Executive Summary

The high level objective of the measure was to increase the number of public transport users. To reach this objective, the operator has provided users of public transport with Real Time Public Transport Information (RTPI) about current trip and transfer possibilities in order to reduce a barrier to use Public Transport (PT).

Nordjyllands Trafikselskab NT (the Public Transport Authority of North Denmark) has implemented the on-trip bus information. The 50 buses operating in the CIVITAS ARCHIMEDES corridor were equipped with flat screen monitors, giving the passengers real time information regarding the current trip including the forthcoming bus stops, which routes the passengers can transfer to at these stops and real time information regarding the routes that they may be connecting to. Prior to the implementation of this measure, NT carried out a pilot-project that consisted of installation of flat screens on a selected bus line. Besides the public transport information screens show news, weather information and advertisements. Based on the experiences and user feedback during the pilot, specifications for the on-bus information system were incorporated into the tender for public transport in Aalborg.

After the installations and tests were finished in the fall 2010, the system has been in operation and has only had minor problems. The on-bus information system is an information channel whose prime function is to deliver existing Real Time Information on next bus stops etc. to the passengers. The success or failure of the system is therefore dependent on the reliability of the underlying RTPI system and the quality of the information in the system.

Some results: The user surveys show that almost all passengers consider the screens and information as a service improvement and are satisfied with the way the information is presented. Almost two thirds of the passengers think it is allright that advertisements are shown in between the information. The advertisers have welcomed the opportunity and the results for these advertisers have predominantly been positive. For the advertisement agency the ads impressions are also positive but economically the bus screens have not yet had the expected turnover.

The measure was already upscaled from the 50 buses operating in the CIVITAS corridor to the 100 buses from Nordjyllands Trafikselskab. A further up-scaling in Aalborg is therefore not possible. Nordjyllands Trafikselskab continues to promote the solution to the rest of the region and it is its ambition that most of the 300 buses throughout the region will have bus screens by the end of 2012.

The system will also be expanded with further information from local service providers such as Visit Aalborg, the Sportsarena etc. and with new types of (dynamic) information such as real-time information on train and flight connections to and from Aalborg being displayed on relevant bus lines. The demonstration system is expected to continue after the end of the ARCHIMEDES project.

Regarding the process a couple of recommendation can be given to other cities. First, a clear devision of responsibilities between the contractors, news provicers, PT, etc. is necessary in order to get the cooperation to work. To give the passengers the best possible experice the bus driver has an essential role. An optimally solution requires that the bus driver detects errors in the bus and reports it. Second, an important prerequisite for a successful project is good and valid data. It is important to have a clear strategy for this work and with more and more systems who are interdependent, it is important that data is collected and maintained in one place.

A   Introduction

A1.1 Objectives

The measure objectives are:

  (A) High level / longer term:

  - To increase the number of users of PT.

  (B) Strategic level:

  - To increase satisfaction among users of PT.

  (C) Measure level:

  (1) To provide users of public transport with RTPI about current trip and transfer possibilities in order to reduce a barrier to use PT.

  (2) To demonstrate whether on board bus-trip information will lead to increased user satisfaction.

A1.2 Target groups

The measure is to be implemented in all buses servicing the corridor.

The target groups of the measure are:

- Present users of PT – the measure represents a new way they can get information during their journeys.

- People not familiar with the PT system (including tourists) – the measure provides information during the journey. For people not familiar with the PT system the information can be a way to secure that they get off on the right bus stop.

A2   Description

On-board information on delays, connections, access to further data (via mobile phones) etc. is expected to give the traveller "ease in mind" and contribute to raise the image of PT.

Nordjyllands Trafikselskab NT (the Public Transport Authority of North Denmark) implemented on-trip bus information. The 50 buses operating in the CIVITAS ARCHIMEDES corridor were equipped with flat screen televisions, giving the passengers real time information regarding the current trip including the forthcoming bus stops, which routes the passengers can transfer to at these stops and real time information regarding the routes that they may be connecting to. NT decided to equip also the remaining 50 buses driving in the city with flat screens.

The ARCHIMEDES project contributed to purchase and installation of flat screens as well as upgrading of the bus computer system to handle data for the flat screen (budget ~114,000€). The measure is co-financed commercially by also showing advertisements, news, weather forecasts etc. in between PT information.

Prior to the implementation of this measure, NT had planned a pilot-project. The pilot-project consisted of installation of flat screens on a selected bus line during summer 2009. The objective of the pilot-project was to test the user interface and the passengers´ acceptance.

A3   Person in charge for evaluation of this measure

Name of person   Lars Thomsen

Name of organisation   NT

Direct telephone   +45 9934 1194

e-mail   let@ntmail.dk

B   Measure implementation

B1   Innovative aspects

The innovative aspects of the measure are:

- **Installation of monitors in buses providing the passengers with RTPI on current trip, locally** – The measure tests the use of monitors as information source during the bus journeys. The measure has tested whether on board information will lead to increased user satisfaction.

- **Information directed at users of PT** – The measure focuses on users or potential users of public transport. The measure results in an improvement in the way information about PT can be reached.

B2   Planning of Research and Technology Development Tasks

Not relevant.

B3   Situation before CIVITAS

Although priority is granted to public transport in Aalborg, delays do still occur and passengers still miss their connections. Uncertainty about departure times and possible problems in reliability prior to and on public transport trips are some of the barriers that can discourage potential passengers from using Public Transport. On-board information on delays and connections, and access to same kind of information prior to entering the bus (via mobile phones ARCHIMEDES measure AAL 68) was expected to lower these barriers and give the traveller "peace of mind". Another benefit is that the system contributes to improving the image of public transport and thus helps public transport to appear as an attractive alternative.

B4   Actual implementation of the measure

In this measure, information on the current journey (e.g. up-coming bus stops and overall destination) are shown on the information screens in the 100 city buses from NT. The information on the flat screens is based on NT's Real Time Passenger Information system (RTPI). The screens show information on the current trip as the destination for the trip and the three upcoming bus stops at all time. News, weather forecasts, advertisements and public transport information are shown alternately. In addition, transfers and connections information will be shown in the next phase.

Of the 100 city buses, 50 buses operating in the CIVITAS ARCHIMEDES corridor are financed with the support of ARCHIMEDES, whereas the remaining 50 city buses are financed by NT. The ARCHIMEDES project contributes to the purchase and installation of flat screens as well as the upgrading of the bus computer system to handle data for the flat screens.

