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International Transit Studies Program

Report on the Fall 2000 Mission

Excellence in Transit Operations in Small and Medium European Cities

This TCRP digest summarizes the mission performed October 27–November 11, 2000, under TCRP Project J-3, "International Transit Studies Program." The report includes transportation information on the cities and facilities visited, lessons learned, and discussions of policies and practices that could be applied in the United States. This digest was prepared by Kathryn Harrington-Hughes of the Eno Transportation Foundation, using reports filed by the mission participants.

INTERNATIONAL TRANSIT STUDIES PROGRAM

About the Program

The International Transit Studies Program (ITSP) is part of the Transit Cooperative Research Program (TCRP). ITSP is managed by the Eno Transportation Foundation under contract to the National Academies. TCRP was authorized by the Intermodal Surface Transportation Efficiency Act of 1991 and reauthorized in 1998 by the Transportation Equity Act for the 21st Century. It is governed by a memorandum of agreement signed by the National Academies, acting through its Transportation Research Board (TRB); by the Transit Development Corporation, which is the education and research arm of the American Public Transportation Association (APTA); and by the Federal Transit Administration (FTA). TCRP is managed by TRB and funded annually by a grant from FTA.

ISTP is designed to assist in the professional development of transit managers, public officials, planners, and others charged with public transportation responsibilities in the United States. The program accomplishes this objective by providing opportunities for participants to learn from foreign experience while expanding their network of domestic and international contacts for addressing public transport problems and issues.

The program arranges for teams of public transportation professionals to visit exemplary transit operations in other countries. Each study mission focuses on a theme that encompasses issues of concern in public transportation. Cities and transit systems to be visited are selected on the basis of their ability to demonstrate new ideas or unique approaches to handling public transportation challenges reflected in the study mission's theme. Each study team begins with a briefing before departing on an intensive, professionally stimulating 2-week mission, after which they return home with ideas for possible application in their own communities. Team members are encouraged to share their international experience and findings with peers in the public transportation community throughout the United States. Study mission experience also helps to better evaluate current and proposed transit improvements and can serve to identify potential public transportation research topics.

Study missions normally are conducted in the spring and fall of each year. Study teams consist of up to 15 individuals, including a senior official designated as the group's spokesperson. Transit properties are contacted directly and requested to nominate candidates for participation. Nominees

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are screened by a committee of transit officials, and the TCRP Project J-3 Oversight Panel endorses the selection.

Study mission participants are transit management personnel with substantial knowledge and experience in transit activities. Participants must demonstrate potential for advancement to higher levels of public transportation responsibilities. Other selection criteria include current responsibilities, career objectives, and the probable professional development value of the mission for the participant and sponsoring employer. Travel expenses for participants are paid through TCRP Project J-3 funding.

For further information about the study missions, contact Gwen Chisholm-Smith at TCRP (202-334-3246; gsmith@nas.edu) or Kathryn Harrington-Hughes at the Eno Transportation Foundation (202-879-4718; khh@enotrans.com).

About this Digest

The following digest is an overview of the European mission focusing on excellence in transit operations in small- to medium-sized cities. It is based on individual reports provided by the team members (for a listing of team members, see Appendix A), who are responsible for the facts and accuracy of the data presented. The digest does not necessarily reflect the views of TCRP, TRB, the National Academies, APTA, FTA, or the Eno Transportation Foundation.

EXCELLENCE IN TRANSIT OPERATIONS IN SMALL AND MEDIUM EUROPEAN CITIES: MISSION 13, OCTOBER 27–NOVEMBER 11, 2000

This 2-week mission involved visits and discussions with transportation providers in 11 small- to medium-sized cities in the Netherlands and Germany: Arnhem, Doetinchem, Nijmegen, and Maastricht (in the Netherlands) and Wuppertal, Oberhausen, Essen, Herten, Lemgo, Bielefeld, and Bremen (in Germany). The program provided team members with an opportunity to meet with, and learn firsthand from, their peers in other countries and to broaden their network of international and domestic contacts for addressing public transportation problems and issues.

This mission primarily focused on integrated multimodal operations of smaller and mid-sized communities that have succeeded in bringing about significant increases in ridership in recent years. These agencies have been recognized in the industry for their innovative approaches to operations and management, planning, marketing, electronic passenger information, and system expansion. Some of the systems are operated by contractors; others are in the process of being privatized.

Some of the transit properties that were visited operated buses only; others also offered tram and commuter rail service or provided connections to a national or regional rail service. Fleet composition varied greatly and included articulated buses, trolleys, trolleybuses, alternative fuel vehicles, and trams.

Transit is an integrated part of the urban fabric of the cities that were visited. Transit stations and stops were not afterthoughts in the land use planning and development process, but rather the core for well-thought-out development. Even when a service is added *after* land use is firmly established, efforts are taken to make the transit system part of the urban landscape. The transit system is designed to fit the scale of development and to match the character of the region.

TRANSIT SYSTEMS STUDIED—OVERVIEW

The study group visited transit agencies and operators in seven cities in Germany and four in the Netherlands. The population of those cities ranged from 42,000 to 630,000 (see Table 1). The cities were located within a several-hour drive of one another, and the team members traveled by bus from one city to another.

The Netherlands

The Dutch government considers public transportation to be an essential service, making town and country accessible to all. Since 1998, the central government has increasingly decentralized its responsibilities for public transport, and today the 12 Dutch provinces and 23 regional administrations play a big role in the planning and financing of regional public transport. In its 1999 "Perspectives Memo for Traffic and Transport," the government called for a more market-oriented approach to public transport, which would also lead to improvement in the quality of service provided *(1)*. This commitment to competition predates the European Union's (EU's) rules for borderless competition for services.

TABLE 1 Cities Visited by International Transit Study Team

City	Population
The Netherlands	
Maastricht	120,000
Arnhem	137,000
Nijmegan	147,000
Doetinchem	45,000
Germany	
Wuppertal	377,000
Oberhausen	222,000
Essen	630,000
Herten	70,000
Lemgo	42,000
Bielefeld	330,000
Bremen	530,000

Arnhem

The Arnhem transit system is operated by the state-owned Connexxion public transport enterprise, which serves the central part of the Netherlands. The company, which was formed in May 1999, when four former transit providers (Midnet, NZH, Oostnet, and ZWN) coalesced into one company that won the 6-year public transportation concession, is in the process of being privatized (the company has already sold its northern Netherlands operations to Arriva, the United Kingdom-based private multinational operator). The city's transit fleet includes 50 trolleybuses, which provide the backbone of the city's public transportation, and 45 diesel buses. Each year, the system carries about 17 million passengers, 60 percent of which are on trolleybuses. Each resident takes an average of 90 trips per year on the system, and the average trip measures 3.9 km. Most of the trolleybuses are 70-passenger, 12-m vehicles, but Connexxion is phasing in 110-passenger, 18-m, high-speed, low-floor vehicles.

Arnhem, which bills itself as "trolley city," is one of a very few western European communities that still offer trolleybus service (in Arnhem's case, since 1949). The trolleybuses, which evolved from electric streetcars and motor buses, are powered by overhead wires, but they travel on rubber tires. Connexxion staff attributes a range of benefits to the trolleybuses:

- No vehicle emissions,
- Low noise level,
- Low energy consumption,
- "Great image" (Arnhem citizens have expressed a strong preference for trolleybuses over diesel buses),
- Long life (trolleybuses average 15–18 years of service, whereas diesel buses average 10–12 years),
- Good acceleration/climbing capacity,
- High level of comfort, and
- No rail infrastructure required.

Disadvantages of trolleybuses include the following:

- Purchase costs are higher.
- Overhead wires are necessary.
- They run on fixed lines (unless auxiliary power systems are available).
- Bus drivers require an additional 2 weeks of training to become qualified to drive a trolleybus.
- Maintenance costs are slightly higher.

Currently, about 40 percent of the cost of the city's public transport system is recovered in the farebox; the Ministry of Transport has set a goal of 50-percent recovery.

The city's "Trolley 2000" plan calls for increased ridership and lower costs. This plan is to be accomplished by improving the quality and length of the network, by more aggressively marketing the system, by improving the image of the system, and by switching to larger vehicles, which will carry more riders without the need for more drivers. The plan is based on using trolleybuses on the busiest routes, with diesel buses serving as feeder lines; both will run at high frequency. The average distance between stops will increase from 420 m to 500 m (the agency believes that people are willing to walk farther to a stop if the service is quicker overall). The system will include 30 low-floor, articulated trolleybuses that will be given priority at intersections along all of the routes. The city provides and maintains exclusive bus lanes for Connexxion to use at no cost, as part of the city's overall goal of encouraging more people to use public transport and thus help protect the environment from noise and pollution. The result will be a more efficient, reliable, environmentally friendly system, which is expected to be operated more economically than the current system because of the higher-capacity vehicles.

Doetinchem

Doetinchem lies east of Arnhem, in the Achterhoek, a region consisting of large expanses of agricultural land and scattered towns and villages. In May 1999, Syntus B.V., the local bus operator, took over the operation of passenger trains in the area.

Syntus, which began operations in 1999, is a collective subsidiary of NS Reizigers (the passenger division of the Dutch national railways), Connexxion Holding, and Cariane Multimodal International (a French company controlled by SNCF, the French national railway operator). The word *Syntus* is derived from "synergy between train and bus."

The company operates 11 trains and 80 buses and serves an area with a population of about 250,000. About 60 of its 280 staff members are multifunctional—that is, they can drive both buses and trains. This gives the company an efficiency advantage, says Syntus, and makes the job more interesting to the employees. The bus fleet is mostly made up of 12-m vehicles, augmented by a few 10-m buses and 18-m articulated buses. Twenty-five new low-floor buses are on order. At the time of the mission, Syntus was leasing its trains from NS, while awaiting delivery of eleven 130-seat, 110-standee diesel trainsets that had been ordered from Alstom. The floor of the new trains is at the same level as the platform, making boarding easy; a transparent door between the passenger section and driving compartment allows the driver to see all the way to the back of the train—and the passengers to see the driver. There are no interior walls to obstruct sight lines. This provides passengers with an enhanced sense of security and helps speed boarding.

Tickets are valid on both the bus and the train, simplifying ticket purchase and fare collection. Bus and train schedules are tightly integrated, with half-hour headways on almost all bus and rail lines, facilitating a seamless, efficient transfer from one mode to the other. Ticket collectors are gradually being phased out, with the ticket collection function being assumed by members of "service and control teams" (which include drivers). These teams will randomly

ask passengers for their tickets, and fare evaders will be fined. The timely arrival and departure of each train at each stop is the responsibility of the train driver. Staff members were part of the decision making that led to these changes, and the company intends to set up "auto-operative teams" in the future, as a means of delegating further responsibilities to the staff.

An open line of communication between bus and railway traffic departments ensures that information about delays and other situations is readily shared and allows schedules to be adjusted as necessary. The stations are built and owned by Syntus; the track is built and owned by the state.

Forty-four percent of Syntus's 8 million annual passengers are students (there is no separate school bus system as in the United States); 22 percent are commuters, and the rest are traveling for social, shopping, or recreational reasons.

The company's objective is to "provide an optimal transportation system in which bus and railway fully cooperate in order to offer the customer the best possible service." The company says that this will be achieved with the same government funding as in the past. "In other words," said Syntus's Frank Van Setten, "the customer gets a better product for the same money."

Nijmegen

Novio (from the Latin name for Nijmegen) operates 79 buses in and around the city of Nijmegen, serving a population of about 150,000 and carrying about 11.5 million passengers annually. The company, founded in 1997, is privately held, with the municipality the only shareholder. The municipality is content with that situation, as Novio is currently making a profit, and any profit must be invested in improving transit service. Novio management would, however, like to bring in another shareholder (perhaps owning 49 percent), as a means of providing some stability for the future.

Novio's two subsidiaries—NovioNet and Novio Techniek—operate a regional bus system and sell, lease, and service buses and minibuses in a joint venture with Renault. Novio is also working on a "cabletram" people-mover system that will connect Nijmegen with the new suburban housing project of Waalsprong, on the other side of the river.

Almost all (90–95 percent) of Novio's 230 employees are unionized and participate in collective bargaining.

The company emphasizes customer service, says its chief, M.P.J. van Lokven. "We expect our buses to be clean and our drivers to be friendly." The company recently starting posting poems dealing with public transport inside its buses, much to bus riders' delight (see Figure 1).

The bus shelters are constructed and maintained by advertising companies, who must paint the shelters in the red-and-white Novio colors.

Maastricht

Maastricht's Stadsbus (City Bus) service was founded in 1919 and became a private, limited liability company in 1994, with the municipality as the sole stockholder. The

Figure 1. Novio posts poems dealing with public transportation inside its buses.

company plans to broaden the stockholder base within the next several years by offering shares to the public.

Maastricht straddles the Meuse River, and Stadsbus not only serves both parts of the city, but also provides cross-border service to Hasselt in Belgium. A network of bus lanes allows transit vehicles to bypass traffic queues and thus improve scheduled service. The bus lanes were built at Stadsbus's expense, with the city handling construction.

In 1992, traffic delays forced the company to increase its scheduled travel times by 5 percent. In 1997, it had to bump travel times up again, this time by 8 percent. Each percentage increase cost the company 1 million NLG ($400,000) in additional staff time, fuel costs, and lost passenger revenue. Since buses were no longer considered reliable, passengers were increasingly opting for other means of transport (e.g., bike, foot, and car). To combat this, Stadsbus designed and implemented a short-range radio system, which gives buses priority at signalized intersections. The company cites savings of 50,000 NLG ($23,000) at each intersection outfitted with the priority system. The system uses dead reckoning and the global positioning system to determine the vehicle's location and to trigger next-stop audio and visual announcements on the bus. The improved schedule and efficiency wrought by the bus lanes and the bus priority system is spurring an increase in ridership.

