ICT SOLUTIONS FOR IMPROVING LONG DISTANCE PASSENGER MOBILITY – SPECIFIC CONDITIONS AND IMPLEMENTATION BARRIERS IN RURAL AREAS

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ABSTRACT

ICT solutions in passenger transport are frequently perceived as a mean to ensure better efficiency of transport system while producing positive effects on mobility, environment and economic growth. However introduction of ICTs requires certain level of technology, social acceptance and economic viability. Although those criteria are usually easily met in large urbanized areas and in regions with high GDP levels they are less likely to be fulfilled outside of the metropolitan areas. This paper analyzes social and economic barriers in adapting ICT solutions in rural regions. Specifically we explore the problems encountered by transport organizers and providers in introducing ICT within those rural areas of the European Union which have GDP below average and are not primary vacation destinations. Based on the field work results conducted in one of those rural regions we conclude that even in this type of area there is significant need for ICT solutions. We further discuss the possibilities of introduction of those features into the transport system in view of unwillingness to adapt on the user part and possible financial barrier. Conclusions are formulated in order to assist transport policy makers, regulators and organizers in developing viable ICT solutions in rural areas.

This paper is based on outcomes of COMPASS (Optimised co-modal passenger transport for reducing carbon emissions, project co-funded by the European Commission within the Seventh Framework Programme), http://www.fp7-compass.eu/.

Keywords: ICT, ICT in rural regions, acceptability of ICT solutions in transport, efficiency of transport system.

INTRODUCTION

One of the COMPASS method to assess ICT solutions is case study. ICT solutions have to be tested in practice in order to assess their real impact on transport system and user behaviour. This could be achieved by in-depth research of selected case studies across Europe. COMPASS selection procedure enables to cover wide range of differentiation in specific dimensions (Bak et al, 2012).

One of the dimension is the classification of solutions developed in COMPASS project. Six categories of solutions are: 1) Transportation Management Systems;2) Traveller information systems, 3) Smart charging, 4) Vehicle-to-infrastructure (V2I) applications, 5) Vehicle-to-vehicle (V2V) applications and 6) Demand responsive transport services.

Another dimension is the geographical background. The differences between regions lead to different reception of ICTs by local citizens, authorities, transport organisers and planners. For those reasons practical tests of different ICT solutions have to be conducted in varied environments. For the purpose of differentiation of possible setups in which ICTs could be used in transport possibly broad range of regions has to be checked. Regional differentiation for selection of case study locations is based on major factors which are responsible for creating regional differences. Among those factors the following most important features must be considered:

1. Economic factor.
2. Geographic factor.
3. Culture/tourism factor.

Economic factor is represented by GDP per capita indicator. The rationale behind its selection is that it allows for establishing which regions are wealthy and which are poor in regard to EU average. This criteria has significant impact on possibility for ICT introduction. ICTs are usually capital intensive tools and as such are more likely to be considered by transport planners and organizers active in wealthy regions. Lack of capital, general poor financial ability of transport users have been often perceived as serious barriers to the introduction of ICTs.

Geographic factor is represented by number of features impacting the need for ICT solutions. Among those accessibility is crucial as it is often a function of peripherality. As such it dictates the need for efficient long distance travel and increases need for ICT solutions improving long trip. On the other hand core areas tend to be heavily congested thus needing ICT solutions allowing better handling of large numbers of passengers using transport in

short periods of time. Different ICT tools are necessary for urban and rural areas. Here the differentiation should be even more detailed as metropolitan areas tend to create different demands on transport system than cities. Similar distinction could be drawn between rural regions close to the cities and those which are remote.

Culture factor has strong impact on the behaviours of users. Culture when it manifests itself by various national heritage sites or through historical landmarks impacts tourism. Areas which happen to be main touristic destinations require more ICTs and more advanced ICTs to handle increased traffic and very diverse needs of international travellers. The indicators representing above mentioned factors are applied to the proposed case study locations and resulting analysis allows for selection of most differentiated setups for detailed study.