Stage 1: Investigation of state of the art and pilot project *(December 2008 – December 2009).*

The technical possibilities and the state of art within the field of were investigated. The planning and pre-data collection phase started in winter 2008 with a working group consisting of the ARCHIMEDES' measure leader, two persons from NT and a traffic planner from the Department for Sustainable Development of the City of Aalborg.

In 2009, NT initiated a pilot-project on one selected bus line to test the system and to gather user evaluations as input to the final system. The pilot project consisted of installation of software and two flat screens in 6 buses in the end of June 2009. After the pilot project, experiences about the user interface and the passengers' acceptance were collected with the help of a questionnaire in November 2009.

Combining on-screen information with loudspeaker announcements of up-coming bus stops was consequently chosen to provide infrequent traveller, elderly or disabled people with more adequate information.

Stage 2: Producing requirement specifications *(November 2009 – February 2010)*

NT produced requirement specifications to secure the bus companies provide the sufficient equipment. Specifications for the on-bus information system were incorporated into the tender for public transport in Aalborg.

Stage 3: Design of the system *(February 2009 – August 2010)*

A system design was developed based on the requirement specifications. The new contracts became effective from end of June 2010.

In the contract, the responsibility for keeping the system running was shared between NT and the bus operators (Arriva and CityTrafik). The operators installed and maintained the screens and were paid a dedicated amount for this. NT delivered the centralised and decentralised system which manages the content of the information.

During summer 2010, companies interested in advertising on the flat screens were contacted.

Stage 4: Implementation of the system and communication *(June - September 2010)*

Installation of the two information screens in the 100 city buses was finished in September 2010. There were still a few minor software problems, but by October 2010 all the information screens were running without problems. The screens are now displaying news, weather forecast, and advertisement along with information about the upcoming bus stops (figures 1-4).

An interface was created that allowed RSS[1] news to be read by the BusPC and integrated on the screens. Agreements were reached with the local media to deliver a special bus RSS newsfeed tailored for the use in the bus, where for example links were removed. The RSS feed is delivered once per hour to the buses via GPRS communication (data communication over a mobile phone network).

The commercials are delivered from an advertising company in the form of readymade JPGs, WMV or other standard file formats. Communication is over GPRS. All files are transferred during the starting up of the bus and news files are transferred to the buses during the day.

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[1] RSS is a family of <u>web feed</u> formats used to publish frequently updated works—such as <u>blog</u> entries, news headlines, audio, and video—in a standardized format.

Figure 1: News display (the upcoming bus stops and the destination are always displayed)

Figure 2: Weather forecast display (the upcoming bus stops and the destination are always displayed)

Figure 3: Advertisement display (the upcoming bus stops and the destination are always displayed)

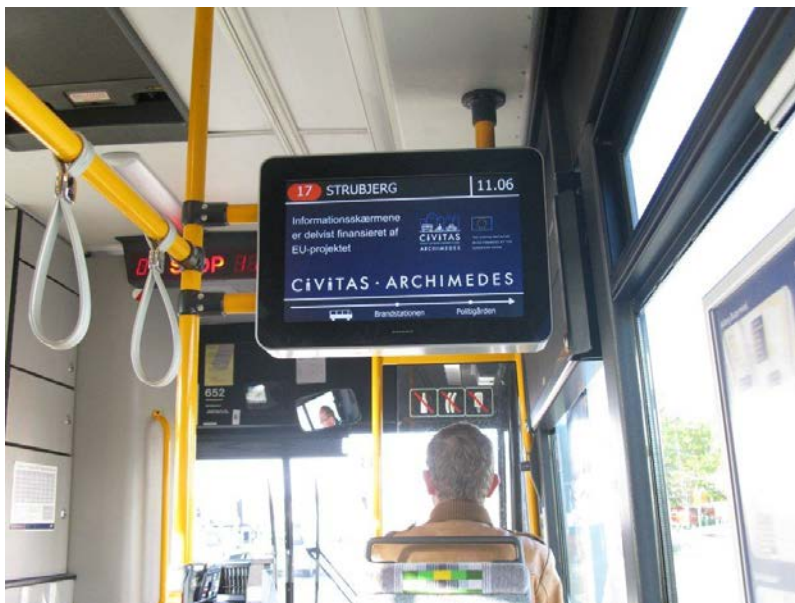| Measure title:	**On-trip Bus Traveller Information in Aalborg**	
City: **Aalborg**	*Project:* **ARCHIMEDES**	*Measure number:* **69**

Figure 4: Splash screen - The information screens are partly financed by EU CIVITAS ARCHIMEDES (the upcoming bus stops and the destination are always displayed)

In a press release NT announced that "all of Aalborg city, metro and service buses service will be equipped with information screens and real time passenger information" (NT press release, January 22, 2010). The local TV channel (P4) brought a short story about the information screens in the buses (figure 5).

Figure 5: TV article from P4, July 2, 2010

The screens allow dissemination of different ARCHIMEDES measures. For instance were campaign movies on the "Take Me Home" mobile phone application launched in October 2009 (Measure AAL 68). In November 2010, a SMS competition with riddles ran as a campaign on the screens to attract attention to the screens and in this way to disseminate the knowledge about the measure.

In addition, four large screens showing similar information were set up in the waiting room of NT.

Stage 5: Evaluation *(November 2010)*

For the evaluation, an after questionnaire was conducted in November 2010. The questionnaire undertaken was similar to the one implemented during the pilot test in 2009. The goal was to make a comparison to the first questionnaire and to evaluate if the changes made in the final system have further improved satisfaction with the user interface and the passengers' acceptance.

B5   Inter-relationships with other measures

The measure is related to other measures as follows:

- **Measure AAL 9** – Modernising Travel Information: This measure includes modernising the homepages concerning PT. Information about the monitors in the buses will be included as part of the new homepage.

- **Measure AAL 68** – Pre-trip and On-trip Mobile Phone Information in Aalborg: Both measures focus at improving the way information about PT can be reached.

C   Planning of Impact evaluation

C1   Measurement methodology

C1.1 Impacts and indicators

The high level/longer term objective of the on-trip bus traveller information is to increase the number of people using PT. This has been evaluated on city/corridor level where passenger counts were conducted.

