

Bus Stop 3.0 – Multifunctional Centers for Regional Development

Manfred Schrenk, Josef Benedikt, Clemens Beyer; Christian Einzinger, Andor Farkas, Gert Delle Karth

Dipl.-Ing. Manfred Schrenk, CEIT Alanova, Am Concorde Park 2/F, A-2320 Schwechat, m.schrenk@ceit.at)

Josef Benedikt GEOLOGIC Dr. Benedikt, Mariahilfer Straße 3, A-1060 Vienna, josef.benedikt@geologic.at

Dipl.-Ing. Clemens Beyer, CEIT Alanova, Am Concorde Park 2/F, A-2320 Schwechat, m.schrenk@ceit.at)

(Christian Einzinger, CEIT Alanova, Am Concorde Park 2/F, A-2320 Schwechat, c.eizinger@ceit.at)

(Andor Farkas MSc., CEIT Alanova, Am Concorde Park 2/F, A-2320 Schwechat, a.farkas@ceit.at)

Gert Delle Karth, CEIT Alanova, Am Concorde Park 2/F, A-2320 Schwechat, g.dellekarth@ceit.at)

1 SUMMARY

“Bus Stop 3.0” represents the future of public transportation stops serving as multi-functional centers for innovative urban and regional development. This project examines demands and challenges related to the expansion of functions of a bus stop in order to integrate it as a meeting place for social interaction in its environment and thereby improve the use of public transportation. The research is conducted within the framework of a Living Lab in the city of Schwechat where various scenarios will be developed.

The increase in traffic in conurbations can be addressed in the future through further improvements to public transportation. In addition to transparent pricing and increased competition between private and public transportation companies, it is the technological developments that will increase the demand for faster, safer and more flexible mobility. In this manner, the focus will not only be on the adaption of transportation modes and the expansion of the basic configuration of the bus stop, but also on the expansion of the basic functionality of the bus stops: how and in what form can e.g. information help motivate less mobile segments of the population (people with physical handicaps) to use public transportation as well as to make the bus stop more attractive for such use? As a precondition for this, it is important to develop the “Bus Stop 3.0” as a location for communication and a barrier-free meeting place for social interactions. This development can be achieved through Wi-fi technology and can lead on the basis of detailed use assessments also to their development into potential local supply points. Creating a bus stop as a communicating, innovative meeting place that makes the use of public transportation decisively more appealing lies thereby at the center of this research.

The bus stops’ actual and potential significance starts with an analysis of the actual state of the use and configuration of the public transportation stops. What demands are made of the bus stops by the public transportation users of all age groups? With this in mind, at the forefront of the discussion will be the additional functions of the “Bus Stop 3.0” that lead the neighbourhood to identify the bus stop as a location for communication and local supply as well as technological access.

2 STATE OF THE ART

Bus stops are meant to serve technological as well as social applications used within society at large. Loads of studies on bus stop requirements and bus stop cadasters lead to an increased understanding of the importance of public transport hubs. So far all studies are focused on the bus stop itself, that is, on a very narrow place with its surrounding environment.

„Bus Stop 3.0“ is a project aiming at the development of a bus stop as an interactive place to communicate as well as a location for advertising of local service providers. The concepts worked with in this project are focused on both the stop and its integration within the surrounding living places. The use of a bus stop is not limited to exiting or entering a bus but to interact with technology, services, information and, well, other customers. The project tries to escape the infinite loop of well known facts and well known resulting conclusions with regards to demographic development and technological usability. It aims at new ways of spatialization of spatial structures and visualization.

What are the general requirements to a public transport facility? Here are some examples:

- Busses do not follow tracks. It is of crucial value to the customer to actually see the bus coming or going. There are no other means rather than an enhanced visibility of the bus stops in a surrounding environment. This may be achieved with an improved visibility of bus stops. As a building it has to be a distinct landmark yet integrated in the neighbourhood architecture. Thus it (and its services) becomes valuable not only for bus users but also for anyone passing by.

- Basic information on buses (schedule, maps) is state of the art. You find other services than ones related to the immediate bus and/or bus stop rarely. The concept, however, is already familiar to car drivers with shops at every gas station. This is not common at all at bus stops. Services, local news, local offers, job offers, food and drinks and a place to simply exchange what's going on will enhance the attractiveness of spending time at the bus stop – „waiting time“ will get a new meaning and will not be perceived as „wasting time“ any longer.
- In an information society users not only receive information but also provide information. The aspect of interactivity is considered crucial for bus stop development. To stimulate social activities it becomes necessary to equip the bus stop with technological access to the community, accessibility to internet, availability to drop messages via mobile devices, communicate with friends etc.
- A modern bus stop serves as a meeting point. Various groups of users are present at different daytimes and it is wished that all groups are provided with adequate technology to communicate not only within one group but also exchange and develop knowledge with other user groups. An innovative bus stop allows for personal identification of people who may or may not use buses in the first place. This benefits the local community as well as the society at large.
- To most users it is also important to be protected against vandalism, violence and bad weather. Given the current setting it is not very comfortable to spend time at a bus stop. Chairs cannot be adjusted, missing tables, lack of information, bad condition of other hardware are not very attractive features of public transport and might be improved in creating a more flexible busstop which can adapt to both user groups and environmental conditions.



