because the volume of vehicle-to-base communications cannot be handled in the limited amount of air time. The program has been modified so that less reliance is placed on vehicle location input and the orders are displayed on the screen with their identifying grid numbers.

The progress to date has shown that with the volume handled—peaks of more than 600 orders per hour that require more than 2,400 radio contacts per hour—digital communications equipment is needed between vehicle and base to handle vehicle identification, status, and location.

The test area has 4 clear pairs of radio frequencies in the 150 MHz ban assigned for taxicab use, but these were not adequate to handle the flow of vehicle input and dispatch output.

Steps 2 and 3 that will insure the proper flow of information from vehicle and proper identification and location are still in the future. Digital communications equipment for transmission of messages from base to mobile units has the lower priority of the 2 factors in step 2.

The utilization of data processing equipment in the disptach of demand-response vehicles is technically and economically feasible. The utilization of digital communications between vehicle and base is needed when order volume exceeds the limits that can be handled on existing radio frequencies. The use of automatic vehicle monitoring equipment will complete the system for service (patron to company to vehicle to patron). The use of digital communications between base and vehicle will further enhance the use of radio frequencies but is not of vital importance.