The indicators chosen for this measure reflect that there are several steps to obtain this objective. First, the on-trip bus traveller information has to function as intended. This was captured by looking at the service reliability and operation statistics.

Second, the users' perception of the service needs to be positive this was measured by looking at the acceptance of the service and the perception of the quality of the service. Increased user satisfaction is seen as a step towards increasing the number of people using PT.

C1.1.1   Selection of indicators

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
	ECONOMY					
		Benefits	Commercial interest	Commercial interest in adding information	Number of sold commercials	No, commercial minutes sold, quantitative, derived or measurement
2a		**Costs**	Operating costs	Operating costs	Costs per km	Euros/per km, quantitative, derived or measurement
	SOCIETY					
14		**Acceptance**	Acceptance	Acceptance level	Attitude survey of current acceptance of the measure	Index (%), qualitative, collected, survey
	TRANSPORT					
19		**Quality of Service**	Quality of service	Quality of service	Perception of quality of service	Index, qualitative, collected survey.
			Service reliability	Accuracy of information provided	Number and percentage of the reliability of the service	No and %, quantitative, collected, measurement
			Occupancy	Number of passengers	Number of passengers on specific bus routes	Number

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
			Operation	Operation statistics	Down time of the service	Down time, No and %, quantitative, collected

C1.1.2   Methods for evaluation of indicators

No.	INDICATOR	TARGET VALUE	Source of data and methods	Frequency of Data Collection
()+2	Commercial interest +Operating Costs		The screens are expected to be co-financed commercially. The interest in this offer (number of sold commercial) and the costs in general was analysed.	Continually.
14	Acceptance level		Attitude survey of current acceptance of the measure among users of the public transport. The survey was conducted in buses equipped with monitors. Apart from focusing on the acceptance of the monitors, the survey also included data on the satisfaction of public transport in general. The survey addressed users of public transport in order to get a user group that potentially could use and know the service. The survey was conducted through questionnaires handed out in the buses. In total 500 questionnaires were handed out in the buses for each data collection. The response rate was 74% in 2009 and 42% in 2010.	2 times. (before and after the implementation)
19	Quality of service		Attitude survey of current acceptance of the measure among users of the public transport. The survey was conducted in buses equipped with monitors. Apart from focusing on the acceptance of the monitors, the survey also included data on the satisfaction of public transport in general. The survey addressed users of public transport in order to get a user group that potentially could use and know the service. The survey was conducted through questionnaires handed out in the buses. In total 500 questionnaires were handed out in the buses for each data collection. The response rate was 74% in 2009 and 42% in 2010.	2 times. (before and after the implementation)
	Accuracy of information provided		Statistics on the service were kept.	Continually.
	Operation statistics		Statistics on the operation were kept.	Continually.
	Number of passengers		Periodic visual passenger counts conducted on bus stop level. Counts were made on every third departure on the bus line. These manual counts	2 times

No.	INDICATOR	TARGET VALUE	Source of data and methods	Frequency of Data Collection
			focused at the development in the corridor and can be compared to the automatic photocell counts conducted continuously.	

C1.1.3   Planning of before and after data collection

EVALUATION TASK	INDICATORS INVOLVED	COMPLETED BY (DATE)	RESPONSIBLE ORGANISATION AND PERSON
Collection of data on agreements about commercials on the screens and operating costs. The data on agreements about commercials should include number of agreements and number of sold minutes.	Commercial interest, operating costs	M12 and onwards	Lars E. Thomsen, NT
Through the pilot-project the attitude and perception of quality among the users will be investigated.	Acceptance level, perception of quality	M12	Lars E. Thomsen, NT
Attitude survey of acceptance and perception of quality among users of PT – conducted in buses equipped with monitors.	Acceptance level, perception of quality	M27	Lars E. Thomsen, NT
Keeping statistics on operation and reliability.	Reliability of information provided, operation statistics	M25 and onwards	Lars E. Thomsen, NT
D12.2 Baseline and first results from data collection	All indicators	Month 34	
D12.3 Draft results template available	All indicators	Month 46	
D12.4 Final version of results template available	All indicators	Month 49	

Indicators on number of passengers have been covered by an overall analysis of the modal shift in the ARCHIMEDES corridor, developed across the measures.

C1.2 Establishing a baseline

Baselines for this measure are concerning two important aspects; **awareness** and **use** of the on-trip bus traveller information. The objective of the measure is to increase awareness of the services and to give the citizens the right information about public transport. Since the on-trip bus traveller information system in Aalborg is a new measure, these aspects will be revealed by using questionnaires among the target group during the pilot-test and the test after the implementation.

C1.3 Method for Business as usual scenario

Business as usual includes not establishing the on-trip bus traveller information. However, improvement of the way passengers can get public transport information is a general focus area and therefore a business as usual scenario is impossible to establish.

C2   Measure results

C2.1.Society

Acceptance level and quality of service

After the pilot project, experiences with the user interface and the passengers' acceptance were collected with the help of a first questionnaire in November 2009, where 368 persons responded.

The respondents showed a very positive attitude towards the information screens. Key results from this 2009 survey were as follow:

- 88% of the respondents liked the information screens.
- 87% of the respondents found it positive that news and weather forecast were shown as a supplemental to the traffic information.
- 91% supported the method of providing traffic information on screens in buses.
- 90% thought that the information screens were a service improvement.
- Only 15% prefer announcements of the next bus stop via loudspeakers instead of the screens. (40% would prefer the information both via screen and loudspeakers, whereas 50% would like only to have the screen information.)
- 63% supported that the screens show advertisement in between the other information.

In addition to evaluating the user interface, the pilot project provided experience in the operation of the screens, including the timing of passenger information and the combination with other types of information. Based on these experiences, specifications for the on-bus information system were incorporated into the tender for public transport in Aalborg.

The questionnaire was again conducted in November 2010, in this case 212 persons responded. The goal was to make a comparison to the first questionnaire and evaluate if the changes made in the final system have further improved satisfaction with the user interface and the passengers' acceptance. The respondents showed again a positive attitude towards the information screens, and there were only minor changes in acceptance. Key results from this survey were as follow:

- 83% of the respondents liked the information screens.
- 90% of the respondents found it positive that news and weather forecast were shown as a supplemental to the traffic information.
- 92% supported the method of providing traffic information on screens in buses.
- 71% supported that the screens show advertisement in between the other information. The acceptance of the advertisement has increased from 63% to 71%, possible due to the bigger variety of advertisement over time.