Stadsbus has a fleet of 55 buses supported by a staff of 190 employees. It is in the process of converting its fleet to all low-floor buses. A Stadsbus-owned taxi company provides shared rides on a demand-responsive basis.

For each guilder collected in the farebox, the company receives 1.5 NLG in subsidies. Each Maastricht citizen takes an average of 80 Stadsbus trips each year.

Twenty-five percent of the public transit market in the Netherlands is controlled by Arriva Netherlands, which is part of Arriva plc, a multinational operator headquartered in London. Although most of Arriva's fleet in the Netherlands operates in the northern part of the country, a small regional division, Arriva Zuid Limburg, operates a fleet of 12 buses on 6 lines in the Dutch province of Zuid Limburg (which includes Maastricht). Each year, Arriva Zuid Limburg carries 1.2 million riders, and its budget is 5 million NLG ($1.2 million), 60 percent of which goes for salaries.

Arriva Zuid Limburg's 40 operators work in self-directing teams, in which they share responsibility for management functions (including marketing, planning, and human resources). They spend part of their day driving a bus and part of their day working in the office. Salaries and benefits are set by collective bargaining (80 percent of the staff belongs to the union). "We used to have a complex organizational structure with employees carrying out simple tasks, but now we have a simple organizational structure with employees carrying out complex tasks," said Ralph Heiligers, a bus driver who also coordinates the company's marketing activities.

These self-directing teams were considered revolutionary when they were introduced in 1995. Today, the company says the teams are the reason for its success, and the employees consider themselves privileged to work on the teams.

Germany

The German federal government considers efficient and attractive local public transit to be an essential element for meeting today's and tomorrow's demands for mobility in urban areas *(2)*. Each day, 26 million people use Germany's public transit systems. To ensure that the German states and municipalities will continue to provide high-quality transit service, the federal government commits more than 15 billion DEM ($6.7 billion) each year for transit; local governments provide an equal amount. In allocating the funds, the federal government asks states, municipalities, transit operators, and transit employees to achieve the following goals:

- **More transparency and competition in local public transport.** Competition is seen as an instrument for mobilizing customer-focused services. The competition for market access will increasingly force transit operators to reduce costs and increase productivity. Operators are encouraged to use strategic alliances, cooperation, and mergers as a means of creating synergy for transit. A competition-oriented regulatory framework will be used to support transit operations. In this new environment, only those companies whose business activities extend beyond their own national territories are likely to survive.
- **Increased emphasis on quality.** A customer-friendly management strategy, not a cost-reduction strategy, is the key to economic success. Customers are attracted by improved quality and services, which will lead to improved profitability. Transit operators must provide modern, low-floor, comfortable vehicles; implement traffic priority and other schemes for improving transit travel time; improve intermodal connections; provide customers with real-time, readily accessible travel information; standardize the fare collection systems; and ensure the safety and cleanliness of stations, stops, and vehicles.
- **A stable financial framework.** The federal government will work with the states to ensure that each mark invested in local public transit will yield an improvement in transit services. Operating agencies should strive to reduce costs by, for example, purchasing lighter vehicles, using longer-lasting materials, and simplifying maintenance procedures.

Starting in 2005, when EU regulations completely open the market for public transit services, companies from outside Germany will be able to bid on German transit operations. Those companies are expected to have lower personnel costs than German companies. This has led to a new collective bargaining agreement reducing the pay scale for

German bus drivers. The drivers acceded to this pay cut out of concern that they will otherwise lose their jobs to companies with drivers from other, lower-wage countries.

The country's integrated fare collection system is based on a passenger count that is conducted every 2 years. That count forms the basis for allocating the federal funds for transit. The system is very controversial, as so much depends on the vagaries of one day's ridership (for example, if it's a warm, spring day, people will choose to walk rather than take the bus).

The Stadtbus, or "city bus," systems that started in small- and mid-sized German cities in the late 1980s and early 1990s can now be found in more than 100 communities. These networks characteristically provide "node and pulse" service—that is, all buses pull into a central transfer station, allowing passengers to easily transfer to another route. The buses pull out on a strict schedule (every quarter-hour, for example). These synchronized, reliable systems have become extremely popular among residents and visitors alike, causing ridership to increase and improving the cities' image and quality of life.

Wuppertal

The 2,500 employees of the Wuppertaler Stadtwerke AG operate the public transit system, as well as the power and water utilities. Revenues from the power utility are used to fund transit operations. The agency uses a computer-aided dispatch/automatic vehicle location (CAD/AVL) system to monitor its 280 buses and to provide traffic signal priority at 170 intersections. The primary reason for implementing the system was to allow buses to travel at higher speeds by avoiding stops and start-up delays at intersections, which would, in turn, enable the buses to stick to their schedules and allow the company to provide the same level of service with fewer buses. The system also will facilitate the provision of real-time information for bus riders. The buses use an onboard ticket-printing unit instead of a farebox, and the onboard CAD/AVL computer can be integrated with the ticket unit, so that only one device is needed.

The agency also operates the world-renown Schwebebahn ("Floating Train"), which is a steel-wheel suspended monorail system. In operation since 1901, the Schwebebahn carries 70,000 passengers per day over its 13-km route 12 m above the Wupper River.

Oberhausen

Oberhausen has experienced a major employment shift, from 30 percent white collar in 1925 to 55 percent white collar in 1993. More than 40,000 jobs were lost as its coal, iron, and steel industry plants shut down, leaving large, dormant buildings on brownfield sites. In 1992, the city purchased and decontaminated the site of a former steel plant to allow for the development of CentrO, a 200,000-m^2 shopping and urban entertainment center. CentrO was intended to solve many of Oberhausen's economic problems by creating 10,000 jobs and attracting 30 million visitors each year.

Figure 2. Both buses and LRT operate on Oberhausen's dedicated busway.

The Oberhausen City Council has set a goal of 30-percent modal split for transit in the central business district (it is currently about half that) and is set on providing good public transit throughout the city and its immediate suburbs. To help reach that goal, the city reintroduced the streetcar in 1996, in the form of a modern low-floor light rail transit (LRT) vehicle, which generated an immediate 15-percent increase in ridership.

The city-owned Stadtwerke Oberhausen AG (STOAG), which is run by the municipal public utility, carries more than 36 million passengers on its 136 buses and 6 LRT vehicles each year. Its buses are color-coded: yellow and green mixed indicates a standard bus, while solid yellow indicates a low-floor, air-conditioned bus. A former freight railway line was converted to a dedicated right-of-way for buses and LRT, allowing efficient connections between the city's downtown railway and bus stations to CentrO and the northern suburbs. The LRT vehicles operate on this 6.3-km corridor, which is also served by 29 low-floor express buses (see Figure 2).

STOAG plans to buy eight new low-floor, air-conditioned buses each year, replacing older vehicles that will then be given away.

Trams and buses operating within the city proper are given priority at intersections.

Essen

Essen is perhaps best known as the birthplace of the guided bus concept, or O-Bahn (see Figure 3). The busway had its roots in an abandoned tramway. To prevent the city from converting the right-of-way into additional traffic lanes, an experimental "low-tech" guided busway was set up by the Essener Verkehrs AG (EVAG) and the Federal Ministry of Research and Technology in 1979. The experiment was successful, and service continues on the line today. Dual-propulsion buses are fitted with two guide rollers

Figure 3. Essen's O-Bahn, or guided busway, uses an abandoned tramway.

mounted near the wheels, which roll against the track's curbs. The guide rollers control the bus along the 8.9-km, 2.6-m-wide track, which is too narrow for a driver of a 2.5-m-wide (8.2-ft) bus to navigate unassisted. The bus can travel on the guideway at speeds of up to 80 km/h. The bus driver controls the speed and decelerates and accelerates at boarding sites and other stops. When the bus leaves the guideway, the driver resumes steering.

EVAG, which is a municipal company with a staff of 2,160, operates the bus, interurban Stadtbahn LRT, tramway, and bus/guided bus services in Essen. Each year, 100,000 million passengers are carried on the company's 147 rail cars and 250 buses. The 46 bus routes provide service over a total of 511 km. Light rail in Essen consists of conventional tramways (nine lines) and the Stadtbahn LRT system (three lines). The tram operates over 54 km, and the Stadtbahn has a route length of 16.1 km. The Essen Stadtbahn lines are part of the planned, much larger 58-km regional network being planned by Verkehrsverbund Rhein-Ruhr (VRR), which represents transit agencies in the Rhein-Ruhr area.

In the next 3 or 4 years, EVAG plans to split into two separate units, in an attempt to diversity the company and drum up new business in the new competitive environment. An operations unit will run the services that will be open to competition, and an infrastructure unit will plan and contract for transit infrastructure. The rolling stock will be owned by the infrastructure unit and available for lease by the operations unit.

Operating costs are financed by fares (40–50 percent), income from commercial operations (10 percent), and subsidies/grants from federal, state, and local governments (40–50 percent).

The fare structure is zone based, and single and multiride tickets can be purchased at vending machines and from newspaper kiosks (see Figure 4); canceling equipment is mounted on all vehicles, and chip cards are being phased in.

Figure 4. Vending machines provide clear instructions for travelers and offer single-ride and multiple-ride tickets.

Herten

The Vestische Strassenbahnen (VSB) has been providing regional bus services in and around Herten since 1982, when the city's last streetcar stopped running. VSB, owned by the county of Recklinghausen (78 percent) and the cities of Gelsenkirchen and Bottrop (11 percent each), provides service to more than 922,000 residents in an area measuring more than 900 km^2.

VSB's fleet includes standard 12-m buses, 18-m articulated buses, 10.6-m fiber composite buses, 15-m buses with three doors for easy loading, and dual-mode diesel-electric buses.

VSB was the first German transit agency to use low-floor buses on an entire route. It was also the first to commit to an all low-floor bus fleet. Today, 75 percent of new buses put into service in Germany have low floors.

The low-floor buses were extremely popular with passengers when they were introduced, but the tires were taking a beating, lasting only 30,000 km. With the strong encouragement of the federal government, VSB worked with the wheel and tire industries to develop a curb that would be less damaging to bus tires that rubbed against it.

Figure 5. Both the front and rear wheels turn on this 15-m nonarticulated bus developed in Herten, allowing it to navigate narrow city streets.

The company's most recent project, again with government encouragement and support, was the development of a 15-m nonarticulated bus (see Figure 5). Both the front and rear wheels of the Neoplan-manufactured bus turn, allowing it to navigate city streets despite its long wheelbase. "A 10-m turning radius was possible with this bus, but we decided to keep the turning radius at 11.5 m, since that is what our drivers are used to," said VSB General Manager Ulrich Rogat.

VSB is also installing onboard video monitors, which will not only provide information on stops, but also feature paid advertising. The company expects the system to pay for itself within 1 year.

Since 1985, VSB has focused on making its staff more efficient and productive, in anticipation of the EU regulations on competition. VSB has cut the amount of rest time paid from 30 percent to 10 percent, and it is striving for 5 percent. The number of drivers has been reduced from 720 to 600, with no reduction in services. The number of mechanics has likewise been cut, from 100 to 80. "The workers were, of course, unhappy with these changes," said Rogat, "but it is now 'to be or not to be'—to survive in the new competitive market."

Lemgo

Lemgo's Stadtbus system was established in 1994 to relieve the city's severe traffic congestion, enhance pedestrian safety, and improve air quality. Five years later, ridership had reached 2.4 million trips per year in this city of 42,000. Bus operations are contracted out, and the contractor owns the rolling stock. The four-line, 12-bus system operates on a pulse—that is, all of its lines converge at a central transfer point in the heart of the city, and all buses arrive at about the same time, making it easy to transfer from one line to another. At 6 a.m. every day but Sunday, three buses begin operating from the north of the city, and three from the south. They go back and forth all day long, and at any time, each bus is no more than 15 min from the city center. During peak periods, additional buses are put into service. On Sunday, when the buses aren't running, the citizens of Lemgo can telephone a request for a taxi, which will pick them up within the hour and deliver them to their destination for the same price as the normal bus fare. The taxi service operates under contract, with Stadtbus paying a 3 DEM ($1.30) subsidy for each trip; the taxi company handles dispatching and operations and bills Stadtbus monthly. The Stadtbus system replaced an inefficient, circuitous, unpopular system that served, according to Stadtbus staff, "only people with no alternative."

Planning studies found that most people considered a walk of more than 300 m to be an obstacle to using public transit. Hence, the 160 Stadtbus stops are located within a 5-min walk of 75 percent of the city's residents. Traffic signal priority at about a dozen intersections helps keep the buses on schedule.

The Stadtbus staff attributes the system's high ridership to its aggressive marketing campaign, for which the city government had budgeted 500,000 DEM ($224,000). "Marketing is essential if we want people to use a product in a free market," said Sylvia Voss, marketing director. A key

element is the "Lemgo Card," a prepaid pass that offers a significant savings over individual fares (and gives the city some flexibility in fares, as the VRR sets fares for all transit systems). The card costs 420 DEM ($188) for travel in the peak period, and payments can be spread over a 12-month period. Today, the Lemgo Card is used to pay for more than three-fourths of all Stadtbus trips. The buses are painted a distinctive sky blue, and the color is carried through on every element of the system (advertisements, Lemgo Cards, timetables, bus shelters, and so forth). To make boarding easy, all of the 10-m buses have three doors and floors that are at curb level, with ample space for strollers and wheelchairs. To speed boarding, all tickets must be purchased prior to boarding the bus, and five inspectors randomly board the buses to conduct spot checks for fare evaders.

Any losses experienced by Stadtbus are offset from profits from the city's energy department (which, like the bus company, is operated by the Lemgo Public Utility Service, or Stadtwerke).

