

BUXI: DEMAND-RESPONSIVE BUS EXPERIENCE IN THE NETHERLANDS

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BUXI combines features of bus and taxi. It can be classified as a first-phase, demand-responsive bus system. New system thinking in Holland has been leading to the construction of a decision model involving many-to-few service for suburbs with 3,000 to 7,000 population, at distances of 1 to 2 miles from town centers and railway stations, and by buses carrying 11 to 23 passengers (11 seated). There would be scheduled routes and scheduled timetables, and no scheduled stops would be made except at terminals. Door-stop pickup and discharge would be possible extras. BUXI has been operating in Emmen on an experimental basis since May 1970. Experience and financial results of this project are discussed and illustrated. The practical difficulties encountered in the promotion of innovation in urban public transportation are discussed.

•THE GENERAL transportation scene in my country does not differ much from that in other western nations except that the Netherlands is about as big as Connecticut and New Hampshire combined but has a population 6 times larger than the population of those 2 states. This fact gives some idea of the density of population.

We now have 200 motor cars per square mile, and if present trends continue we will have 500 of them in the year 2,000. For comparison, the United States has 8 times fewer cars per square mile. This difference will grow, for car ownership in the United States shows a lower rate of increase than it does in Holland.

In terms of gross national product per square mile, Holland is second in the world, after Japan, and is far above the United States. If you consider this proportion a measure of the pressure a nation lays on its natural environment, you could say that against every unit of pollution in the United States stand 8 units in the Netherlands and 10 in Japan. This gap again seems to get wider, for the growth of the national product is faster in Japan and in Holland than in the United States.

These 2 trends point to one of the basic conflicts of our society: the lack of balance between prosperity and well-being. In my opinion, a reappraisal of many traditional and valued ways of thinking and acting is necessary. One of the areas in need of re-balancing is the transportation field.

The balance between private and public transportation—expressed in number of trips made—will have to shift in favor of collective modes of transportation because they use less land and other resources, cause less pollution of all types, and possess a built-in higher level of safety for users and nonusers.

The advantages of public transportation, however, can be felt in the long run only. In the short run, in the daily individual choice of mode of transport, the advantages of private transportation normally are overwhelming. The emotional impact of the motor-car on its owner and user surpasses that of almost all public vehicles and can, as has been said, be compared to the thrill of riding a thoroughbred horse or a fast speedboat.

Even more important is the quality of the transportation product. Public transportation fundamentally works along a line, and one can only enter or leave the system at certain fixed places. Private transportation works from any point in an area to any other point.

In our research on innovation of urban public transportation, we tried to upgrade quality as well as emotional impact. Doing so, we almost invariably hit on some kind of demand-responsive system. In the United States, large computer-aided bus systems

and systems for guideway-bound, small automated vehicles are being developed. We decided to keep to non-guideway-bound systems and leave the computer out of the picture.

The reasons are that in Holland all towns have local bus services or regional bus lines serving local needs. However, suburbs do exist that are not integrated into these existing networks. This limits the scale of new systems currently needed. Dispatching can be done manually instead of electronically. Second, only half of all families own a telephone. Public telephones would have to be installed along the route, and people would have to walk to a street telephone, call the bus, and then wait. This is no different from the existing situation. Third, and most important, heavy passenger volumes are not expected in the suburbs where there is now no public transportation. If acceptable vehicle occupancy levels were reached, the headways between vehicles would have to be rather long. In a system acting on demand only, this would mean maximum passenger waiting times exceeding 10 min, which we think is about the limit for quality.

What gradually emerged was a system with the following characteristics:

1. Fixed route but no fixed stops—passengers signal driver to stop anywhere along route (the option of leaving the route and giving door-stop service is an important feature);
2. Scheduled and published timetable;
3. Small, comfortable buses on which 10 to 12 passengers can sit and the same number stand (headroom for standing passengers and ample space for luggage are provided);
4. No more than 1 vehicle on the road at a 30-min headway (this restricts costs to 1 vehicle plus its reserve);
5. Connections among a suburb and at least 2 main attraction points such as the town center, the railway station, the hospital, or a shopping center;
6. Distances of 1 to 2 miles between terminals and the beginning of the built-up area of the suburb;
7. Suburb population of no more than 7,000 to 10,000 people; and
8. Tickets costing as much as the market will bear.

We called this many-to-few system BUXI (Fig. 1). It is defined for 1 suburb; if a suburb is added, another BUXI service would have to be added too. It can be considered a first step toward a fully demand-responsive system like dial-a-bus.

The first BUXI project was in Emmen, a rural town turned industrial in the northern part of the country. It has a population of 36,000, and the new suburbs were served by stops at the regional bus lines radiating to the center. One of these, Emmerhout, had been built between 2 existing highways and did not possess a bus line. Its street network was designed to keep through traffic away from the access roads and parking areas where the houses are located. Population was 3,500 and will increase to 13,000.