The two surveys have only been focusing on the information screens / content and there haven't been any questions concerning participant's background. This focus has been chosen in order to as much information about the passengers' acceptance of the screens as possible instead of investigating the background of the passengers. From the regular passenger surveys (done four times every year) figures shows that the general gender distribution between women and men are close to 60%/40%. Almost two thirds are under 20 year and the single largest group is the 16-19 years olds who account half of the passengers.

The first survey was meant to identify the systems scope and based on the pilot make a decision. Based on the answers concerning loudspeakers it was decided not to have this part with. Questions about sound were not relevant in the second survey. Notoriously people are more positive when the questions are formulated "would you like..." or "would it be a good idea ...." The ideas about information screens were presented a focus group and then the pilot in one bus line should ensure that passenger impressions were taken into account before the rollout to all buses.

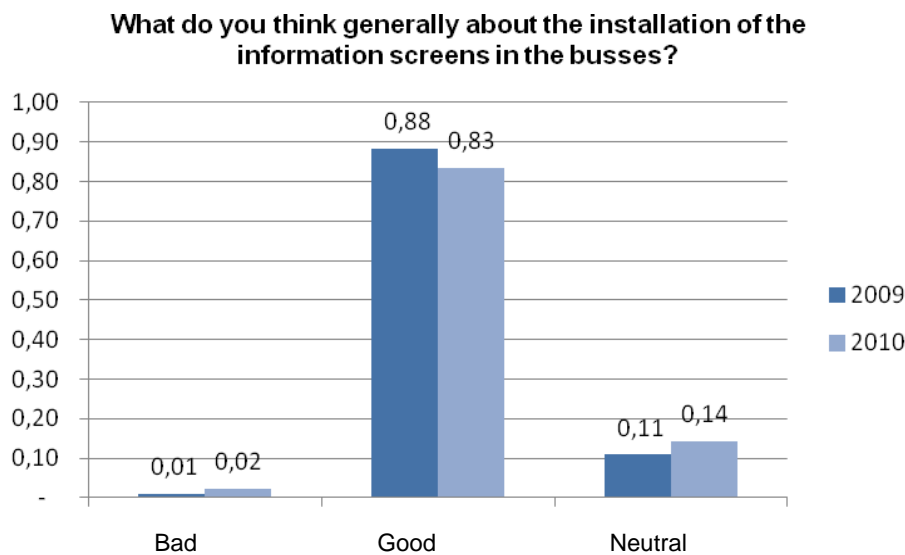The following figures show the results from both surveys:

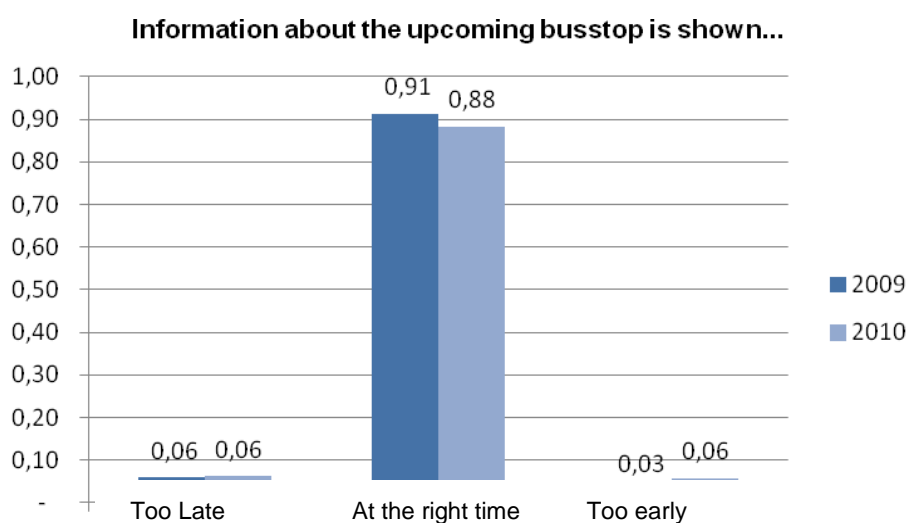Figure 6, General impression of the screens

Figure 7. Attitude to bus stop information

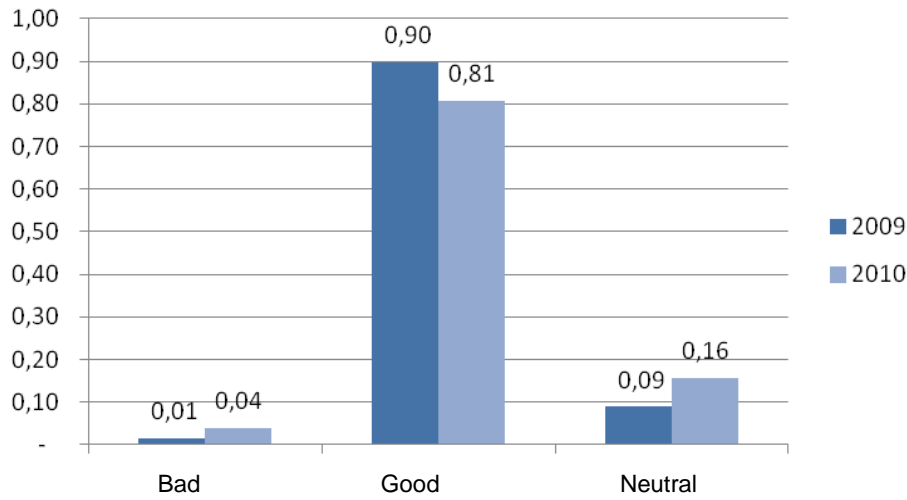### How do you rate the screens readability?