Bielefeld

The 325,000 residents of Bielefeld are served by an extensive bus and tram, or light-rail, system, which carries more than 33 million passengers each year. City politicians heavily encourage transit use and support transit enhancements. In the years after World War II, tram systems in Germany were increasingly abandoned in favor of buses. Bielefeld's city council reversed that trend, however, by ordering new tram cars in 1956 and thus ensured that the system would survive despite explosive growth in automobile ownership and use. Today, 40 percent of all trips in the city are by bus, tram, bike, or foot; the remainder are by private car or motor scooter.

The Stadtbahn (LRT) is the backbone of the transit system, which is managed by the Stadtwerke Bielefeld, the municipal authority responsible for public transit, utilities, and railroad stations. The other components of the system are

- Stadtbus (city bus);
- Quartierbus (minibus), used for very short trips or to collect people and bring them to a transfer point;
- Nachtbus (nightbus), which operates only on weekends (the overwhelming popularity of service necessitates that articulated buses be used on these routes); and
- Anruf-sammeltaxi, for those off-peak periods when bus service has been cut back, yet people need a safe way to get home (passengers can arrange for a taxi to pick them up at the end of a main bus line and take them directly to their home).

In addition, holders of annual transit passes are eligible for inexpensive car rentals (39 DEM/day [$17.50]), about half of what it would normally cost. The cost is subsidized by Stadtwerke Bielefeld as a means of encouraging people to use transit and discouraging them from buying cars.

The Stadtbahn had seen ridership double on two of its lines in the past decade, prompting the city to add a fourth line to its system in 1999 (this line had originally been planned in the 1930s). The system now consists of 75 km of rail, 167 switches, 11 intersections, 45 raised platforms, and 855 bus stops. All trams have to travel through a central tunnel, which is a point of constriction, particularly during the prime school travel periods. To try to spread some of the peak periods out, the transit agency is encouraging the school system to change the starting times. The 71-vehicle fleet currently includes forty-two 18-m articulated buses, twenty-three 12-m buses, and six midibuses.

Tickets are sold only by off-vehicle vending machines, and all tickets must be validated by onboard machines; inspectors randomly check for fare evaders. A chip card, introduced in the city in 1999, can be used to buy transit passes, among other things.

Trams on main line buses are given priority at the city's signalized intersections. The agency had to first convince politicians that a signal priority system would not result in massive traffic jams for nontransit vehicles.

As a cost-cutting action, the agency is increasing the number of hours each employee is expected to work weekly. Seventy-three of its 117 drivers are licensed for buses and LRT.

To keep abreast of market trends, Stadtwerke employees conduct period surveys and hold community hearings. They also monitor customer letters and complaints. They aggressively seek partners in funding network improvements. For example, the home furnishings giant IKEA provided 100,000 DEM ($45,000) to subsidize a route near their store. IKEA publicized the route through store advertising; within 1 year, ridership had increased enough that headways could be reduced to 20 min, with no increase in subsidy. IKEA attributes much of its 7 million DEM ($3 million) increase in revenues that year to the shoppers who traveled to the store by transit. As another example, the night bus is subsidized by a German bank and insurance company; the insurance company wants to decrease the number of nighttime auto accidents, and the bank wants to improve its image in the community.

Marketing is very important, said Hans-Juergen Krain of Stadtwerke Bielefeld: " 'Marketing overkill' is necessary, both to get into the head of the customers and to introduce new service." Stadtwerke uses a wide range of marketing strategies, including, for example, furnishing advertisements to be packaged with hospital paychecks, alerting the hospital staff to a new bus line or service.

Bremen

Transit in Bremen is coordinated by the Verkehrsverbund Bremen/Niedersachsen GmbH, a regional transit authority that covers the cities of Bremen and Delmenhorst and the 8400-km^2 area within a 70-km radius of Bremen. Today, 18 percent of travel in Bremen is by

public transportation; within the region, that number drops to only 7 percent. Bremen has the lowest proportion (30 percent) of single-occupancy vehicle travel in the region (48 percent). A very high proportion of shopping trips are also made by public transportation in the city.

Bus and tram (LRT) service in the city is provided by Bremer Strassenbahn AG (BSAG), which operates 150 LRT vehicles on eight routes and 280 buses (half of which are articulated) on 48 routes. The trams run right through the city center; they move very slowly, coexisting safely with crowds of pedestrians. Transit ridership totals almost 100 million passengers per year. There are three major transfer points in the city, and buses and trams serve each with high frequency. Many people prefer to walk or bike in nice weather, so transit schedules vary by season.

As part of its marketing efforts, BSAG tells customers that bikes are good for some reasons, cars are good for others, but public transportation is best for most reasons. Ten years ago, the agency experimented with bike racks on their vehicles, but few riders used them. Today, riders can bring bikes on buses and trams, provided there is room. BSAG puts the responsibility for proper (i.e., courteous) behavior squarely on the bike riders. "We say, 'it's up to you—you must take care of your bike and avoid hitting or inconveniencing fellow riders,' " said BSAG's Martin Nussbaum.

The city recently spent 50 million DEM ($22.4 million) to implement an intersection priority system for transit. Traffic signals are automatically adjusted to give buses and trams a longer green cycle, but only if necessary to maintain their schedules. This helps improve transit service, without provoking the ire of other motorists. For 2 years now, BSAG has been installing dynamic information systems at many transit stops to give waiting riders real-time travel information. In-vehicle information systems display the entire route, showing the vehicle's position along the route; this is augmented with audible announcements about upcoming stops and transfer points.

A dial-a-ride taxi system allows customers in outlying areas to schedule a ride when buses are not running (such as late in the evening). The cost is about 30 to 50 percent higher than a regular transit fare, but it's much less costly than a regular taxi fare. The fare is subsidized by the community, and the service is provided by private taxi companies. BSAG is also planning to operate passenger rail service on what are now freight-only tracks. The goal is to allow commuters from outside the Bremen area to travel straight through to the city center on LRT—with no transfer. "We want the vehicles to transfer, not the people," said Nussbaum. A BSAG survey found the agency could expect a 50-percent increase in passengers if such a shared truck system were implemented.

BSAG devotes a great deal of its staff time and resources to marketing. "People think it is difficult to ride public transit," said Wolfgang Pietsch of BSAG. "Our marketing efforts focus on showing how easy it is—to determine the schedule, buy a ticket, and so forth. We also emphasize the importance to the environment."

KEY OBSERVATIONS

During their 2 weeks of meetings, presentations, and site visits, the team members tried to pin down what these transit agencies did differently to account for their excellent reputations, growing ridership, and high levels of customer satisfaction. What follows is a summary of their findings.

System Administration and Labor Relations

The creation of the EU has had a significant impact on the transit properties visited. The removal of trade borders in Europe has caused most properties to revamp their way of operating. In pre-EU days, municipalities owned most transit properties, which were then operated by utility departments. Any transit operating deficits were usually offset by profits the municipality earned through the provision of gas and electricity. Efficient operating practices were not always a high priority.

With the creation of a single market in 1993, everything began to change. Efficiency is now the name of the game, and new, "private" transit companies are now the major players. Although still heavily subsidized by the local governing bodies, these companies are distinct from the municipality and are no longer considered a public utility. "Concessions" (i.e., contracts) to provide transit services for the city or region over a set period of time were given to these new private companies. The companies own the rolling stock. Fares are set by a central government agency, and the company receives a subsidy from the government, which is intended to make up the difference between farebox revenues and operating costs. Future bidders will have to specify in their proposal how much subsidy will be required; those companies that require lower subsidies will have the best chance of winning the new contracts.

With the resulting reduction in spending have come changes both in the structure of the companies and in the employees' role in the company. Some properties have holding companies, leasing companies, and private maintenance companies. Departments are, in many cases, staffed by employees who formerly worked in similar roles for the public utility.

All but the top one or two managers are part of the collective bargaining unit. The collective bargaining agreements are, however, much different than those found in the United States. For example, provisions covering working conditions, vacations, grounds for termination, and grievance procedures are commonly found in union contracts in the United States, but are rarely addressed in contracts in Europe. One contract is typically negotiated for all workers at all properties in the state, and it deals almost entirely with working hours and hourly wage; the result is that all operators work the same amount of hours per week and are paid the same hourly rate. Many of the transit systems make no distinction in wage rates among operators by mode. Although this practice could inflate wage rates, it seemed to be

coupled with an attempt to reduce the total number of operators by increasing their flexibility. Employees in large cities earn the same wage as those in rural areas. The average bus operator still works only 38.5 hours per week and earns about $40,000 (US) per year—wages that are about 30 percent higher than comparable private-sector jobs in Germany and the Netherlands.

The only employees accorded job protection are those who were employed by the municipality at the time the operations were privatized. That protection applies only as long as the current company maintains its concession with the municipality. This provision provides an incentive for the former municipal employees to do everything they can to help their current employer maintain the concession. Employees are expected to comport with the company's work rules, and the unions do not vigorously represent employees in work rule disputes. An employee who is dismissed by a company for violating a company rule can appeal the termination, but it is very expensive for the worker to do so.

The line between labor and management and between union and nonunion employees is becoming less rigid as companies struggle to survive and grow in the new European economy. Employee-management roles are even further blurred at Arriva Netherlands, which has used "self-directed teams" to run its operations since 1995. Each staff member spends half the day driving a bus and half the day handling office tasks. The drivers are divided into five work teams: marketing, personnel, technical services, administrative services, and planning. (The maintenance functions are contracted out.) As Arriva employee R. Heiligers put it, "We used to have a complex organization with simple tasks; now, we have a simple organization with complex tasks." Each team includes a coordinator, who is paid the same amount as the other team members. A coach oversees all the teams. Initially, each worker chose the team he or she wanted to be on; later, workers rotate through the teams, gaining expertise and knowledge in each of the program areas. Team members consider themselves privileged to work on such teams. Arriva's sick leave rate of 4 percent is significantly lower than the industry's rate of 12 percent.

The self-directed teams handle complaints markedly different than is typical in the United States, where management confronts an employee about a complaint received. At Arriva, an employee against whom a complaint has been issued is expected to contact the complainant directly and to resolve the issue amicably. This is a key component in the company's efforts to improve its public image, which employees believe will be helpful when bids are let for new concessions.

Labor has serious concerns about the impact of restructuring on its workforce, and some systems (for example, Connexxion) have entered into agreements that guarantee the jobs and conditions for their covered employees even if the management of the system changes. Another example is in Essen, where the EVAG group (a part of the Stadtwerke) will be split into an operating company and an infrastructure unit. The operations will be competitively bid; nonetheless, the new service provider must assume the employees of EVAG with the labor agreement, as well as public pension provisions, grandfathered in. In some cases, organized labor is represented at the board level, where the board consists of appointed members representing management, union, and city.

There is a great deal of uncertainty among the properties visited. The lines between union/employees and management will continue to blur as the date for awarding new concessions approaches. Labor negotiations were under way at the time of the mission, and discussions included increases in the hourly work week and wage adjustments. Although the unions are resisting an increase in the 38.5-hour work week, they are aware that their protection lasts only as long as the current company has the concession. This forces the rank-and-file employees to work in concert with management.

EVAG views the EU mandate as a tool with which to open up negotiations with labor. Whether labor will accept this view is open to debate. According to the management team of STOAG, if management has any tool to leverage concessions from labor, it would be the fear of "gustarbieter," or foreign laborer, in German systems. The EU's call for a free and open public transport market by 2005 will result in an increased competition from service providers in other countries, many of whom have lower wage costs. Non-Europeans and workers from former Eastern bloc countries are generally willing to work for lower wages, and the relative freedom of labor movement may bring organized labor to the table and make them more willing to accept the need to reduce labor costs. Transit workers in the Netherlands and Germany will likely accept lower wages in the future as a means of preventing the contract, and their jobs, from being awarded to a lower-cost company from another country.

System Integration

The level of integration among transport modes and routes, as well as with land use, is impressive in the Netherlands and Germany. Seamlessness is not a buzzword, but rather a reality. Although the most modern new developments might look, at first glance, no different than a typical American development, closer inspection reveals a successful integration of pedestrian, bicycle, and transit facilities.

Public transport carries a significantly greater market share of all urban trips in Europe than in the United States. Contributing to this difference are several factors, including a land use ethic that highly favors concentrated development, higher fuel prices, and a more positive image of transit.

Integration of Modes and Providers

The most common statement heard during the presenta-

tions at the dozen transit systems visited was along the lines of, "The customer doesn't care what color the bus is or who operates it—just that they can reach their destination easily and quickly." Customers have no allegiance to a particular transport provider, and their trips often require transfers from one route to another, from one mode to another, and/or from one provider to another. The means of integrating those services are similar in both the Netherlands and Germany, but with some distinctions.

The Netherlands. The Netherlands is the third most densely populated country in the world. It is small—roughly the size of Connecticut and Rhode Island combined, but with a population the size of California's. Integration of traffic and transport is a national priority governed by the Second Transport Structure Plan (SVV-II), which came into effect in 1992 and remains effective until 2002, when a new plan is likely. Permeating the plan are the beliefs that transport capacity is a constrained commodity and that all forms of transport affect a fragile ecology. The plan encompasses all modes and covers both the movement of people and the movement of goods—a departure from the by-mode thinking that dominates a good deal of transport planning in the United States.

One element of national transport policy that was evident at all five Dutch transit systems visited was a single, nationwide, unified tariff. The Dutch Ministry of Transport established a distance-based fare that applies to all public transport providers in the country. For example, a person traveling from the hinterlands can purchase a single ticket that can be used to travel on a local bus from home to the nearest train station, on a train to Amsterdam, and then on a tram to the final destination. For added flexibility, a "Strippenkaart" is offered. The Strippenkaart is a paper ticket printed with a preset number of coupons (2, 3, 8, 15, or 45), each valued at about $0.30 (US). The card is sold at rail stations and transit terminals all over the country and can be used on any public transport provider, including buses, trams, and trains. The user merely tears off the appropriate number of coupons. The cards are convenient for the passenger, but they make allocating the revenues collected from their sale a complicated process, according to Dutch operators. A chip card (or smartcard, a credit-card-sized plastic card containing a small microprocessor and memory unit) for fare payment is currently being tested on a few systems.