Figure 1 Current Bus Stop, Schwechat, Main Square

Most attempts to design intelligent bus stops are concerned with customary electronic passenger's information systems, e.g. neon writing boards using LED or LCD technology which announce the departure of the next means of transportation and indicate, perhaps, a little additional information or advertisement. Common additional requirements include: ability to orientate, accessibility on foot and on wheels, signposts; bicycle storage facilities; no underpasses, no angst-areas, supervision and help facilities; bright materials, illumination; equipment without barriers, suitable for the handicapped; regular servicing and cleaning. All this is basically a static part of the bus stop with no ability for users to interact with the surrounding environment e.g. other customers, local businesses or communities.

„Bus Stop 3.0“ and its ability to interact via mobile devices certainly raises the attraction of bus stops altogether and attracts people who would not use public transport otherwise. For example, acoustic announcements at departure times/delays for partially sighted or elderly people are currently tested with the communities of Salzburg and St. Pölten. Technological developments support the attraction of public transport towards participants in traffic situations and show the basis for the enlargement of existing stop concepts. In particular the equipment using radio technologies (Wi-fi, Bluetooth etc.) allows for information exchange with the surrounding environment. New communication forms, as they are already enough introduced by web 2.0 technologies, are an added value for the public transportation stops which are beyond pure ticketing systems and timetable information. New forms of interactive displays or screens and their

compositions are available to the project for investigation with regard to the user friendliness for different age groups and user groups.

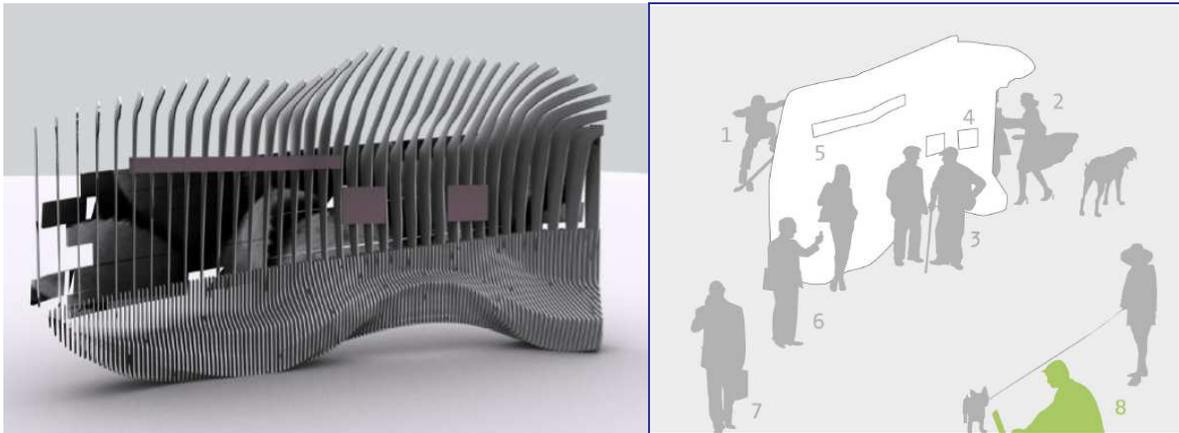


Figure 2 Bus Stop MIT Design Lab – Paris Bus Stop: You can send SMS and MMS to the bus stop’s urban garden, a social networking application with a GUI in a garden metaphor. This application takes also the role of a neighbourhood specific concierge and a bulletin board for related posts.

To prepare and look at current state of the art information, a geographic information system (GIS) is used to collect, analyse and visualize state of the art information on public transport with respect to socio-demographic attributes and locational information. A GIS is used to spatialize quantitative and qualitative measurements to support decisions and visualize the findings of ‘Bus Stop 3.0’.