Figure 8. Attitude to the screens readability

What do you think about that the screens show news and weather forecast?
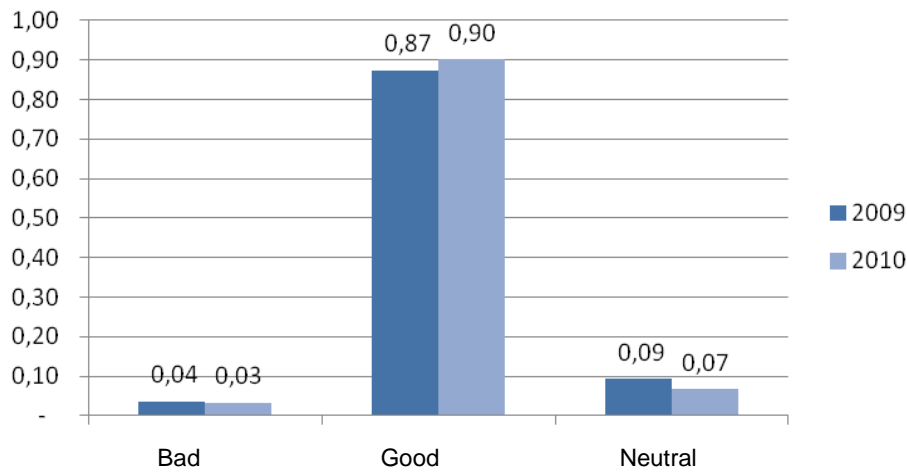

Figure 9. Attitude to news and weather forecast

What do you generally think about getting traffic information on screens in busses?
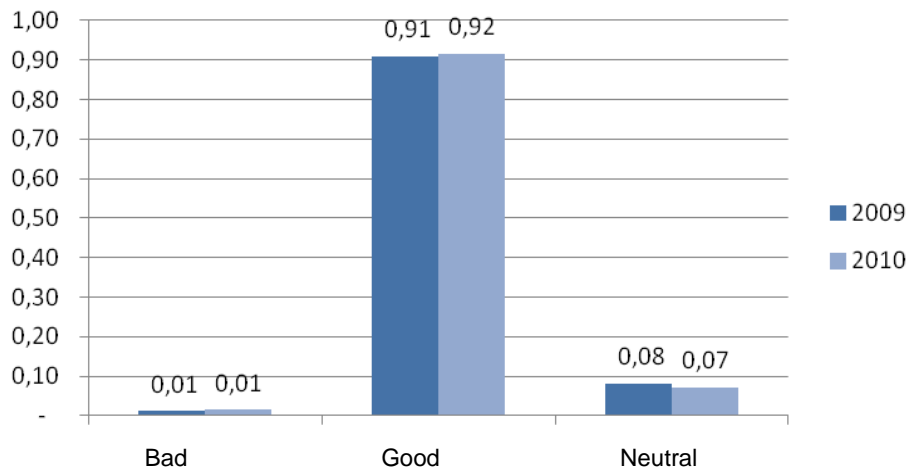

Figure 10. Attitude to traffic information

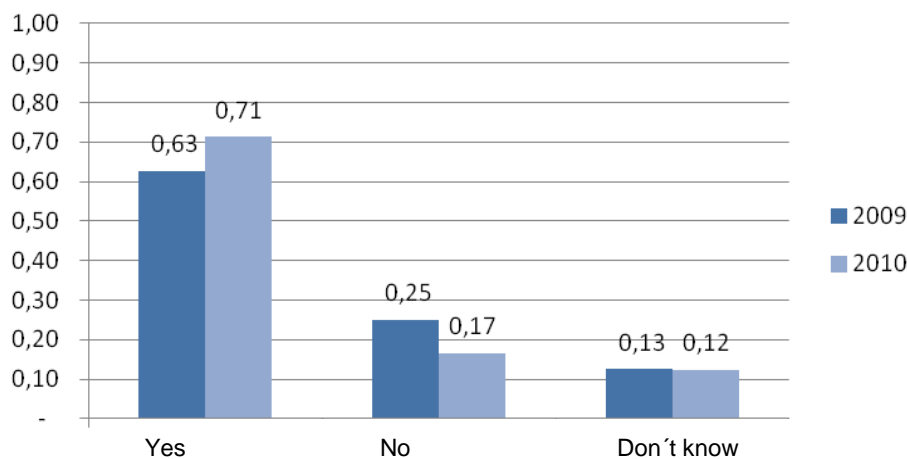## Is it alright that the screens show advertisement in between the other information?

Figure 11. Attitude to advertisement

It can be concluded, that the acceptance of the measure is very high and that the acceptance has improved slightly from 2009 to 2010. Even though the acceptance level is very high, there has been a minor decline in the general attitude towards the information screens from 2009 to 2010. This trend may be due to statistical uncertainty but may also be due to the novelty in the first study. As new initiative it is rated very positive, but after a period of time some people might be more sceptical towards the information screens and perhaps have had experiences where they didn't have enough time to read everything on the screens. Some of the feedback from the passengers has just been too much text on the screens or they change too quickly.

Table C.2.1.1 Society results

Indicator	Before	B-a-U	After	Difference:	Difference:

	(date)	(date)	(November 2010)	After –Before	After – B-a-U
No.14: Acceptance			83% of the respondents liked the information screens. 90% of the respondents found it positive that news and weather forecast were shown as a supplemental to the traffic information.		
Quality of the service			92% supported the method of providing traffic information on screens in buses. 71% supported that the screens show advertisement in between the other information. The acceptance of the advertisement has increased from 63% to 71%, possible due to the bigger variety of advertisement over time. On average a technician is called out in		

			1% in the buses every day - meaning for every 100 days of operation the computers and screens need to be serviced (see below).		

Accuracy of information provided & Operation statistics

Investment

The whole information system is built upon the existing bus IT infrastructure at Nordjyllands Trafikselskab. The information screens use the BusPC installed in all buses and the central AVL-system handles the communication to and from the buses. Cost has primarily been software upgrades to handle information on screens and installation of two screens in each bus. The SW-cost has been about 750 euro's per bus and two screens with installation have been about 2.100 Euros per bus.

Operating costs

For Nordjyllands Trafikselskab the information system hasn't caused increased operating costs. The system has been an addition to the existing system. The bus contractors might have had some extra costs to service the screens but it's not possible to estimate this.

Commercial interest

As mentioned above the passengers have a high acceptance of the more commercial oriented content on the bus screens. It's the general impression that a wide range of different traffic information, news and advertisements are giving the passengers the best possible experience. It's important that it isn't the same pictures that are shown continuously. In average there are about 50 different elements in rotation - though some are shown more often than others.