The compactness and density of the country create an environment conducive to a national tariff. Despite a large amount of farmland and open space separating Dutch cities, the Netherlands encompasses an area that is not much larger than the largest U.S. metropolitan areas. A national fare is thus analogous to a unified fare structure in a large contiguous North American urban area. At the time the national tariff was established, most public transport was provided by state-owned enterprises.

The method of distributing fare revenues among transport providers is a major, and contentious, issue in the Netherlands. Every 4 years, a detailed count is made of all passengers on each system over a 1-week period. This count establishes ridership figures that are then used to allocate funds. This method fails, however, to recognize ridership changes as they occur during the ensuing 4 years. Should factors beyond the control of a transport provider, such as weather, influence ridership during the survey week, the share of funds received during the next 4 years will be affected. The chip card will, it is hoped, alleviate this problem by collecting data on a continuous basis and therefore eliminating anomalies that can impact a transport provider's share of revenue.

In addition to national fare integration, there are cases of regional fare integration. For example, the Dutch city of Maastricht, which lies near the border of both Belgium and Germany, offers a regional fare ticket and pass honored by the transport providers in nearby communities in all three countries.

Transit routes and schedules are integrated within each region. Each transport provider formulates its own routes and schedules; however, the planning is coordinated with the regional authority, which must approve all schedules before they are implemented. Although this can be a time-consuming process, the result is a well-coordinated route and schedule network that makes transfers between two routes, modes, or providers relatively easy.

One of the paradoxes of local Dutch transport is that the staff of one provider considers another provider in the region as its competitor, yet integration of service is far more advanced than what is typically found in the United States (where transit officials may be less likely to refer to adjacent transport providers as competitors).

The Dutch corporate structure will likely be more competitive in the future, once the market is fully open to all qualified bidders from EU member countries. It is unclear what impact this will have on integration, but if today's successful integration in a competitive market is any indication, integration will probably survive a future with more competition.

Syntus, a system serving southeastern Netherlands and based in Doetinchem, exemplifies how system integration and operating frequencies can improve performance and ridership. Two Dutch railway branch lines, one operating from Doetinchem to Winterswijk, the other from Zutphen to Winterswijk, were slated for abandonment when Syntus took over operation, as part of an experiment in privatization. The corresponding bus service was also sold to Syntus. The company's first move was to improve the rail service, using old Netherlands Railway cars, and to eliminate duplicative bus service parallel to the rail lines. Syntus began operating trains every 30 min all day long and changed the schedules to better integrate with bus services. Ridership jumped dramatically, increasing 16 percent and 69 percent on the two rail lines. The new route structure is working well enough that Syntus plans to replace the train sets with state-of-the-

art diesel multiple-units (DMU, or diesel light rail), which should improve reliability while significantly lowering operating costs (since the onboard staff can be reduced by more than half).

Bus-rail integration in the Netherlands is apparently not as developed as integration between bus routes, nor is it as commonplace as it is in Germany. The Syntus representatives indicated that improved integration between bus services and the two rail lines is critical to the renewed success of the lines, but they also stated that transit providers in that part of the country were thought to be more parochial and therefore more resistant to better coordination. Nonetheless, the experience in Germany indicates that success is in fact achievable.

A national traveler information system, which a customer can access by phone from anywhere in the country, provides information on all transport operators, allowing the customer to easily plan a trip between any one point in the country to another.

Germany. Germany, like the Netherlands and most other European countries, is densely populated. It is slightly larger than the states of Washington and Oregon combined, with a population equal to one-third that of the United States. In many respects, integration among transport modes appears to be very similar to that found in the Netherlands. But there is no national tariff or ticket that can be used on all urban transit systems throughout the country, nor is there a national traveler information system.

Germany is a pioneer in the regional transit association concept. Regional associations establish integrated fares and coordinate routes and schedules within metropolitan areas. The makeup of the governing board and the method of distributing revenues differ from association to association.

The study mission team visited four transit systems in the Rhine-Rhur region of Germany, all of which are members of the Rhine-Ruhr regional public transportation network (VRR). The VRR started 20 years ago and was modeled after the first German regional transit association, in Hamburg. The VRR, with about 100 employees, sets the tariffs for member operators, coordinates service at connecting points, engages in some regional marketing, and establishes some technical specifications. For the first 10 years of its existence, the policy board consisted of representatives of the transit system members. For the past 10 years, the representatives of the municipalities served by the association have composed the board—a change that reflects the fact that the municipalities provide the funding for transit.

The VRR is not the only instrument of coordination. The timetable must be approved by the landen (i.e., state), as must each city's 5-year plan. The transport ministry in each state acts as overseer to ensure coordination takes place.

The regional transit association for the East Westfalia region contains about the same number of members (35 transit systems, including the German national railway). The fare policy for all association members is "one city, one price"—that is, travel in any one city has one price, with the region divided into five zones. All revenues go into a single pot and are distributed among the members. Other regions have other regional associations.

Other forms of service integration include Oberhausen's shared tram line. STOAG, the Oberhausen system, and the neighboring transit provider jointly operate service along the tram right-of-way, which accommodates both buses and trams.

Bremen plans to implement track sharing, which would allow rail cars to operate on both intercity rail lines and local tram routes. This would enable rail transit from outlying communities to penetrate the center city, making transfers to tram unnecessary.

Integration of Transit and Land Use

Land use policies in Europe are based on concentration, rather than dispersion. The dense population centers provide ample open space, and the cities are vibrant, full of commercial and residential life.

The Netherlands. The bicycle is an integral part of the Dutch transport network. Extensive bike parking at train stations allow passengers to easily transition from pedal to rail (see Figure 6), and bike paths parallel most major roads, including expressways and congested arterials. The bike lane network is as extensive in new communities as it is in older, established communities.

Whether it is by enlightenment or by tradition, or a little of both, accommodating all modes of transport in all development decisions appears to be second nature in the Netherlands. Environmental goals play a large role in the formation of transport policy. Indeed, the environment appears to play a role equal to that of economic productivity when multimodal transport policies are being developed. Such a high emphasis on the environment dictates a larger role for alternatives to driving. The Ministry of Housing, Spatial Planning, and the Environment played a major role in the development of the Dutch national transport policy, setting the tone for the transport–land use relationship throughout the country.

Individual communities may have different priorities or approaches to transit and land use, but typically the two are closely integrated, and alternatives to private automobiles play a major role. For example, the city of Arnhem wants to reduce automobile traffic; thus, it constructs segregated bus lanes that, by allowing buses to travel unimpeded by traffic congestion, make transit a more attractive option to the automobile. The transit authority typically requests a bus lane where it feels it will increase speed, and the city complies with that request.

The city of Maastricht uses parking management to control automobile use. The parking tariff was raised 50 percent in 2000, and when the city's parking lots are full, cars are barred from entering the central business district.

Figure 6. Train stations offer ample, and often sheltered, parking for bikes.

Germany. In Germany, land use planning is done at the local level, but is based on federal standards. As with the Netherlands, concentration rather than decentralization rules most planning decisions. This results in densities that are almost always supportive of high levels of transit service. The bicycle does not play as big a role in Germany (its hills can be a deterrent), but transit links are designed to be pedestrian friendly. For example, when an abandoned industrial plant was converted into a major retail/entertainment complex in Oberhausen (CentrO), the city required that the developer achieve a 30-percent transit mode split. The developer worked with the transit authority, and, as a result, a combination bus/tramway bisects the center and a major transit stop serves the center. The existence of quality transit service, which delivers riders right to the main entrances of the attractions, is sufficient, despite plentiful free parking, to achieve a 30-percent mode split.

Bremen is another example of a successful consultancy between development and transit provider. A new campus-like technology center, which at first glance looks like a sprawling commercial development, features pedestrian walks, bikeways, and a light rail transit line. It also has plenty of parking, but the parking does not separate the buildings from the street.

Ridership Trends and Customer-Focused Services

Ridership was growing at all the transit properties visited during the mission. The amount of increase varied from one property to another. In some cases, the increase was in response to a dramatic service improvement (the reintroduction of rail in Oberhausen, for example). In other cases, it was for number of reasons. In all cases, however, the agency took a diversified approach to attracting and keeping riders—one that stemmed from a genuine desire to put the needs of the customer first.

The foundation of a well-used transit system is frequent service, with good connections to where people want to go. Transit networks in the areas visited showed a density in time and in space equivalent to much larger U.S. cities. The services operate on a consistent schedule, with regular headways. In some places, a night network of routes allows for more cost-effective operation of a less dense network on a pulse schedule.

Infrastructure and systems that support efficient transit operations—from dedicated lanes and priority at traffic signals, to shelters and major transfer stations at key locations—play a strong role in attracting transit riders. Government support for transit also includes market measures, such as high gas prices, hefty urban parking fees, and driver's license fees, that discourage automobile ownership and driving.

The systems' maintenance practices and fleet replacement programs were also key to attracting riders. Technological advancements that would improve transit fleets and facilities were continually sought and implemented as part of a desire to provide a consistently high-quality product to the customer; these included alternative fuels, composite

materials, innovative braking technologies, and low-floor vehicles. The workforce was well trained in the repair of equipment, and end users were frequently important members of the design teams for new products.

The European host agencies focused on the many details that improve the customer experience and the likelihood of transit being chosen to complete a particular trip. Everything from padded leaning rails in the joints of articulated buses in Arnhem to free bicycle shelters at the front door of train stations (while the expensive car parking lot was farther away) make being a transit user comfortable and easy.

For many transit trips, bus stops serve as the initial point of contact between the customer and the transit system. The European systems studied recognize this fact and devote a substantial amount of resources to improving amenities of each individual bus stop. The distance between stops tends to be longer than in the United States (400–500 m, as opposed to 100–250 m). Fewer bus stops results in reduced travel time and better on-time performance; it also means that more resources can be devoted to improving the customer friendliness and attractiveness of an individual stop. For example, basic customer information, such as routes and schedules, is displayed at each stop, and bicycle racks are frequently installed to make it easy for customers to bike to the bus stop and leave their bike there. More than half of the bus stops in many of the cities visited were outfitted with passenger shelters that not only made waiting for the bus more comfortable, but also made getting essential information easier (maps and schedules were clearly posted). Funding for these shelters was provided by government subsidies; revenue from advertisements on the outside of the shelter provided funds for maintenance. Most shelters are quite simple, with high visibility, but offering few seats, as frequent headways generally mean short waiting periods. In many cases, the curb height at the stop had been adjusted to accommodate both high- and low-floor vehicles, making it easier for customers to board.

Less than 5 percent of trips in the United States are made by bicycle; in contrast, 30–40 percent of all trips are by bike in the German and Dutch cities visited. There, bike-and-ride facilities are much more common at transit stations than are park-and-ride lots. It is not uncommon for hundreds of bicycles to be parked outside a transit station, and it is not uncommon to find a bicycle repair shop in the station. Few buses sport bike racks, however, because the prevalence of secure bike racks at transfer stations and bus stops often makes it unnecessary for riders to take their bike with them on the bus, and when they do need to take their bike, they can usually bring it right on the bus with them.

Unlike in the United States, where transit stations are often required to conform architecturally to the existing urban environment, European transit facilities often make dramatic architectural statements that draw attention to themselves and to the transit agency. Many of the systems visited boasted stations that were physically attractive and featured many amenities, despite their relatively small footprint.

Technology has made passenger information systems easier to operate, update, and integrate. For example, traveler information is provided on a national level in the Netherlands, using a technology referred to as "the traveler's friend." The traveler enters his or her destination and desired arrival time into a computer system housed in conveniently located kiosks; the system then displays the optimum means of travel, including mode, time of departure, and price. The traveler has the option of accepting this recommendation or rejecting it and asking for another recommendation.

Ample and accurate information on bus schedules and routes is provided at bus stops, in waiting shelters, on the bus (both visual and audio announcements), and on the train. For example, travelers transferring from train to bus at a train station in Oberhausen are greeted with a display inside the station that indicates when the next bus will be leaving, in real time. Accurate and very readable maps and schedule books make it easy for travelers to learn when the next bus or train is coming, where it is going, and when the next one will be along after that.

Real-time stop announcement systems are common onboard transit vehicles. Most of these systems are hubometer based, as opposed to the global positioning system (GPS) technology that is more commonly used in North America. The hubometer (a.k.a. hub meter) measures distances along the route and, as a predetermined point is passed, triggers prerecorded announcements and generates electronic messages (usually transmitted via a light-emitting diode sign). These stop announcement systems not only aid visually impaired people who may have difficulty discerning their location along the route, but also help all passengers.

Another factor behind the sustained ridership growth was municipal policies and systems that accord transit vehicles priority treatment in traffic. Such measures included restricted road building and parking, dedicated lanes for transit operations, and additional green time at traffic lights, with or without queue jumpers (queue jumpers are techniques that allow buses to bypass traffic queues at intersections). Signal preemption systems, which recognize an oncoming bus and assign it the right of way, and signal prioritization systems, which adjust the timing of the traffic signal to better accommodate bus schedules, give buses an advantage at signalized intersections. In both cases, the system is triggered by a radio frequency or infrared signal emitted from the bus as it approaches the intersection. These systems reduce bus travel time, which allows the transit company to provide better service, with fewer delays for the customer, and to optimize the use of its vehicles and drivers. In Germany, transit operators are required to have a traffic signal priority system in place, or else they will no longer receive funding from the Ministry of Transport.