The resulting multilevel matrix allows for selection of best fitting case studies. One of the COMPASS case studies is located in the North-Eastern part of Poland. We use data collected on user behaviour and user needs and confront this with stakeholder's view on use of ICT solutions (based on interviews and surveys of transport managers and organisers) and conduct comparative assessment of user (client) perspective versus transport organiser/provider perspective (Bak, Borkowski, 2012). Then we assess ICT solutions implementation in regard to: economic/financial viability, user benefit vs. user cost, transport provider benefit vs. transport provider cost, user acceptance, technical capability. In addition it enables to conclude on a given solution's transferability.

CHARACTERISTICS OF ICT SOLUTIONS

Concerning the relationships between ICT solutions and seamless co-modal trips, the identified ICT solutions and technologies have shown significant potential in favouring co-modal seamless solutions. More transport safety (through cooperative applications), a better environment (through transport management tools) and accessibility (in particular the development of Demand Responsive Transport (DRT) services) benefit from the extensive implementation of ICT applications. The resulting classification has led to the identification of six categories of ICT based applications:

1. Transportation Management Systems, helping to plan and run efficiently the transport system.

2. Traveller information systems, in which the key characteristic is to assist the traveller with several basic information (travel time, routes, traffic conditions, etc).

3. Smart ticketing and tolling applications, addressing new ways to get tickets and to pay for using transport services.

4. Vehicle-to-infrastructure (V2I) applications, which can be generally defined as wireless cooperative interaction between vehicles and infrastructure, based on systems that can improve safety and traffic management .

5. Vehicle-to-vehicle (V2V) applications, leading to tighter integration among vehicles operations and disclosing a wide range of important transport services to the traveller, in particular concerning safety, mobility and efficient infrastructure use.

6. Demand responsive transport services (DRT), which provide a mechanism whereby passengers can be picked up and dropped off at their chosen locations, at a price usually associated with fixed route bus services.

This classification largely corresponds to the six priority action areas of intervention considered as relevant for favouring the deployment of ITS at European level (EC, 2011). The below table 1 of correspondence shows that most of the EC key areas of intervention identified by the EC Action Plan six Areas for the Deployment of Intelligent Transport Systems in Europe are addressed by the ICT applications as identified in COMPASS project.

Table 1 COMPASS classification and priority areas of the EC Action Plan

EC Action Plan: six Priority Areas	Relations	COMPASS ICT solution classification
Optimal use of road, traffic and travel data		Transportation management systems
Continuity of traffic and freight management ITS services on European transport corridors and in conurbations		Traveller information Systems
		Smart ticketing applications
Road safety and security		Vehicle-to-infrastructure applications
Integration of the vehicle into the transport infrastructure		Vehicle-to-vehicle applications
		Demand Responsive Transport services
Data security and protection, and liability issues		
European ITS cooperation and coordination		

Source: (Enei R, 2012a).

The ICT based solutions can be analysed according to the following three objectives:

1. To identify the ICT solutions with potential in favouring seamless co-modal journeys.

2. To stress their role in favouring data collection and data management.

3. To provide indications how ICT based solutions can meet future passengers needs in the light of the likely future trends affecting transport demand.

The assessment of the COMPASS ICT categories of solutions with reference to their capability to influence the various aspects of the transport system, i.e. operations, in-vehicle monitoring and information to users, shows that the ICT based applications classified under the so-called Cooperative Systems (Vehicle-to-vehicle and Vehicle-to-infrastructure) appear to be the most promising. This comes not only from the high capability in providing information to travellers and allowing in-vehicle monitoring and control systems, but also from a good capability to influence the operation of transport systems, via the possibility for traffic management systems to communicate with individual vehicles, in order to optimise the overall network efficiency.

Concerning the potential for seamless integration across transport modes, important enabling applications are represented by smart ticketing options combining tariff information of several transport modes (smart cards) and traveller information systems, informing transport users on timetables and travel time (multi-modal traveller information systems). Table 2 presents the indications of the capability of the identified applications to:

1. To influence the operation of transport systems.
2. To allow in-vehicle monitoring and control systems.
3. To provide information to users of all transport systems.
4. To create the potential for seamless integration across transport modes.