The advertisers have welcomed this opportunity and the results for these advertisers have predominantly been positive. There have been campaigns without the anticipated effect, but many other factors can also have had an influence on the results.

For the advertisement agency the impressions are also positive but economically the bus screens have not had the expected turnover. However, the purpose of the screens has been to implement them as an extra service for the public transport users and thereby increase user satisfaction. The economical crisis has affected the marketing budgets in all industries and the advertisers are not as risk tolerant as previously. At the same time NT as the transport authority has had a vantage club (NT inclusive) where frequent bus users obtain benefits in certain shops and restaurants. These companies have had the opportunity to advertise on the screens and it has been a competition to the advertisement agency. This problem has been minimized but according the advertisement agency the market has to increase considerably before the economy has reached a satisfactory level.

The company selling the ads has chosen to make the solution as simple as possible. The advertisers buy exposure for 7 days in all buses and it is also possible to buy the setup and production of the ads. An example of the price level at present (spring 2012) is that a package with 10 seconds views at least 25.000 times during one week costs around 950 Euros.

Operation

After the installations and tests were finished in the fall 2010 the system has been in operation and has only had minor problems. During the winter 2011/2012 there has been some challenges in the central system and this has had an impact on the screens in the busses. On average a technician is called out in 1% in the buses every day - meaning for every 100 days of operation the computers and screens need to be serviced.

The strategy of the whole IT-system has been an integrated system with different suppliers using the same data and infrastructure. A failure in one part of the system can have influence on the other parts even though they are in normal operation. To ensure the best possible performance all buses are being checked by **the** service personnel every night when the buses are being cleaned and prepared for the next day. In this exercise the screens are also checked and according to the service personnel in some situations they have to restart the unit controlling the screens - normally because there has occurred an error in the communication with the computer. NT is considering how one can secure that the systems can co-operate so if the systems for some reason do not start up at the same time they can subsequently make the right connection.

As mentioned there have during the last winter been some problems on the central side. The system is ongoing been enlarged. More than 300 buses are delivering real-time services and more than 150 buses have infotainment screens. NT expects that during 2012 all city buses in the 6 largest cities in the region and all regional busses will have screens installed. This places great demands on the central system and NT realized that the central system had to be up-scaled to meet these demands. The whole system became more and more sluggish and for example updates on the screens were more and more delayed - especially during rush hour in morning. A comprehensive analysis of every process has been carried out together with the suppliers and several successful initiatives have improved the performance and NT has intensified the daily monitoring so similar problems will not occur or at least can be handled before it develops into a problem.

Table C2.1.2: Costs Results

Indicator	Before (date)	B-a-U (date)	After (2012)	Difference: After –Before	Difference: After – B-a-U
No.2: Operating costs			The SW-cost has been about 750 euro's per bus and two screens with installation have been about 2.100 Euros per bus. The system has been an addition to the existing system. The bus contractors might have had some extra costs to service the screens but it's		

			not possible to estimate this.		
Benefits			In average there are about 50 different elements in rotation - though some are shown more often than others. An example of the price level at present (spring 2012) is that a package with 10 seconds views at least 25.000 times during one week costs around 950 Euros.		

Number of passengers

Indicators on number of passengers will be covered by an overall analysis of the modal shift in the ARCHIMEDES corridor, developed across the measures. This is included in appendix A.

C3   Achievement of quantifiable targets and objectives

No.	Target	Rating
1	High level / longer term: To increase the number of users of PT.	★★★
2	Strategic level: To increase satisfaction among users of PT.	★★
3	Measure level: 1) To provide users of public transport with RTPI about current trip and transfer possibilities in order to reduce a barrier to use PT.	★★
4	Measure level: 2) To demonstrate whether on board bus-trip information will lead to increased user satisfaction.	★★

<div style="border: 1px solid black;">

NA = Not Assessed   O = Not Achieved   ✶ = Substantially achieved (at least 50%)

✶✶ = Achieved in full   ✶✶✶ = Exceeded

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C4   Upscaling of results

The measure was already upscaled from the 50 buses operating in the CIVITAS corridor to the 100 buses from Nordjyllands Trafikselskab. A further up-scaling in Aalborg is therefore not possible.

Nordjyllands Trafikselskab continues to promote the solution to the rest of the region and it is the ambition that most of the 300 buses throughout the region will have bus screens by the end of 2012.

C5   Appraisal of evaluation approach

Using questionnaires is an obvious method when measuring the passenger's acceptance. The answers are based on the experiences out in the buses when the passengers are watching the screens and the content. Normally it can be difficult to make people fill out questionnaires, but in the bus people are seated and often have the time to give the answers.

Both of the surveys are after results. As described, an after questionnaire was conducted in November 2010. The questionnaire undertaken was similar to the one implemented during the pilot test in 2009. By haveing this approach, it has been possible to make a comparison between the first questionnaires and to evaluate if the changes made in the final system had further improved satisfaction with the user interface and the passengers' acceptance – for instance the acceptance of the advertisements improved from the first to the second survey.

To answer the question concerning the possible increase of the number of users of public transportation one can count the passengers. Several initiatives are implemented in the Archimedes corridor and it can be difficult to determine what influence one initiative have compared with the others. At the same time other factors may have influence in both positive and negative direction. For this measure the overall positive feedback from the passengers confirms that the screens are helping to improve the conditions for the passengers. Changes in modal split have been measured within the effects of the package of measures related with this is reported in appendix A.

C6   Summary of evaluation results

The user surveys show that the almost all passengers consider the screens and information as a service improvement and are satisfied with the way the information is presented. Almost two thirds of the passengers think it is allright that advertisements are shown in between the information. The advertisers have welcomed the opportunity and the results for these advertisers have predominantly been positive. For the advertisement agency the ads impressions are also positive but economically the bus screens have not had the expected turnover.

Indicators on number of passengers will be covered by an overall analysis of the modal shift in the ARCHIMEDES corridor, developed across the measures. This is included in appendix A.

C7   Future activities relating to the measure

The system will also be expanded with further information from local service providers such as Visit Aalborg, the Sportsarena etc. and with new types of (dynamic) information such as real-time information on train and flight connections to and from Aalborg being displayed on relevant bus lines.

The demonstration system is expected to continue after the end of the ARCHIMEDES project.

D Process Evaluation Findings

D.0 Focused measure

X	0	No focussed measure
	1	Most important reason
	2	Second most important reason
	3	Third most important reason

D1 Deviations from the original plan

There has not been any deviation.