Transit rights-of-way that were preserved when rail or trolley lines were discontinued not only protect the right-of-

way for future use, but also allow such innovations as the O-Bahn–guided busway in Essen and the shared use of the tram guideway in Oberhausen to be tried in a supportive environment.

The transit agencies also engendered community and municipal support by making community service part of the agencies' mission. Small things, like putting art on buses (along with the advertisements) and providing school tours of the facilities, went a long way toward creating goodwill and fostering a willingness to accommodate transit's needs.

The European transit managers looked at transit ridership as a 24-hour phenomenon—and they repeatedly stated that it did not make sense to advertise peak-period services, when the transit system is at capacity. Instead, their focus is on moderating ridership over the course of the day and making the use of transit such a habit that transit is used for all manner of trips, not just commuting. One of the common ways that this is done is through the marketing of annual transit passes. Some properties that were visited boasted that up to 60 percent of their sales were in the form of annual passes. Annual passes often came with other benefits, such as allowing up to four family members to travel on the pass in the evenings or on the weekends, reduced rates at rental car companies, and discounts on other related services. Marketing efforts were often targeted toward packaging transit tickets with tickets for theatrical or sporting events, which would entice people to use the "excess" capacity of the system during off-peak hours. These marketing techniques included exploring new ways for people to purchase transit service, such as with smartcards and electronic purses.

A major difference in Europe, compared with the United States, is off-vehicle fare collection for bus transit. Off-vehicle fare collection facilitates faster boarding and allows a transit system to accept different payment mechanisms without complicating the bus driver's job. It requires the bus company to have a system in place to verify that all riders have paid the proper fare; in most cases, this involves onboard ticket validators and roving ticket inspectors, who have the authority to levy heavy fines on fare evaders.

In some cases, small efforts to improve transit ridership are not enough—something bigger and bolder is needed. A dramatic example of this occurred in the town of Lemgo, Germany, which instituted an aggressive marketing campaign to attract and keep riders. Lemgo had no local bus service prior to 1995, when a mayor who strongly supported environmental friendliness was elected. The bus system (Stadtbus) that was created at his urging is based on a thorough knowledge of the city and is rooted in a desire to support compact development and a vital retail area downtown. The hub-and-spoke bus system operates on a 15-min peak (30-min off-peak) pulse schedule around a central transfer station. Most residents are within a 5-min walk of a bus stop. The bus shelters have a uniform design, and a schedule is posted at every stop. At a given stop, the schedule is consistent throughout the day (for example, always at 12 min after the hour).

The town of Lemgo, originally laid out in the Middle Ages, has very narrow streets, making choreographed pulse operations difficult. To overcome this, the Stadtbus planners became very adept at finding places that would accommodate very short bus-only lanes, such as in between two culde-sac streets or between two commercial parking lots. Important to the success of the Lemgo Stadtbus are its consistent image, coordinated marketing, good publicity (including school design competition for the logo), and community celebrations. Even the upholstery on the buses wears the Stadtbus logo, helping to create product recognition of the new system. The system has become a true source of civic pride, and it carries 2.4 million riders per year on its fourteen 10-m buses.

The European transit systems visited were primarily organized around trunk and feeder lines, with service levels and type often varying by route classification. Rail or tram would often provide the trunk service, while buses served the feeder routes. Local service, with more frequent stops and circuitous routing, would be timed to meet up with more frequent, direct service to major destinations.

The team saw two instances where the preservation of a traditional transit mode for the city resulted in a boost in ridership. Arnhem's trolleybus system, the only one operational in the Netherlands, was slated to be eliminated because of higher maintenance costs. A public outcry led to its preservation. The trolleybuses now form the trunk lines; buses handle the local and interregional routes. In Wuppertal, the suspended railway, or Schwebebahn, celebrated its 100th birthday in 2001. It has undergone major renovations as part of a financing plan that arose in response to public dismay over its planned demise (based on maintenance costs that were too high to justify its continued existence). The preservation of the system has contributed to a revitalization of Wuppertal as a tourist destination, as well as to providing a practical transportation corridor in a small city along a narrow river basin.

In addition to customer information and customer-friendly services, many Dutch and German operators are making their fleets much more user friendly. Customer want easy access to transit vehicles, and they want their commute to take as little time as possible. In both the Netherlands and Germany, there is no federal law mandating physical accessibility to transit vehicles for people with disabilities. However, in the interest of customer friendliness and speeding overall passenger trip time, almost all of the operators are moving to low-floor vehicles. Many of these newer vehicles have double door openings that allow simultaneous boarding and alighting.

In Herten, transit operator VSB focuses its efforts on providing faster boarding and alighting and, thereby, faster run times. Although the VSB buses are well equipped, clean, and comfortable, passengers have little expectation of getting a seat during peak travel times. Most trips are relatively short, and passengers prefer being able to quickly board a crowded bus that will promptly get them to their destination,

rather than waiting for a bus that will offer them a seat. Bus interiors are thus intentionally arranged to have fewer seats and more standing room. The increased open space provides more room to board and maneuver around other passengers and, thereby, provides faster boarding. VSB's 12-m buses have 35 seats each and allow for 59 standees, for a total capacity of 94 passengers. Their 15-m buses have 44 seats each and allow for 86 standees, for a total capacity of 130 passengers. The 18-m articulated bus has 50 seats and provides for 103 standees, for a total capacity of 153 passengers. Novio in Nijmegan is making use of similar seating configurations and has added grab bars throughout the bus to accommodate increased numbers of standees.

As in the United States, advertising is common both inside and outside the vehicles. But rarely do advertising wraps extend over the windows, as passenger have a heightened sense of security when people on the street can see into the bus.

Several common themes emerged regarding key means of increasing ridership:

- **Remember the basics.** Frequent, uniform service provided by a well-maintained, modern fleet is by far the most important key to attracting and keeping transit riders.
- **Pay attention to detail.** Small things matter and add up to overall service quality.
- **Know your city/region.** Local cooperation is key to successful operation of a transit system. The transit system must fit within its local environment and must operate with the encouragement and respect of local politicians.
- **Use the many tools available to the transit agency to encourage ridership.** These include the quality and quantity of customer information.
- **Don't be afraid to change what is not working.** Not all experiments succeed. But one can still learn from them.

Passenger Information Systems

Different systems use technology differently. The Wuppertal transit authority, for example, implemented a CAD/AVL system in 1995. This system, purchased from INIT, provides voice data, vehicle location, and dispatching features. The system has the flexibility to support rail service and is compatible with the city's traffic priority system. It currently enables passenger information (i.e., route and stop) on vehicles; however, plans include expanding this feature to bus stops, Internet, cell phones, and kiosks. A combination of federal and state funds was used to implement the system. Officials for the authority said a key to the success of such a system is getting the staff members who will work with the system involved in the design of the system (rather than leaving the design to computer/technical experts).

Oberhausen's STOAG uses an earlier version of the AVL system for managing its bus service. However, the system has limitations in its ability to serve as a platform for providing passenger information. As a result, passenger information, including route, schedules, and next-bus arrivals, is only available at the agency's central station.

A STOAG-run website allows passengers to access route and schedule information. An agreement with local banks allows customers to use their STOAG annual pass as an automated teller machine (ATM) card. Transit operators can use voice communications to arrange for a taxi to meet a passenger at bus stops—a very welcome convenience during early morning, late evenings, or at bus stops with limited activity, such as low-density areas.

Essen's EVAG is planning to implement several technologies to improve its operation and customer service. A contactless fare card will be compatible with other transit operations in the region. A computerized passenger information system will provide real-time information on arrivals, transfers, delays, and breakdowns; this information will be displayed on vehicles and at major transfer points. The passenger information system will be supported by the agency's AVL system.

Stadsbus in Maastricht has implemented several technologies to cut travel time and improve reliability and accuracy of the bus service. These include a transit priority system using short-range radio, an AVL system that uses a combination of dead-reckoning and global positioning technology, a customer information system with displays on vehicles, and voice communication via telephones on specific route information. Drivers have displays on the vehicles that show real-time information about performance, which determines bus priority at intersections (see Figure 7).

Lemgo's Stadtbus investment in technology has been limited to a digitized information display at the central transfer station. A bus priority system is used at 12 intersections within the city.

Figure 7. Onboard displays show real-time performance information.

Bielefeld has been successful in applying an AVL system that uses signpost and odometer recording technology for managing bus operations. The AVL system is linked to the municipality's computerized signal system and allows bus priority. This system also serves as the platform for a customer information system. It includes next-stop announcements on buses and dynamic message boards, which provide information on arrival and departure times at stations.

Nearly all of the systems observed indicated that early involvement of unions and employees eased the deployment of intelligent transportation systems (ITS) technologies. Clearly, these systems enable management to have a higher degree of control and information over its bus operators—a dispatcher can unequivocally determine whether an operator is off route or running ahead of schedule, which oftentimes are grounds for disciplinary action. Furthermore, widespread use of CAD/AVL would seemingly allow the transit system to reduce the number of supervisory staff, but the job functions of a dispatcher or supervisor must be redefined. He or she must become more of a systems analyst.

Many of the transit managers reported that the widespread use of CAD/AVL appeared to smack of "big brotherism" among the rank and file and was a source of contention. For the most part, management was able to gain the employees' acceptance of these systems by agreeing not to use them as the basis of discipline. For example, in Wuppertal, there are limits placed on the software, which prevents the dispatcher from examining a single bus trip (the data can be viewed in the aggregate only). The Wupperatal staff stressed the importance of educating the operators about the benefits of CAD/AVL as a way to ensure employee buy-in and acceptance. Most of the systems required direct observation by supervisory staff prior to initiating any disciplinary action.

System Expansion

Perhaps most important in understanding the similarities and differences between European public transport operations and public transit in the United States is the simple fact that Europe is so much smaller in geographic area. Europeans move across the borders of countries more frequently and routinely than most U.S. residents cross state boundaries. In order to understand the concept of "expansion of transit services" in Europe, a U.S. resident must modify his or her idea of what expansion means and view the European experience in this context.

First of all, there are few, if any, areas of Europe without transit service. Even in rural areas, public transport is available. There is also an extensive bicycle network throughout Europe, and the bicycle network serves both rural and urban areas. The bicycle mode split is supported by paved and separated bicycle paths throughout the Netherlands. Row after row of bike racks occupy prominent locations at train stations in both Germany and the Netherlands.

Accessible paratransit service for elderly and disabled passengers is not, however, generally readily available. First, it is not mandated by law; there is no law comparable to the U.S. Americans with Disabilities Act that requires protection and service for this portion of the population. Second, accessible paratransit service is just now beginning to be demanded in Europe by groups representing people with disabilities. Low-floor vehicles are being put into service, and regional/dial-a-ride taxis are being implemented in some areas.

Public transport operators who want to be competitive in this new open market are striving toward greater productivity; few public transport operators are thus likely to expand service in cases where ridership is marginal.

Many of the public transport operations are provided by public utility agencies with multiple subsidiaries. This public-private model for provision of service permits cross subsidy to the transit operations from other divisions of the company, most frequently the electric utility. The government provides "operating grants" to public transport operators; however, the formula for calculating this assistance is a disincentive to expansion. Cities and regional agencies frequently provide the capital funds to finance the transit infrastructure and often own the facilities. The public transport operator must be ever mindful that the day of reckoning will eventually come when productivity will be evaluated. This evaluation will then determine whether the agency can continue to operate or whether it will be consolidated with another larger, "regional" provider. These mandates from the EU are the controlling factors that establish the ground rules for any expansion of service. Most operators are responding to these mandates by expanding operations and improving customer service.

A traffic signal priority system implemented in Wuppertal improved operational efficiency of the bus system (and thus increased ridership). Wuppertal officials spoke of a single bus route with 25 intersections. Implementing an effective traffic signal priority system enabled public transport to operate the same frequency of service with one less bus. In Germany, this is considered an expansion of service.

Some complementary services are provided, and these actually serve as "extensions" of the public transport operations. For example, the "night taxi" concept is being implemented in several areas. The customer can phone the night taxi provider to arrange for a taxi to meet the bus at its last stop. The customer completes his or her trip home via the taxi. Similar service, known as a train taxi, is available at some train stations. These types of arrangements represent an expansion of service that is accomplished in a very cost-effective way.

The cost of highway construction in Europe has influenced the expansion of transit service and ridership. Four economic realities support the political position that citizens have a right to expect, and that government is responsible for guaranteeing, a minimum level of public transport: (1) ecological tax on energy consumption, (2) high gasoline prices ($4 per gallon), (3) high cost of roadways, and (4) high cost of road congestion.

Thus, in many cases, service expansion is accomplished by providing larger, articulated buses and trains. As in the United States, driver wages are the key element in operating costs. Larger equipment enables the European public transport systems to provide more service (and thus increase ridership) with the same number of operators.

Improving the frequency of service has also expanded service in Europe. Attempts to make public transport more attractive to riders are generally confined to improving headways and passenger amenities, rather than building new rail lines. An exception to this generalization is the planned LRT extensions from Bremen to Borgfeld, a new community of 3,000 residents (expected to eventually grow to 10,000 population). The LRT extension to Borgfeld will be completed by 2003, and it will then continue on to Falkenberg (population 16,000). This light rail service will replace the bus line that currently carries 22,000 passengers per day. Feeder buses will connect to the light rail service. Dial-a-ride taxi service will complement this expansion of service in areas currently without service. This type of expansion is not the norm for Europe today; but it is an interesting illustration of the many different types of expansion that occur there.

"Using light rail vehicles doubles the capacity of an articulated bus, and thus saves 2 million DEM [$896,000] in annual operating costs," said Martin Nussbaum, BSAG's director of planning. BSAG carried 93 million riders on all modes in 1999.