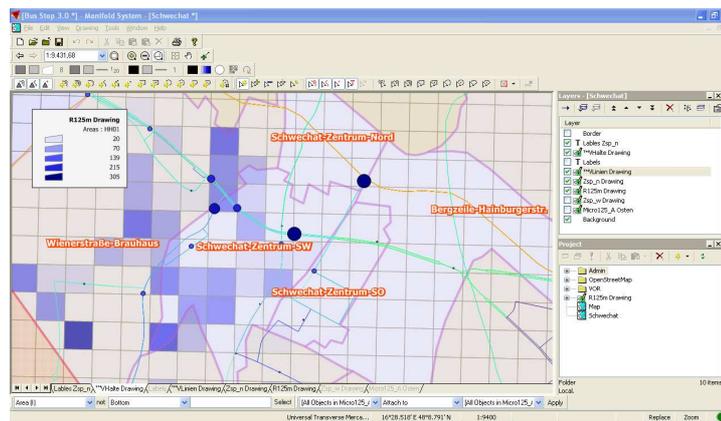


Figure 3 Bus Stop Services – SDSS (bus stop frequency/demography)

3 BEST PRACTICES

To further promote the importance of technology in improving the attractiveness of public transport, the authors collected best practice studies. Here you can see some examples for that:

User-Aware, User-Supportive Bus Stop

The scenario of a "Center for LifeLong Learning and Design (L3D)" originates in the vision that different technologies are collected to present information of various kinds (visually, auditive, tactile, by means of wireless connections), these may be timetables (“the next departure, have I missed the last coach?”), delay information and additional information about the route of the single lines. Thus possibly the mobile device of a passenger could already contain information about his driving aim; a personal route is generated, the coach driver to find the right way. At the end of 2008, the project is in the waiting loop, hence, a realisation of the prototype did not occur up to now.

Future Transport in Birmingham – „Developing our Intelligent Transport Systems Strategy“

The intelligent traffic system (Intelligently transport system, ITS) encloses the integration of information technologies and communication technologies in the transport infrastructure, vehicles and passengers. Information is collected and distributed to ease the orientation and choice of transportation to the passengers and to impact on the environmental consequences of traffic. Vehicle-based satellite navigation systems as belong to traffic light influencing facilities to ITS. Mobility, accessibility, less barriers and traffic jams are problem-afflicted in many towns. In the past, one built simply additional roadways; nevertheless, this process solved neither the problems nor reflects today's state of the technology. ITS offers possibilities to grasp the amount of traffic, to manage and to reduce thus the need of new roadway infrastructure. The use of the public transport becomes more attractive and saver for the passengers.

Bluespot – a digital Customer and City Information System (Wall AG)

Bluespot is a digital information system with manifold functionalities. Each terminal shows content relevant to the surrounding environment. Shops and institutions next to the public transport facilities are given a priority, other information, however, can be obtained from general services:

- Event information, shopping tips, restaurants and leisure time packages
- Schedules
- City mapping on your mobile telephone
- Free phone call services
- Free SMS for registered users
- Games and entertainment services
- Internet access

Being a registered user more options are provided. Most interaction is done via your mobile phone, including sending and receiving registration information.

An intelligent wireless bus-station system dedicated to disabled, wheelchair and blind passengers

The urban public transportation systems are usually not appropriate for disabled, wheelchair and blind passengers (DWB). This paper introduces the MobiPlus system that aims at improving the public transportation service so as to meet the needs of DWB. The MobiPlus system is an intelligent wireless bus station interactive system with the integration of multi-wireless techniques (RFID, ZIGBEE, Wi-Fi, and GPS). It consists of three subsystems: DWB detection subsystem, wireless communication subsystem, and bus service subsystem. This study presents the design of the MobiPlus wireless interactive system at different levels, such as hardware, software and protocol, and also gives the function description of its three subsystems. Currently, this system has been implemented and is under evaluation in the city of Clermont-Ferrand, France.

4 LIVING LAB

The Living Lab of the city of Schwechat will serve in the development of scenarios also from the standpoint of the theoretical introduction of a possible prototype for an intelligent bus stop. The project will also document measures at the national level as to how an innovative "Bus Stop 3.0" can be formed such that it supports both the basic and additional functions and can be adapted to the social, demographic and economic changes. As a mid-range goal, the research will target the inclusion into the existing transportation concept of the city and aims thereby to make a sustainable contribution to the increased use of public transportation.

With such a „Living lab“, high-tech products can be developed in a completely new manner, namely under integration of the future users from the first minute of the process of development under protection of all ethical aspects. Besides, the Schwechat "research citizens" introduce their knowledge as well as their personal wishes, images and ideas for future products and enhance the findings of experts and scientists.

Today many things are technically feasible. The „Living Lab Schwechat“ allows technological innovations that correspond to the actual needs and wishes of the users. Hence, within the scope of the project prototypes of an intelligent bus stop are developed and tested by the research citizens with support of the scientists to be further improved. The Living Lab method is an important focus of the city of Schwechat.