D2 Barriers and drivers

The on-bus information system is an information channel whose prime function is to deliver existing Real Time Information on next bus stops etc. to the passengers. The success or failure of the system is therefore dependent on the reliability of the underlying RTPI system and the quality of the information in the system. As Nordjyllands Trafikselskab NT (the Public Transport Authority of North Denmark has a clear IT strategy for these matters and has been deliberately working on the data and IT infrastructure for some years, this has not been a problem in Aalborg. But attention has to be paid to this issue.

Securing a satisfactory uptime for the system can be another challenge, especially in the technically demanding bus environment. A clear division of responsibility for the different parts of the system is a prerequisite for success. In Aalborg, NT is responsible for the BusPC and the software where as the public transport operator is responsible for the uptime of the screens. This is a natural and sound division as it is the operator's employee, the driver, who is the first person to identify when the screens are not running.

As the system is an information system first, and a news and entertainment system second, it is important that the responsible organisation (the City or the Public Transport Authority), deliberately sets up the scheme so that information provision takes priority over news / entertainment. In Aalborg it was decided that the route destination and next stops should be shown all the time and that one third of the screen time should be reserved for traffic information.

During the project using sound on commercials and news was considered. It was decided to begin with a silent solution and to later test the impact of adding sound. In the meantime, experiences from a parallel system in the urban commuter rail system in Copenhagen have shown great discontent with the use of sound.

The final system became rather complex with a lot of parties involved (contractors, news providers, advertisement agencies, NT etc.). Therefore responsibility must be kept clear and internal and external interfaces must be open and simple. This requires a clear strategy and the willingness to simplify the system and keep traffic information the focus, if necessary.

The barriers and drivers are summarised in the following sections.

D2.1 Barriers

Preparation phase

- **Barrier** 1 – (Technological/Planning) The success or failure of the system depends on the reliability of the underlying RTPI system and the quality of the information in the system. A clear IT strategy for these matters is a precondition for success.

Implementation phase

- **Barrier 2** – (Organisational) The final system became rather complex with a lot of parties involved. A clear strategy and willingness to simplify the system and keep traffic information in focus is necessary to handle this.

Operation phase

- **Barrier 3** – (Involvement) The bus driver is the closest key-person towards the bus passengers. In the system setup it is not possible to monitor everything and e.g. a failure in a specific monitor requires that the driver detects the error and report it. Driver support and desire for the system to work is essential for the system to work optimally.

D2.2 Drivers

Preparation phase

- **Driver 1** – (Organisational) Focus at securing a clear division of responsibility between the different parts of the system.

Implementation phase

- **Driver 2** – (Planning) Possibility to lean against the experiences with using sound on the commercials from Copenhagen.

Operation phase

- No barriers experienced.

D.2.3 Activities

Preparation phase

- NT made a pilot in some buses: first, to evaluate the content partly to prepare for installation / planning in the best possible way. (Planning)

Implementation phase

- To get the right content on the screens, NT has repeatedly evaluated content in collaboration with different stakeholders. The content will continue to be developed based on coming feedback and new opportunities. (Planning)

Operation phase

- To ensure high performance (24/7), NT and contractors in cooperation have intensified the daily operation follow-up. Not only based on the infotainment but to ensure all systems towards the passengers. (Organisational)

D3 Participation of stakeholders

D.3.1. Measure Partners

- **NT, Public Transport Authority of North Denmark** - Responsible of the planning and implementation of the measure.

- **City of Aalborg –** Represented in the working group related to the measure.

D.3.2 Stakeholders

- **Bus Companies** – NT has set up the specifications for the requirements that the bus companies need to supply in the buses.

- **FARA** - FARA supplied the technical IT-solution that the system is built upon.

- **Organisations that want to advertise on the flat screens** - The system is be co-financed by organisations interested in advertising on the flat screens. The commercials are shown in between PT information.

D4   Recommendations

D.4.1 Recommendations: measure replication

- **Recommendation 1 -** Information technology is a rapidly growing area. To succeed and ensure future-proof solutions it's important to aim for open and standardized systems. New opportunities arise all the time and it is important to have a system that can easily and simply fits in new opportunities. A clear IT strategy is a precondition for success

- **Recommendation 2** – Passenger surveys shows that information screens are being well received. It's important that the content is adapted this media so the amount of text and the transition time between each picture is appropriate. If this isn't well balanced it can cause irritation because not everyone reads the same speed.

- **Recommandation 3** - Experiences from aalborg shows that the income from commercial advertisers currently not can cover the investment. Better information for passengers requiring public investment. Securing a sufficient number of organisations interested in advertising on the screens demands an information effort.

D.4.2 Recommendations: process (related to barrier-, driver- and action fields)

- **Recommendation 1 -** Clear devision of responsibilities between the contractors, news provicers, PT, etc. is necessary in order to get the cooperation to work. Finally to give the passengers the best possible experice the bus driver has an essential role. An optimally solution requires that the bus driver detects errors in the bus and reports it.

- **Recommendation 2** – An important prerequisite for a successful project is good and valid data. It is important to have a clear strategy for this work and with more and more systems who are interdependent, it is important that data is collected and maintained in one place.

Appendix A

ARCHIMEDES corridor - Number of passengers from 2009 to 2011

For the part of the ARCHIMEDES corridor in the region of the University the modal split impact of ARCHIMEDES is expected to be: 2-4% less use of car among the students and employee reference groups; 1% annual increase in public transport use; and a 5% increase in cycling.

In order to investigate these objectives, two counts of bus passengers have been completed. This document will summarize the results of these counts and across measures conclude on the effects of ARCHIMEDES on the use of public transport.