Within the Netherlands and Germany, there is strong support for regional bus networks. In some cases, these buses regularly cross country borders, allowing people who live in one city (or country) to work in another. Arnhem is one example; many of its residents leave the city to work elsewhere each day, using the state-owned Connexxion public transport enterprise.

The mechanisms for expansion of transit service in the Netherlands and Germany are distinctively different from the U.S. model, in which cities join an existing transit authority or vote to levy a sales tax for transit. European expansion is accomplished through procuring vehicles with greater capacity, offering paratransit (like night taxi and dial-a-ride), improving customer service so as to generate higher ridership, installing traffic signal priority systems, improving headways, and expanding the number of routes.

Strategic Planning

Strategic planning is defined as "a continuous and systematic process where the guiding members of an organization make decisions about its future, develop the necessary procedures and operations to achieve that future, and determine how success is to be measured" *(3)*. In many organizations, a written document is used to reflect decisions that are scheduled for implementation. These decisions include the development of a mission, values, goals, and objectives by members within the organization. The involvement and inclusion of all members allows buy-in and increases the likelihood of successful implementation.

As in the United States, strategic planning activities in Germany and the Netherlands are used as a guide for transportation. But agencies and companies use various degrees of strategic planning mechanisms. Although the approach varied among organizations, the commonality of these successful companies included strategies to ensure that the expectations and needs of the customers are met. Feedback from the customer was captured in various ways. The majority of firms conducted surveys to examine data relevant to improve their existing services with a future long-term focus.

Three companies in particular stood out as engaging in the most interesting strategic planning approaches for providers of bus and rail services: Arriva, Connexxion, and STOAG.

Arriva, headquartered in London, is recognized as one of the top three operators in Great Britain. This multinational operator operates in the Netherlands, Denmark, Spain, and Sweden. There are approximately 11,000 urban buses available in Arriva's fleet for transporting riders to various destinations throughout Europe. The majority of vehicles in the Netherlands operate in the northern region of the country.

Arriva is an example of a partnership between a private company and local government. Several subsidiary companies work together to produce quality transportation. The combination of the use of the city's existing infrastructure and outsourcing offers tremendous advantages in a competitive market: It facilitates efficient service and rapid expansion without increasing overhead costs. Most of the planning functions are performed by the city, since the city is the primary owner of the bus companies, traffic lights, and bus lines. The uniqueness of this system is the use of self-directing teams. In this motivational personnel structure, employees are responsible for total operations without management assistance. One person serves in the coaching capacity to ensure all activities are proceeding adequately. Every driver is assigned to a group, and each employee participating in the self-directed team approach has a rotating opportunity to perform functions related to marketing, planning, administration, personnel, and technical assistance. This approach has assisted Arriva tremendously with cross-training efforts.

At Arriva, each team member develops his or her own bus schedule, handles office work, and solves customer complaints. When developing bus schedules, each member determines the best and shortest route from point A to point B. Customer complaints are usually responded to by letter, through a visit to the customer, or through a telephone call. Team members determine the best approach for dealing with each complaint on a case-by-case basis. If a team member is unable to perform a particular activity, other teammates assist to ensure that excellent quality is still rendered to the customer.

The self-directing team approach serves as an effective mechanism for motivating employees to perform top-qual-

ity service, with an overall goal of obtaining "the best for less." The employees take pride in their work and perform to the best of their ability.

Connexxion uses very extensive strategic planning initiatives, ranging from developing mission statements to developing actual goals for implementation. The mission of Connexxion is "bringing people together" to provide an excellent product that is attractive to business clients and the public. Strategic planning has enabled this agency to focus its efforts on improving its transportation network to make transportation more accessible and user friendly. Four core values are used to create an environment of convenience:

- **Reliability**—delivering consistent and constant transportation to both its business and individual passengers,
- **Enthusiasm**—cultivating the customers' positive perception of services,
- **Entrepreneurship**—producing a quality product, and
- **Pleasure**—offering a dynamic level of service in the most appealing fashion possible.

During 1999, Connexxion's major focus was the implementation of Arnhem's "Trolley 2000," which is a plan to reduce the operating costs through collaborative efforts with local transit authorities and the Transport Ministry. The strategy for Trolley 2000 streamlines internal processes and stimulates innovation for trolleybuses. This was accomplished in three primary ways: improving the quality of the transportation network, enhancing marketing efforts, and investing in image. Improving the quality of the network meant the agency would have to evaluate scheduled times and synchronize routes and vehicle pickups. Enhancing marketing efforts included making the public more aware of the services available and offered by Connexxion. Investing in the image of Connexxion was critical to the agency's success. Improving the aesthetics of bus shelters, transfer centers, and buses were advantageous to attracting new ridership. Another integral component of the plan was introducing low-floor trolleybuses into the fleet to meet the needs of the disabled and elderly populations.

Connexxion has high ambition in undertaking strategic steps for creating innovative solutions for individuals, businesses, and government agencies. For Connexxion, bringing people together is more than just a marketing slogan—it is a commitment to provide quality service to millions of people.

STOAG's slogan is "go with the winner." Going with the winner means being able to grow and change with the needs of the economy. Over the past few years, STOAG has undergone a considerable restructuring to address the demands of today's market.

STOAG's planning initiatives focus on marketing efforts that enhance image and attract new customers. The entire organization works as a team to improve operational aspects. In the past, when customers or potential customers thought of STOAG, the image conjured up included uncomfortable vehicles, poor service, bad relationships with customers, and long wait times. With a reenergized team and mission, STOAG has developed into a first-class transportation provider.

The agency focuses on three main goals. The first is to work as an economic development tool for local businesses by providing more mobility options. The second is "social" in nature—to promote a more favorable relationship with its customers. The third is to improve the ecological effect of the transit system on the surrounding natural environment. These goals are seen as stepping-stones for an improved customer-oriented agency with a new and caring image.

By adopting innovative measures for enhancing ridership, Arriva, Connexxion, and STOAG collect enough revenue to recover their costs and remain viable in a competitive environment. The customers' input and needs are crucial elements in the design of these transportation systems.

Use of Small Vehicles and Taxis

At almost every transit system visited, there was some use of minibuses, taxis, or even sedans. The use of small vehicles fell into four general categories—small buses in conventional fixed-route transit service, minibuses in paratransit service, taxicabs or taxi-buses in shared-ride taxi service, and sedans used as a complement to public transportation.

Small Buses in Conventional Fixed-Route Transit Service

Even in small communities, such as Lemgo, service was provided with 10-m, heavy-duty buses. In other communities, the standard bus appeared to be the 12-m transit coach. In Herten, where trams had been phased out in favor of buses years ago, 15-m nonarticulated transit buses were in service. Likewise, 18-m articulated buses were not at all uncommon, even in cities as small as Arnhem.

It is not surprising, then, that small buses were not seen often in fixed-route transit service. There were, however, several notable exceptions. In Bremen, where BSAG operates no buses shorter than 12 m long, a contract operator provides service in outlying communities with 8-m midibuses. In Bielefeld, Stadtwerke Bielefeld provides a service called Quartierbus, feeder buses that operate on a fixed route, with stops closely spaced for rider convenience. The system uses six 9-m, wheelchair-accessible, low-floor midibuses, each seating 25.

In Maastricht, Arriva operates minibuses. The small buses are reportedly less costly to operate, in part because the drivers are paid less. However, in the current tight labor market, finding and keeping drivers is a challenge. In fact, drivers of small buses are required to sign a 2-year employment contract; otherwise, as soon as they are trained they would leave for a job driving a large bus. Midibuses are also employed by Novio in Nijmegen.

Minibuses in Paratransit Service

Both the Netherlands and Germany provide for the transportation of people with disabilities through paratransit services. The use of small vehicles in this application is straightforward; body-on-chassis minibuses, equipped with wheelchair lifts, appear to be the standard. It is interesting to note that while low-floor buses and/or trams were found in virtually every transit system visited, low-floor minibuses were much less common. Stadsbus Maastricht was one of the few operators reporting the use of low-floor minibuses.

In the Netherlands, a service called Mobi-max provides paratransit services to people with disabilities, as well as residents of outlying areas, where even a 10-m midibus would not be justified. Using wheelchair-accessible taxivans, the service is fully integrated with local bus and train operations (see Figure 8). The program is run under contract by a cooperative of four taxi companies. (Syntus, the local bus and train operator, has concluded that, having no background in taxi operations, it could not afford to acquire the equipment and expertise to run the operation internally.)

In Germany, several transit operators explained that the paratransit services provided to people with disabilities in their region were operated by social service agencies rather than transit systems; hence, these transit operators had no direct involvement.

Taxicabs and Taxi-Buses in Shared-Ride Taxi Service

While the use of small buses in conventional fixed-route transit service was quite limited, and the study mission did not include direct exposure to social service agencies' paratransit operations, the use of small vehicles was found to be alive and well—in the form of shared-ride taxi service.

Train-Taxi. In Arnhem, taxis and taxi-buses are used to provide train-taxi service, an off-hours feeder service that meets early morning and late evening trains, providing longer service hours and a premium level of service. Like Mobi-max, the train-taxi is operated as an adjunct to the regular bus service, but is completely separate from Connexxion, the local bus operator.

Based at the railway station, the train-taxi is summoned from a kiosk outside of the station (where the prospective rider simply pushes a button) or (in the case of early morning service) from home via telephone. Pushing the kiosk button alerts the taxi dispatcher to dispatch a taxicab to that location. If more than one person has signaled for a cab, the principle of "first come, first served" is applied. However, as this is a shared-ride system, the taxi will take multiple riders going in the same direction.

The train-taxi fare is 7.5 NLG ($3) if the ticket is purchased in advance (at the ticket counter inside the railway station). However, the passenger can also pay the taxi driver, but at a premium fare of 9 NLG ($3.55). There is a very

Figure 8. Wheelchair lift-equipped taxi-bus in Nijmegen.

simple two-zone fare structure—a flat fare applies for all trips within the general area of the station; a higher fare is charged for longer trips.

There are several advantages to the train-taxi. In the early morning and late evening, when ridership would be insufficient to warrant running a regular bus route, the train-taxi is able to provide service to the sizable portion of the market whose origin or destination is the train station. The taxi can be operated at a lower cost than a bus, as presumably labor, consumables, depreciation, and other operating costs are lower. The customers receive a premium service, as the train-taxi provides "door-to-door" transportation, and the driver even waits until the rider is safely indoors.

Anruf-Sammeltaxi. In Germany, a fairly common use of taxis in public transportation is called the Anruf-Sammeltaxi, which translates into English as dial-a-shared-taxi. Although the study mission did not observe this type of service first-hand, it was described by several transit systems' staffs.

In Bremen, BSAG operates an Anruf-Sammeltaxi in two areas of the city, plus several outlying villages that are willing to pay the required subsidy. The service operates much like the Arnhem train-taxi. When the bus or tram reaches the end of the line, passengers desiring to go farther call the taxi dispatcher. When the taxi arrives, it will take up to five passengers from the stop to their final destination. A premium fare—30 to 50 percent higher than the regular transit fare—is charged. The service is described as being very efficient.

In Bielefeld, the Anruf-Sammeltaxi operates as even more of an extension of the regular transit service. Riders can use the telephone to call for a taxi from home or make the request onboard the bus or tram by asking the driver to call ahead. (In the case of the tram, an intercom is used to tell the driver that a taxicab is needed.) Although the service is more expensive (the regular taxi fare, rather than transit fare, is charged), it is reported to be very popular because of the high level of safety and security it provides. The transit system contracts for the dispatching service from the local taxi cooperative.

Bus Service Substitution. Stadsbus Maastricht takes a slightly different approach to the use of small vehicles. The city has established a policy that transit service will be provided to within 500 m of every dwelling place at least every 30 min during the day and every 60 min in the evening. However, if fare recovery on a particular route drops below 20 percent, the transit operator can withdraw regular bus service and substitute door-to-door paratransit service.

The door-to-door service operates whenever the buses would have run—weekdays from 6 a.m. until midnight, with reduced hours on Saturday and Sunday. The fare is 1.7 times the regular fare. Both taxis and taxi-buses are used. Costs are reported to be much lower than the corresponding transit service in part because the drivers, both taxi and taxi-bus, are paid 60 percent of the wages paid to bus drivers. There are a number of taxi companies available to participate—in fact, Stadsbus Maastricht owns one of them, with 50 taxis, 70 taxi-buses, and 200 employees.

Stadsbus has recently proposed a variation on the shared-ride taxi substitution concept, namely that the neighborhood of Itteren be served by buses during the day with collective taxis operating in the evenings and on Sundays. However, to date the plan has not been accepted by the Maastricht City Council.

The only other city to report taxi substitution is Oberhausen, where one suburb has replaced an underused bus route with a subsidized taxi program. According to STOAG management, although market research has shown the lowest level of customer satisfaction with night service, so far there has been no consideration of using collective taxis in the evening.

Other Shared-Ride Taxi Programs. Stadtwerke Bielefeld operates a program that provides taxis on low-ridership bus routes, where the buses don't run after 8 p.m. or before noon on Sundays. Taxis cover the regular route, taking people from the end of the tram line to their homes. The fare for the service is the regular transit fare, plus 2 DEM ($0.80).

In Oberhausen, STOAG operates a similar program. At night, the bus driver will call ahead for a taxi, so that the taxicab is waiting when the bus arrives at the stop, allowing the rider to transfer to the cab for the final leg of the trip.

In Bremen, shared-ride taxis are used in outlying areas of the community with low population density. The service is contracted out to a local taxi company, which operates a trip every 30 or 60 min, depending on the time of day. The taxis do not, however, follow a fixed route; the routes are modified as necessary to serve the passengers.