The town's administrators have a standing reputation for dynamism and innovation. So have the managers of the Drenthe Regional Bus Company, who asked the Center for

Figure 1. BUXI in service.



pickup at doorstep



arrival at railway station

Transportation Planning to act as a consultant. Netherlands Railways has shown interest in view of the possibility of extending BUXI to its other subsidiary bus companies.

The population of Emmerhout appeared to be 80 percent lower middle class and 20 percent upper middle class. Car ownership amounted to 50 percent more than the national average. We introduced the BUXI idea to the people and got a favorable response; 50 percent reacted very positively, and 30 percent said they would use BUXI when the car was in repair or the weather too bad to use the bicycle. Based on stated intentions to use BUXI for certain trips, we estimated the passenger volume to be as expected.

We were proved to be wrong, however, because of the well-known habit of interviewees to be friendly to the interviewer. We knew this, but did not know by how much we would err. In the first 12 months of operation, BUXI carried 50,000 passengers, or 30 percent fewer than forecast. The fare might have been a contributing factor. A ticket cost 1 guilder, which is about 50 cents and about twice the fare usually paid in Holland for a local bus ride. We assumed that people are willing to pay more for better quality. If this is always true, it should be possible to keep innovative public transport systems out of the red even with the 20 percent increases in personnel costs that we have had for several years now. The price the market will bear, however, appears to be lower than that needed for profitable operation, especially in times of rapid inflation.

Another feature in which the facts proved us wrong is the attraction of doorstep service. Clients telephoning in advance were picked up at their homes, and passengers in the vehicle could ask the driver to drive to their front doors. These deviations could run up to a maximum of 150 miles from the fixed route, as defined by the street network. This service was free of charge and existed on half of the runs, for we could not allow room in the timetable to extend it to all the runs.

The bookings could be made very quickly: Sometimes the driver received the radio message while on his way to the suburb, so the passenger would wait only a few minutes. But the number of people using this truly demand-responsive facility has been limited. We estimate that 2 percent of all trip-makers have been doing so in the first year of operation.

Also, few people used the service regularly; 80 percent of the users averaged 9 pickups or discharges per year. Only 20 percent of the users were regular customers, averaging one trip per week, and they amounted to 3.6 percent of all families in the suburb.

The reasons behind this somewhat disappointing development are probably the short distance to the sidewalk where BUXI can be stopped and the trip-maker's reluctance to put the driver and his fellow passengers to trouble with detours for his sake. The fact that in a small community many people know each other personally reinforces this handicap. Anyway, when the possibility of rerouting past a new hospital came up recently and we had to decide whether to trade off the time allowed for pickups and discharges for the longer fixed route, we decided in favor of the fixed route and the doorstep service was discontinued. After all, you cannot force service down people's throats. The possibility of telephoning to reserve a seat remained.

Perhaps the conclusion is that the combination of a fixed route that entirely covers an urban area and the option of doorstep service is not viable. If this is true either you have to have fixed routes that cover the area less intensively so that deviations become meaningful, or you have to abolish the fixed route altogether and run on demand only. For the latter, more than 1 vehicle is needed in order not to exceed the client's waiting time of 10 min. This seems to be guaranteed only in larger towns with heavier passenger volumes. Chances for that in Holland and most other European countries do not exist now. Existing bus networks are still not bad enough and not expensive enough. The turning point will come when passenger volumes have decreased and costs have increased still more. The mood for innovation will then come more naturally.

I can illustrate this with the Emmen case. There, a conventional bus line would eventually produce a 60 percent higher deficit than BUXI. Yet, the deficit incurred in BUXI's first year amounted to 60 percent of the expenses, and the deficit in the second

year is in the same range. When the suburb has reached its full growth, the deficit could fall to 30 percent of the expenses.

Costs of BUXI operation do not differ much from those for ordinary buses. Personnel costs are the same, and the cheaper small bus has to be depreciated faster. The difference lies in the fares. Although we started to double the price of the fare, experiments to establish the optimum trade-off between higher fares and loss of potential passengers remain to be carried out. In Emmen, a multiride ticket with 25 percent reduction was recently introduced. This is expected to lead to somewhat better financial returns.

The future for BUXI in Holland is uncertain. The Department of Transportation is still examining the desirability of subsidizing the Emmen project. Emmen municipality has offered to cover 25 percent of the losses. Meanwhile municipal authorities in other towns suited for BUXI are planning to start feasibility studies. Other potentials have not materialized because only a few bus companies and municipalities are really attracted by the role of the pioneer. There were also cases we had to turn down because they did not fit the BUXI characteristics. We want to apply our model rather rigidly to select the cases most likely to succeed, for one BUXI failure will cause more damage than 10 experiments not started, so to speak.

An essential to get the heavy stone over the top of the hill lies, in my opinion, in a more active participation of the government. Up till now, the Department of Transportation has restricted itself to the making of encouraging noises and a willingness to change the law that says that buses within city boundaries can only stop at officially established stops. But the innovation of urban transportation calls for more than that. One of my hopes is the Organisation for Economic Co-operation and Development in Paris, working steadily at the integration and stimulation of the isolated attempts of innovation.