Table 2 Uses of the different ICT categories

COMPASS ICT categories	Influencing the operation of transport systems	Allowing in-vehicle monitoring and control systems	Providing information to users (travellers)	Seamless multi-modal integration
Transportation Management Systems	√√√	√	√√	√√
Traveller Information Systems	√√	√	√√√	√√√
Smart Ticketing Applications	√√	√	√√√	√√√
Vehicle-to-Infrastructure Applications	√√	√√√	√√√	√√
Vehicle-to-Vehicle Applications	√√	√√√	√√√	√
Demand Responsive Transport Services	√√	√√	√√√	√√

The analysis is carried out according to the following qualitative assessment: low capability (√), medium capability (√√) and high capability (√√√).
Source: (Enei R, 2012).

Concerning the capability of ICT solutions to curb unnecessary passenger transport, it is not clear whether ICT acts as a brake or as an accelerator in what currently seems a relentless growth in the demand for passenger travel. Timely information on traffic conditions and interconnections (Transportation Management Systems), could reduce congestion (and emissions), but at the same time it might encourage other longer distance travel, like leisure travel by air or ship (most polluting transport means). The direct effects on transport may be some replacement of existing travel, but in the longer term new patterns of longer distance travel may appear as the ICT becomes embedded in lifestyles (Traveller Information Systems). ICT may allow people to live in remote parts of the European Union and to develop locally based travel patterns with occasional longer distance journeys to the city. The improvement of accessibility made possible by ICT, e.g. in rural areas, may be overcome, increasing the total transport demand by public transport modes or collective car services. The individual case study analysis can answer some open questions raised above.

RESULTS - THE USER REACTION TO THE PROPOSED ICT SOLUTIONS

The rural setting has its specific characteristics which strongly impact possible ICT options. The gap exist between user needs and transport service providers interests in regard to selection of optimal ICT solutions. On the user side there are several acceptability barriers like: lack of knowledge necessary to take advantage of more advanced ICTs or lack of access to mobile/computer based applications while for service providers economic viability is often questionable.

To answer those questions potential for introduction of several solutions was tested in one of the rural settings of the European Union – Warminsko-Mazurskie Region in North-Eastern Poland. Field research among users and non- users has been conducted in the area which is primarily serviced by coach transport. The research was based on statistically valid group of 300 users and non-users. Potential competitors to coach services in theory are rail and individual passenger cars. However frequency of rail services is low and destinations are very limited therefore only real competition is from the privately owned cars. In this setup ICT solutions could contribute to making public transport more efficient more user friendly and above all might provide competitive edge to the coach operators. While introducing ITC solutions into the particular mode of transport one has to remember that not all types of applications could be transformed into working solutions in all modes. ICT's are mode specific and might as well be region specific due to the social and economic constraints resulting from particular region characteristics.

In this rural region with rather low GDP level dominated by coach transport the following solutions were tested:

1. Internet based travel planners.

2. Electronic real time information at bus stops.

3. Ticket purchasing via mobile phones / internet.

4. Real time information on services via mobile phones / internet.

5. Real time information on estimated arrival times, stops, route on board of vehicles.

6. Demand responsive services - possibility for direct pick-up/delivery of passengers in response to prior demand.

Solutions were researched in terms of: user acceptance, usefulness, willingness to pay and competition against alternative modes (in this case alternative is mainly use of private cars).

Internet based travel planners

Internet based travel planners are considered very useful by 34% of potential passengers, useful by 29.6%, not too useful by 7.6%. As essentially necessary considers them 9.2% travellers while 19.6% considers them useless for their travel planning purposes.

Interesting observation could be made in regard to different distances. Importance of travel planners increases with the increase of distance it is considered necessary tool by only 5% of local (up to 40 km) travellers but by 14% of medium range travellers (40-100km) and 19% of long – distance passengers (more than 100km). Second grade – of very useful shows this trend even more, for local travel purposes it scores 29% while medium distance 44% and for longest routes it is 42%.