The small city of Lemgo uses taxis in a similar way. In the evening and on Sundays, when the buses don't run, taxis provide public transportation. The prospective rider calls for a taxi 1 hour ahead; for the regular bus fare plus 3 DEM ($1.2 US), the taxi provides transportation from one bus stop to another. The service is very popular—more than 12,000 passengers are served annually, at a cost to the transit provider of 110,000 DEM ($43,000 US). However, at certain times, such as late at night on Saturdays, demand reportedly exceeds the capacity of the system.

Entrepreneurial Services. Perhaps no city visited by the study team had as diverse involvement with small vehicles as Nijmegen. Novio NV, the transit provider, operates a "Novio Express" division that coordinates small buses and taxis. The management of Novio has made the decision not to own any taxis, but to subcontract for the service, reasoning that if Novio should lose the contract to provide Nijmegen's transit service, the taxis and taxi drivers won't become a burden on the organization.

Novio is also the owner of "Novio-net NV," a communications firm, and part-owner, with a taxi company, of "Novio-stebo NV," which provides taxi dispatching.

Twenty-six taxi companies in Nijmegen and Arnhem are served by the call center, which uses up to 10 call takers and two dispatchers. Dispatching is facilitated by mobile data terminals in all cabs. Novio's management states that the call center is profitable to Novio's operation and also to the individual taxi companies.

The shared-ride taxi concept has not succeeded everywhere. In Essen, EVAG has tried to negotiate with the local taxi collective. When the parties couldn't agree on cost, EVAG was forced to continue running large buses for very few passengers. However, EVAG management believes that EVAG may employ taxis in the future, if federal law in Germany will allow transit systems to operate their own taxi services.

Sedans to Complement Transit Service

In Germany, the study team uncovered an approach to supporting public transportation not seen in the United States—subsidized rental cars. The concept is that the availability of low-cost rental cars for occasional use will encourage people not to purchase their own cars, and not having their own cars, they will use transit more.

In Bielefeld, the transit operator provides a "carpooling" program. The operator contracts with a rent-a-car company for a significant discount for cars rented by holders of annual transit passes. The rate for passholders is 34 DEM ($13); ordinarily the rate would be between 70 and 90 DEM ($28 and $36). The cars are rented at one central location; 60 cars are available, approximately 60 percent of which are in use daily. The typical rental is for 1 day or less. No reservation is required; if a renter shows up and all the cars have been committed, the prospective renter can go to another commercial rent-a-car company and secure a car at the same low rate.

Bielefeld is also the location of a "carsharing" program. Operated under contract with a commercial rental car company, the program parks one or two sedans at each of about 30 locations around the city. The program is open to the transit system's annual passholders, and others by subscription. The user calls ahead to reserve a car; if none is available, the prospective user is directed to an alternative location. The system is automated. When a car is reserved, the customer is given a personal identification number (PIN), which enables him or her to open a lockbox containing the key. Fees are based on kilometers driven.

In Bremen, BSAG provides discount rental cars to holders of annual transit passes, much like its counterpart in Bielefeld. Again, the philosophy is to make cars more readily available for last-minute, unscheduled use, so that people do not feel compelled to purchase their own automobiles, and thus will continue using transit as their main means of transport. Bremen is also home to a Stadtauto (i.e., city automobile) program. This system, which is run independently from transit system, facilitates the shared use of small cars.

Competition in Public Transport

Privatization is very much in the thoughts of transit operators in the Netherlands and Germany, where it is referred to as "competition." The emphasis on competition is driven by the EU, whose policies and regulations encourage competition across borders.

Competition, coupled with a renewed focus on quality control, accounted for greatly reduced transit costs in the cities visited. The Netherlands is farther along in its competitive efforts than its German counterpart is because laws requiring competition in the Netherlands predate the EU rules.

Public transportation in Europe, like in the United States, is highly subsidized and has, for the most part, been operated as a monopoly. The EU is dictating the elimination of this public monopoly through the competitive bidding of transit services. This change is being mandated under the general assumption that if public transit is subject to competitive bidding, cost savings will result. These cost savings will reduce the need for public subsidy and/or concurrently improve service by applying the creativity and sensitivity to customer service by private enterprise. In the Netherlands, a common opinion was "thanks to competition, we have more public transportation for the same subsidy."

Access to transit is considered a right for every German and Dutch citizen and an obligation of the government. The current level of subsidy to the transit systems visited ranges between 40 percent and 60 percent. This is less than the public subsidy in comparably sized U.S. cities, which ranges from 75 percent to 90 percent. Total transit spending per capita is substantially larger in the Netherlands and Germany—in fact, 300 percent higher in Germany. These subsidies are of concern to Germany and the Netherlands, and discussions about reduced spending and increased competition are built on the premise that competition will result in decreased costs and in improved service.

Perhaps the most confusing aspect of competition is the structure of the operating agencies subsequent to competitive bidding. Stockholder-owned companies in the Netherlands can, for instance, bid on a contract, but the majority of operations are operated by "private companies" that are wholly or nearly wholly owned by public agencies. These companies function in the marketplace as private companies, but any surplus revenue is sent to the federal government, and any shortfall is covered by the federal government.

Transit operators in the Netherlands can thus be viewed as subsidiaries of the government, but with separate operational budgets and independent boards of directors. In some cases, the companies sell buses and tires, maintain outside equipment, and even operate construction companies. They do not pay dividends to stockholders, but they do receive subsidies from the government. They do not look or feel like what people in the United States would consider a private company. For instance, Syntus, which operates an integrated rail and bus system serving both urban and rural areas, is

owned by the passenger division of the Dutch national railways, a bus holding company, and a French company controlled by SNCF, the French national railway operator.

In the Essen metropolitan area, multiple operators serve individual cities. There is currently a high degree of fare and service integration between the various operators. The cities and operators assume, however, that if cost reductions are to be achieved, the systems will, at some level, need to be consolidated in order to reduce overhead and otherwise benefit from economies of scale. To ensure that the systems will remain responsive to local needs, Dutch law mandates that no single company be allowed to operate more than one-third of the country's transit services.

Competition is a concept that has universal approval. Clearly, the public transportation sector is a big target for potential savings. Certainly, the initial results indicate a reduction of costs. All of the transit systems in the Netherlands indicated a willingness on the part of labor to reduce costs through either hourly wages or work rules. The most comprehensive description of true privatization comes from Arriva, a British corporation. In Great Britain, Arriva has captured a major share of the transit market that has been competitively bid. It currently has over 20,000 employees in 100 different locations in England, as well as in Denmark and Spain.

Arriva primarily operates in the northern part of the Netherlands, but also has a small operation in the southern part, around Maastricht. After Arriva won this concession, service was increased by 30 percent, but ridership initially only increased 10 percent, gradually reaching a 36-percent increase. The bottom line, however, is that the company is losing money in what can only be described as a less than Spartan operating environment. The system is small—12 buses on 6 lines. The administrative functions are performed by operators during their splits, and the maintenance is contracted out. The only full-time administrative employee is the general manager, who also drives and does everything else as needed. The operators, initially challenged by this level operating structure, are now frustrated by the lack of funds to grow and an inability to be innovative. Internally, the system is severely strained, but service to the public has increased and costs have been reduced. The real question is whether this operating environment can be sustained.

There seems to be an inevitable tension between quality and cost. If a bus or shelter window is etched by a vandal, at what point is service degraded enough to warrant replacing the glass?

Early efforts in Germany are paying off in reducing costs with no discernible degradation of quality. The system in Herten has reduced operator rest time from 30 percent of pay hours to 10 percent, with a goal of 5 percent. The system has also cut the number of maintenance employees from 150 to 80, with no reduction in bus service hours. In other German cities, similar discussions are taking place in this precompetition environment. In Bielefeld, for instance, one strategy to reduce costs for the transit provider is to "give back" to the municipal government all of the infrastructure associated with the light rail/street car system, including right-of-way, electrical power grid, and stations.

Perhaps a more critical issue facing many German systems is the possible end to current cross subsidies from city-owned utilities. In many cities, the municipal governments have a monopoly on the distribution of public utilities, including water and electricity. The EU has mandated that these monopolies, like transit, be competitively bid. This most likely means the end to this cross subsidy with no identified source of replacement revenue on the horizon. The results of these mandates from the EU and the previous Dutch legislation are yet to be fully understood.

Transit Innovation in Context

In the minds of many transit officials in the United States, the term *innovation* has come to be associated mainly with technology. In examining innovation in the European context, however, it is apparent that the term has a wide variety of additional meanings, as well as shades of meaning.

What is innovative to one organization or agency might be routine or mundane to another. Innovation is relative to the point of view of the beholder. In the cases of the properties studied during this mission, the immediate central motivating factor for innovation is the EU's new competitiveness rules. Innovation in response to these new rules and the openness of the local properties to competition from throughout the EU is usually a combination of three types of innovation: technological, administrative, or marketing.

Technological Reinvention and Innovation

The term *technological reinvention,* as applied here, means the deliberate modification of an existing technology to create a new, more efficient service that takes advantage of technological improvements while retaining the essential identifiable character of the system. Transit agencies and cities in Europe incorporate the well-liked aspects of the current system into the design of new systems. They don't abandon successful systems and concepts.

For example, Wuppertal is home to one of the engineering treasures of the early 20th century—the hanging monorail, or Schwebebahn. The system has become the hallmark of the community. The system was built in the mistaken belief that it was a demonstration of the mass transportation system of the future. The Wuppertal authorities have continually updated the rolling stock and improved signaling and control functions while maintaining the fixed guideway structure. When the support structure had to be rebuilt after World War II, minor improvements were incorporated into the design. And before the system celebrated its 100th birthday, a major initiative was undertaken to update and improve the supporting structure.

While the unique configuration and distinctive struc-

ture of the Wuppertal line provided an obvious candidate for reinvention, the Arnhem trolleybus system was less distinctive physically and lacked some of the glamour that goes with a historical engineering monument. The trolleybus was, however, chosen by the people of Arnhem as the core system to be used within their city and for extensions to suburbs and new towns. The community's adoption of the phrase "Arnhem—the trolley city" is a part of that identity. This phrase appears on all the trolleybuses of the community. Local authorities estimate that dropping the trolleybuses would result in a 10-15 percent decrease in ridership. The reinvention of the system through the use of new rolling stock is not so visually obvious, yet it was the community's decision to buy new trolleybuses and to continue the existing system with new equipment that made it possible. The decision was based on ecological reasons, primarily that the electric fleet was cleaner than a conventional diesel fleet.

In addition, many cities creatively transformed well-liked aspects of the existing system into means of improving modal integration. One example is the use of freight rail lines for passenger transport, as in Doetinchem and Bremen.

Another reinvention involved running LRTs through underground tunnels tubes in the central city, a measure that helped to support the extension of pedestrian ways in central cities. This had been carried out in several cities that were visited, including Essen and Bielefeld. Bielefeld's complex geology includes sand and marl, as well as the remnants of a filled-in city moat; these characteristics required very complex engineering measures to overcome the tendency of tunnels to collapse. Oberhausen, in contrast, had retained its surface system, but had built an elevated combined busway and tramway north of its central outdoor bus transfer point adjacent to the main rail station. This elevated system provides improved access to the northern parts of the city and makes a striking presence in the *Neue Mitte,* the new downtown of Oberhausen, which includes a large shopping mall.

Rolling stock innovation is expensive and requires a long lead time. For this reason, most major vehicle design changes in Germany receive government funds for prototype development. Further movement into mass production may occur if private industry sees a market for the type of vehicle developed. This is true for both buses and rail vehicles. The obvious change here is the opening of the market to the whole of Europe as a result of the competition edicts of the EU. This has resulted in an internationalization of the market, with Germany, among the largest European countries, seeking cross-border sales of its vehicles.

Innovation in the bus arena is characterized by development of a series of new-generation buses appropriate to specific route characteristics. There has been a conscious effort on the part of the German transport industry to standardize bus sizes according to type of service. This was initiated in the 1960s under the auspices of the Verband Deutscher Verkehrsunternehman (VDV), the association of German transport companies, and continues to this day. The first Standard Regional bus was introduced in 1972 and was followed by the Standard Regional Bus II in 1983 *(4)*. These types of buses have been widely adopted outside Germany.

The range of urban bus innovations in the Netherlands and Germany reflects many of the same concerns that transit managers have in North America. There is a growing awareness of the needs of the disabled in the EU, with those needs cited as the primary reason for the development and deployment of low-floor vehicles.

Germany has had an extensive ongoing development program to create new bus types, usually in partnership with a local service provider. Herten's VSB, under the direction of Ulrich Rogat, has had several distinctive, if not unique, buses developed through this program. One low-floor bus has all of its mechanical parts in a single rear compartment. Rogat noted that one goal of this bus design was to allow the entire engine and transmission to be removed for major service; a serviced module could then be swapped for the removed module, allowing the bus to be quickly put back into service. This would drastically lower bus downtime, as a changeover to the new or overhauled module could be done in less than a day. The fact that the wheels are located as far as possible to the rear also means that the bus has virtually no overhang.

Some of the bus development efforts have been aimed at meeting air quality standards through the use of compressed natural gas (CNG), exhaust-free buses with filters, electric buses, and fuel cells.

Both meter gauge and standard gauge rail systems are used in Germany. In general, the advantages of the meter gauge (narrow turning radii and lower capital costs) are felt to be outweighed by the advantages of standard gauge (additional capacity). Standard gauge is also ahead of the competition in terms of its flexible use on existing freight and heavy rail lines for suburban service. EVAG in Essen noted the extra cost of maintaining a dual-gauge system. Maintenance and track costs are higher, as all track work in maintenance depot is dual gauge, and one of the tunnels has dual-gauge track. EVAG has modern equipment on both meter and standard gauge, but is trying to do all expansion using standard gauge.