5 ONLINE QUESTIONNAIRE

To interact with bus stops using state-of-the-art technology in general and mobile devices in particular is essential for a “Bus Stops 3.0”. In March and April 2009, users and potential customers are invited to participate in an online questionnaire to find out about their wishes and needs (http://www.ceit.at/bus_stop.html). Target groups of public transport were identified beforehand. Focus groups increased the understanding of the user requirements for such an online questionnaire. The main target groups and their characteristics as well as their requirements are:

- Students are young and usually show a high learning curve. The need to get attracted public services while young. The best way to do this is to listen to their wishes and analyse their requirements. The findings of a previously held focus group resulted in surprisingly similar wishes as are talked about by elderly people, including tables, safety buttons and weather protection.
- Senior citizens share a tremendous knowledge on earlier times, when bus stops were of greater importance than today. They, however, show a great affinity towards cars and have to be ‘convinced’ again to use public transport. The use of new technology makes it additionally challenging to analyse the user group requirements.
- Entrepreneurs show a great interest in new services at bus stops, since their target groups can be probably reaches with appropriate advertisement. Given the vast amount of technological opportunities, it will become necessary to invest more research in socially acceptable technological innovations to provide sustainable product placement (digital signage development).

Non-public transport users are also addressed. Evaluating the online questionnaire might reveal wishes and needs for non-public transport users to get attracted (again) by public transport. All results of the various focus groups will be presented in the final documentation. Given the knowledge and interest of the focus group, a questionnaire has been set up and is available online (german only). There are questions on the general use of bus stops as well as on the possible use with new technologies.

FRAGE 13: Welche zusätzlichen Informationen bzw. Unterhaltungsmöglichkeiten möchten Sie an einer Haltestelle vorfinden? (Mehrfachantwort möglich)	
<input type="checkbox"/> Internetzugang	<input type="checkbox"/> Werbespots lokaler Geschäfte
<input type="checkbox"/> Informationsstelle der Gemeinde (mit eGovernment: z.B. zum Ausfüllen von Formularen)	<input type="checkbox"/> Einkaufsmöglichkeiten (Werbeeinschaltungen, Online-Shopping)
<input type="checkbox"/> Interaktiver Stadtplan	<input type="checkbox"/> Nachrichten
<input type="checkbox"/> Interaktive Spiele	<input type="checkbox"/> Darstellung von Umweltangaben (z.B. Ozon-, Luft-, Lärm-, Feinstaubwerte)

Figure 4: Sample question of online questionnaire (german only)

6 OUTLOOK

Basically all technologies used within the project already are available, technically sound and socially accepted. The pioneering innovation of „Bus Stop 3.0“ is based upon a special linking of these technologies to support the interactivity and communication at public transport stops to enhance social interaction in a local and regional community. The project is supported by local politicians, decision makers, commercial institutions, public transportation authorities and the local community and schools in the city of Schwechat. An important part is played by the citizen, who participates in the project within the framework of a ‘Living lab’. Technological innovation and social innovation are believed to go together to maintain a sustainable solution for public transport facilities.

7 ACKNOWLEDGMENTS

The project is funded within the IV2SPlus programme (ways2go-initiative) of the Austrian Federal Ministry for Transport, Innovation and Technology (BMVIT), the Austrian Research Promotion Agency (FFG) and is supported by Verkehrsverbund Ost-Region (VOR) and the city of Schwechat, Lower Austria.

8 REFERENCES (SELECTED)

Federico Casalegno: <http://mobile.mit.edu> (MIT mobile experience lab), 2006

- Center for Social Innovation (Hrsg.): Open Innovation - Instrumente und Strategien zur aktiven Einbeziehung von NutzerInnen und anderen relevanten sozialen Gruppen in technische Innovationsprozesse, Wien, 2008
http://www.zsi.at/attach/1Open_Innovation_Endbericht.pdf
- Paul E. Keel: Collaborative Visual Analytics: Inferring from the Spatial Organization and Collaborative Use of Information. In: IEEE Symposium on Visual Analytics Science and Technology, S.137-144, 2006
- Institut für Mobilitätsforschung (Hrsg.): Mobilität 2025. Der Einfluss von Einkommen, Mobilitätskosten und Demographie (IFMO-Studien). Berlin, 2008
- iQube.ch-Firmeninformation: Intelligente Fahrgastinformation. In: Bund und Wirtschaft X/3
(http://www.precimation.ch/pt/en/downloads/artikel/130303_de.pdf), 2003
- L. Höfler, H. Koch: Zukunftsfähiger und effizienter öffentlicher Verkehr für den ländlichen Raum. In: Österreichische Zeitschrift für Verkehrswissenschaft, Jg. 54., Heft 3-4, S: 13-25, 2007
- VCÖ (Hrsg.): Einfluss der Raumordnung auf die Verkehrsentwicklung. VCÖ-Schriftenreihe „Mobilität mit Zukunft“, 3/2007, Wien, 2007