Methodoly

The passenger counts have been carried out before and after all measures were implemented. The first counting was made in the period 26 October to 8 November 2009 while the second counting was made in the period 9 November to 20 November 2011. All passengers entering and exiting the buses were counted manually at every bus stop for every second or third departure during daytime.
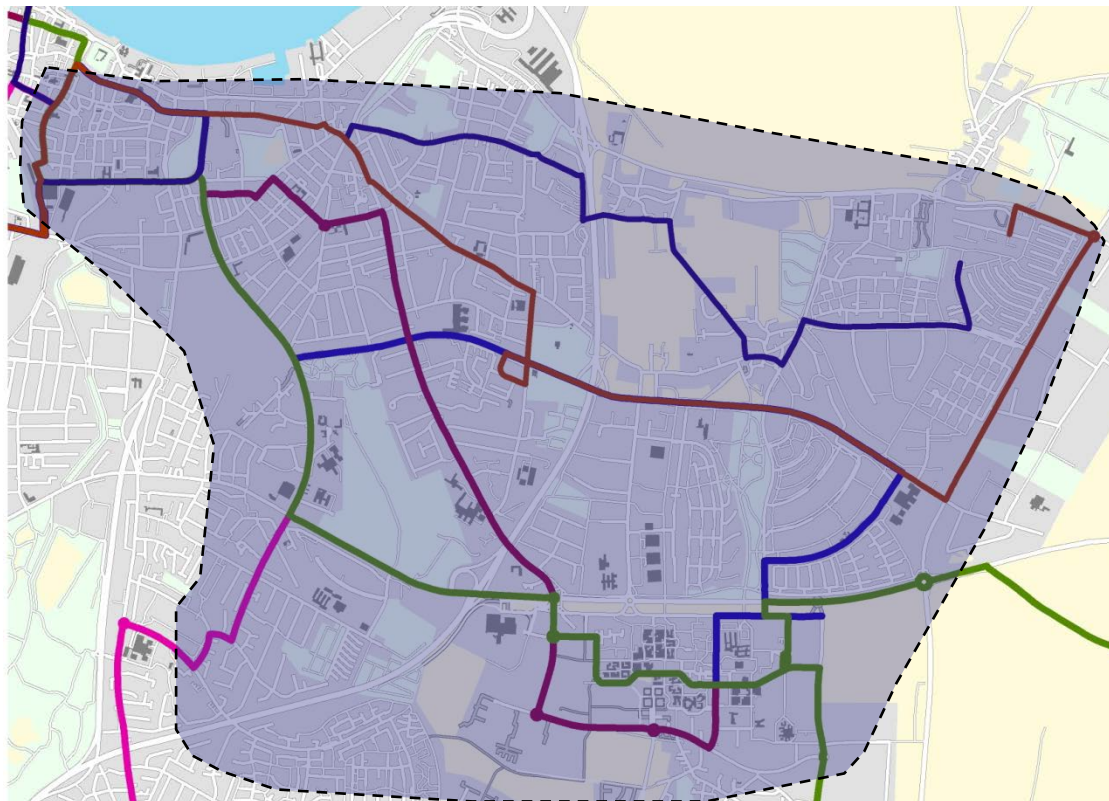

Figure A.1 Bus lines within CIVITAS corridor

The following bus lines are included in this analysis: Bus line 2, 11, 12, 14, 15 and 17. On the map the counting area within the ARCHIMEDES corridor is marked together with the bus lines going through the corridor.

The operational level has been almost the same throughout the period apart from the number of extra buses used.

Results

The overall result shows that there has been an increase of 6.2 % in the number of passengers from 2009 to 2011.

There has been an increase in the number of passengers on all bus lines except bus line 2. An explanation for this might be that during rush hour there was a larger number of extra buses in 2011 than in 2009 and therefore the number of passengers that use the normal buses are spread out to more buses. We have not counted the number of passengers using the extra buses, but based on experiences a plausible estimate is that the number of passengers in average is 30 pr. extra bus. When including this number of passengers from the number of extra buses in both periods there have been an increase of 6.2 % in the number of passengers in the corridor.

	2009	2011	Change in %
Line 2	15,483	13,624	-13.6
Ekstra buses	1,200	3,450	
Line 11	5,258	5,469	3.9
Line 12	7,455	7,766	4.0
Line 14	5,996	6,513	7.9
Line 15	4,727	4,809	1.7
Line 17	5,464	6,767	19.3
Total	45,584	48,399	6.2

Table A.1 Compared results of counts 2009-2011

Appraisal of Evaluation Method

The counts include both entering and exiting passengers, in order to make sure that all passengers are counted. This could be a source of error if there had been a significant change in the way the passengers travel in or across the corridor from 2009 to 2011. We have no indication of such a change.

Counting passengers is a resource demanding task if you do not have an automated system. As we do not have unlimited resources, we had to limit the number of trips and the period of time that we counted. We have counted every second or third trip and calculated the total number from these. The passengers are not necessarily evenly distributed between the different trips, and this could also be a source of error. As the counted trips are randomly chosen based on which trips the counters could reach, there should be no such systematic error.

The two periods in which we have counted are not exactly the same, but they are so close that we don't think this has a significant influence on the result.

In addition to these sources of errors there are a number of externalities that also could influence the result.

The weather is an important factor in Denmark, because a lot of the bus passengers choose to walk or ride their bike when the weather is fine, but when the weather is cold or rainy they use the bus. We have only counted the passengers over a relatively short period of time, and if there have been more cold or rainy days one year than the other, this will affect the result. If we should compensate for that it would require a lot more counting.

One of the other measures in the corridor is improved bicycle lanes from the city centre to the university. This can also affect the number of passengers that use the bus, if they choose to ride bicycle instead of the bus. This is of course a good thing, but it will affect the number of passengers that use the buses.

Establishing a baseline for comparison

The only passenger counting system we have in Aalborg is an old, simple automatic system that only detect entering passengers but not where, when or on which bus line. Counting from this system indicates that there has been an increase in the total number of passengers in the buses on 7.5% for the whole network. The results of the passenger count in the ARCHIMEDES corridor and this number is not comparable since they are made in two very different ways and with different purpose, but they can give an indication of a positive development in the whole city.

The Public Transport related measures that have been implemented on the bus lines in the corridor have later been extended outsides the corridor by the PT authorities, and is supposed to have same positive effect outsides the corridor as in the ARCHIMEDES corridor. Therefore it is not possible to establish a genuine 'business as usual situation' for documenting the positive effect in the corridor.

Conclusion

Compared to the number of passengers in 2011 to 2009 the numbers have risen by 6.2% or 3.1% a year. This is well above the goal of 1% a year.

Trying to use the numbers of passengers on the rest of the network as a 'business as usual' is not possible, partly due to differences in the counting methods, partly due to the fact that the ARCHIMEDES improvements done in the corridor, later is extended to the rest of the system.