One area in which all properties visited seem to excel is that of modal integration. All operations emphasize transfers from rail to bus systems; most connect with heavy rail passenger systems. Even the small Lemgo operation has a convenient transfer to commuter rail. The integration of some distinctive modes into the more conventional transit modes has helped to keep such systems vital, as in the case of Wuppertal. This continues with new initiatives, such as the overhead cabletram system between Nijmegen and Waalsprong, which is being built as a demonstration, with no local contribution to the 120 million NLG ($47 million) capital cost.

In Germany, traffic engineers are overcoming their suspicions of traffic signal priority systems, and more intersec-

tions throughout the country are being outfitted with such technology. Wuppertal has an extensive signal priority system covering 170 intersections, allowing the green cycle to be extended as necessary. Responsibility for this system is shared by the transit agency and the local traffic control agency. Maastricht has a similar system, but protects its "old town" by letting only four cars in per green signal, with no exceptions for buses. This can hold up the bus schedule, particularly during peak tourist periods.

In the European experience, real-time customer service information systems are commonplace, particularly on systems with a rail component, but increasingly on bus systems also. Bremen, for example, has an extensive multilevel system for passenger information. Transit information on the bus ranges from the conventional, such as printed schedule availability, to more modern systems, such as web-based information services. Schedules and fare information is provided at all stops, with real-time information available at many of the major stops on main lines. An infrared system registers the location of vehicles. An onboard display shows the entire route, and stops are displayed and announced. The system shows transfer possibilities and provides maps. This gives logical control of position information.

Innovation in maintenance practices has resulted in a lowered number of maintenance personnel per vehicle in Germany, with concomitant savings. The recommended number of bus maintenance employees per vehicle, as computed by the VDV, had dropped from 0.7 in 1971 to 0.16 by 1995. Practice lagged behind the standard, however, as the actual average number of bus maintenance employees per vehicle in 1995 was 0.28.

At the same time, accommodation of the different characteristics of low-floor vehicles requires additional capital input for construction of new facilities or modification of old facilities. The Oberhausen maintenance facility, for example, was originally built with deep fixed-level bus maintenance pits, with maintenance personnel working from open-grid metal walkways above the bottom level of the concrete floor. This additional margin of space below the workers allowed the steel beams supporting the work walkways to be lowered between 1 ft and 1.5 ft when low-floor buses were introduced, which means the workers can carry out their work without crouching.

Maintenance facilities in both the Netherlands and Germany are very well equipped by North American standards. The observer carries away the impression that the facilities carefully considered their resources and were not afraid to invest what was needed to maintain and extend services. While this is not in itself an innovation, it shows their desire to avoid being "penny wise and pound foolish" when considering maintenance facilities. For example, computerized wheel-turning equipment was demonstrated in Essen, Bielefeld, and Bremen (see Figure 9). The agencies were well aware of the value of having a quieter steel-wheel-on-

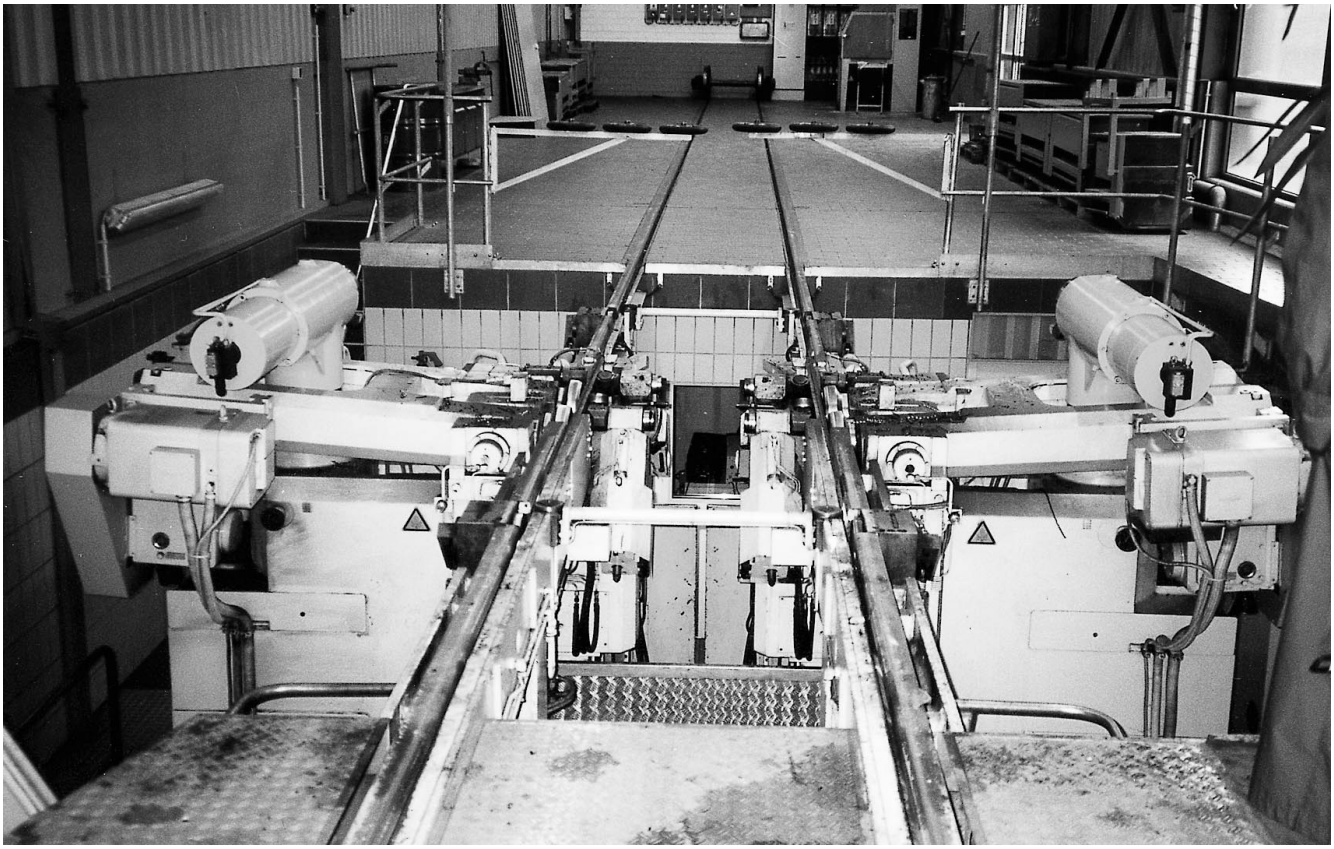

Figure 9. Computerized wheel-turning machine for Bielefeld's trams.

rail service in urban areas and presented their equipment as an ecologically sound means to that end.

Administrative Innovation

The response of transit providers to the EU transit competition mandates varies depending upon the current orientation of the system. Strategic alliances are important, but different groups are not always able to identify which alliances would complement their current strengths. All are confident that they will succeed in the new milieu, but only a limited number of companies will be able to meet the new conditions: consolidations are inevitable. Passenger expectations may or may not be met in the future. The idea that the systems must all be profitable raises the possibility of very high fares or areas without service. Competition throughout the EU for these contracts will likely result in situations that some constituencies will find unacceptable in the future.

Management importation has been carried out to develop new orientations in the privatizing transit industry. In the case of Nijmegen, the director was brought in from the airline industry to apply lessons learned in that context. The reorganization of the company has been based on airline practices. This orientation extends also to the physical plant; the architectural firm that designed and built new offices and maintenance shelters for Novio has extensive experience in designing airports. In Bremen, staff members have been brought in from Karlsruhe, where a successful LRT system using heavy rail facilities is already in operation, to support the new Bremen light rail initiatives.

The Netherlands is making a stronger effort than Germany is to integrate rural and urban transit service of all modes. The current countrywide Strippenkaart, a universal ticket, will be replaced by a debit card for all services. Some rural areas have on-call train-buses that meet the train and provide a route-deviated service in places without conventional bus or train service. There are also train-taxis that provide a service to the train station in smaller communities. The information on these services is available at the train stations.

Another innovation in administration has been the integration of formerly completely separate technical specialties. In Essen, bus and train integration has been furthered by training all drivers to operate both buses and trains. This has eliminated a feeling of superiority on the part of rail operators, a feeling that had had a divisive effect, and is said to have significantly increased morale. At the same time, it has allowed a more flexible and efficient use of the workforce. In Oberhausen, all operators can drive buses, and 55 can also drive trams. The agency hopes to expand this number in the future to achieve full integration of the operating staff.

Marketing Innovation

According to Professor Obst in Essen, the image of transit as a viable service is enhanced by the presence of a fixed infrastructure that one can see. This builds confidence in the security of the system and is important in drawing people out of their cars. EVAG, the Oberhausen transit agency, conducts an extensive series of surveys of all area residents to see how well the service is perceived by riders and nonriders alike. EVAG feels that its image is an integral part of the community. The close agreement between survey results for transit users and nonusers shows that the service improvement strategies are working; there is a congruency on the increasingly positive image of the transit service.

Nijmegan's Novio believes that new buses improve the image of public transport. Novio has ordered the prototype X98 Fokker composite bus powered by a conventional diesel engine; the result is a 40-percent weight reduction and 25-percent lower fuel consumption. Novio also believes "little things" also spark good impressions; for example, the company uses high-mount mirrors on their buses, which look good and don't get knocked off as easily as conventional mirrors. Novio rejects at least one technological innovation, however: security cameras. The company director claims cameras give riders the impression of potential danger.

Bus stop signs in Lemgo incorporate a distinctive paddle design, painted in the sky blue corporate color. The "handle" of the paddle has the bus number printed on it in the color of the route. The street on which the stop is located is printed vertically below the route number, and the route map and schedule are on the wider "blade" at the bottom of the paddle. As there are a limited number of routes on any one street (three is the maximum), the bus company uses a separate paddle color scheme for each route. The distinctive look of the signs and the amount of information on them help promote confidence in the system.

Buildings, from bus shelters to corporate headquarters, play an important part in defining the place of transit in the consciousness of the community. The German and Dutch agencies visited believe that if a transit system can incorporate its distinctive designs into the community's identity, it has a greater chance of being seen as an essential part of the community. For example, glass covers the entrance to the Bielefeld Haptbahnhof station and extends down the escalator, covering the passengers as they enter the station. This open, attractive structure draws attention and prominently marks the entrance to the underground station.

Efforts to ensure safety at German and Dutch transit stops and stations focus on providing information to the individual, who is then expected to behave appropriately so as to avoid unsafe situations. Barriers are present, but not prevalent. As an example, Bremen's exclusive transit lanes have narrow standing areas with shelters in the middle of the street. Passengers must cross a single lane of traffic to reach the curb-high platform where they wait for trams and buses. Passengers have complete access to the entire length and width of the street. Although the speeds of cars and trams are relatively low, there is no physical barrier to prevent passengers from stepping in front of an oncoming automobile on one side of the platform or an oncoming bus or tram on the other side.

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APPENDIX A—STUDY MISSION TEAM MEMBERS

William L. Volk, *Team Leader,* Managing Director, Champaign-Urbana (Illinois) Mass Transit District

Nancy Amos, Deputy Assistant General Manager, Fort Worth (Texas) Transportation Authority

Michael Carroll, General Manager, Greater Lynchburg (Virginia) Transit Company

Kathryn Engel, Manager of Strategic Planning and Intergovernmental Relations, Montebello (California) Bus Lines

James Gee, Director of Planning, Toledo (Ohio) Area Regional Transit Authority

Eric Hill, Manager of Systems Planning, Metroplan Orlando (Florida)

Ronald Kilcoyne, Transportation Manager, City of Santa Clarita (California)

Deborah Moore, General Manager, Capital Transportation Corporation (Baton Rouge, Louisiana)

Hugh Mose, General Manager, Centre Area Transportation Authority (State College, Pennsylvania)

Mark Pangborn, Assistant General Manager, Lane Transit District (Eugene, Oregon)

Arlene Prince, Deputy Director of Mass Transit, South Carolina Department of Transportation

Bruce Turner, Assistant Planning Manager, Regional Transportation Commission (Las Vegas, Nevada)

Kristina Younger, Manager of Planning, Capital District Transportation Authority (Albany, New York)

Kathryn Harrington-Hughes, *Mission Coordinator,* Director of Operations, Eno Transportation Foundation (Washington, D.C.)

APPENDIX B—STUDY MISSION HOST AGENCIES

Germany
Wuppertal: Wuppertaler Stadtwerke AG
Oberhausen: Stadtwerke Oberhausen AG (STOAG)
Essen: Essener Verkehrs AG (EVAG)
Herten: Vestische Strassenbahnen (VSB)
Lemgo: Stadtbus
Bielefeld: Bielefeld Stadtbahn
Bremen: Bremer Strassenbahn (BSAG)

The Netherlands
Arnhem: Connexxion
Doetinchem: Syntus B.V.
Nijmegen: Novio
Maastricht: Stadsbus and Arriva Zuid Netherlands

APPENDIX C—ABBREVIATIONS

APTA	American Public Transportation Association
BSAG	Bremer Strassenbahn AG
CAD/AVL	computer-aided dispatch/automatic vehicle location
DEM	German marks
EU	European Union
EVAG	Essener Verkehrs AG
FTA	Federal Transit Administration
GPS	global positioning system
ITS	intelligent transportation systems
ITSP	International Transit Studies Program
LRT	light rail transit
NLG	Dutch guilders
PIN	personal identification number
STOAG	Stadtwerke Oberhausen AG
TCRP	Transit Cooperative Research Program
TRB	Transportation Research Board
VDV	Verband Deutscher Verkehrsunternehman (organization of German public transport companies)
VRR	Verkehrsverbund Rhein-Ruhr
VSB	Vestische Strassenbahnen