Age of user is one of the primary factors in acceptance of ICT solutions. This results from acquaintance with modern technology, deeply rooted behaviours of older users and knowledge of modern technology (internet and more advanced function of mobile phones). For the age group 15-18 years there were no responses stating that proposed solution is useless and only 2.4 % users considered it of little use with 9.5% considering it necessity, 47.6% very useful and 40.5% useful. In the age group 30-45 there were 1.8% answers indicating non-usefulness of proposed solution, 8.9% of respondents found it of little use while 23.2% deemed it necessary, 41.1% very useful and 25% useful. Next age group 30-45 years answered the following: not useful – 11.5%, of little use – 6.6%, useful -27.9%, very useful 44.3%, necessary 9.8%. This picture changes dramatically in older age groups. For those aged 46-60 solution was useless for as many as 33.3% of users and of little use to 14%. But still it was considered useful or very useful by 52.6% people. For the oldest passengers this ICT solution seems to be mostly unnecessary, an option scoring 64.7% answers.

Nevertheless high acceptance rates users in general are not willing to pay extra for this additional feature. On average 77% of all users decline to pay for this improvement. As might be expected opposition is strongest with shortest distances (where ticket price is rather low

and increase of even 1 EUR is very significant as compared to the ticket price). But even for long distance travel there are only 31% of potential users willing to pay. This data is consistent with age preferences. For youngest group of users there is only 62% unwillingness to pay noted while for oldest group it is 94%.

As regards modal shift there is visible impact of this ICT solution on shift from passenger car to the bus service. Those users who have access to passenger car were asked about their willingness to abandon it in favour of bus if travel planner is introduced. 21% answered that they would probably shift to bus with further 22% stating that they would do so on selected routes.

Electronic information at coach stations

Electronic real time information at coach stations is considered necessary by 7.6% of users, very useful by 36.8%, useful by 34.8%, of little use by 8.4% and of no use at all by 12.4%. Division into distance groups brings some surprising results. Usually with all on-station information it is expected that they are most beneficial to the short distance travellers. In our research we found out that this solution is considered most useful by middle distance travellers. 14% of them deems it necessary, 32.6% very useful and 46.5% useful. For the short distance travels the numbers are: necessary – 5.7%, very useful – 36.5%, useful – 34%. Similar acceptance is found in long distance travellers group. In that case 8.5% of them considers solution necessity, 41.7% treats it as very useful improvement and 27.1% as useful.

The highest acceptance is again associated with young age. In the age group 15-18 there are 14.3% respondents considering proposed measure as necessary, 38,1% as very useful, 38.1% as useful and only 4.8% say it was of little use with the same number treating it as unnecessary. Similar situation could be noticed in segment of 19-29 year olds with 14.3% finding it necessary, 28.6% - very useful, 37.55 – useful, 14.3% of little use and 5.4%- not useful at all. Age group 30-45 differs in regard to exact percentages but general picture holds: 1.6% answered that proposed solution was necessary, 50.8% that it was very useful, 32.85 – useful and 8.2 % found it of little use with 6.6% considering proposal not useful. Like with previous solutions a clear border could be established when switching to people over 45 years. For those aged 46-60, 38.6% consider solution very useful and 31.6% useful while 8.8% of little use and 15.8% of no use at all. This trend is strengthened in age group of over 60 years old users – where solution is considered very useful by 20.6%, useful by 35.3% of little use by 2.9% but of no use by as many as 38.2% of all users.

Like other analysed solution here as well little willingness to pay extra for availability of information is noted. Only 19.2% of users are willing to pay and from those 72.9% no more than 1 PLN, 18.9% up to 2 PLN, only 6.3% of users are willing to pay up to 5 PLN and just 2.1% - more than that amount. Highest willingness to pay is represented by youngest users (15-18 years of age) and middle aged users (30-45 years). This could be easily explained by the fact that youngest people are those raised in economic conditions of competition (born

after country transition to market economy) while middle aged are those who are currently employed and have comparatively more financial resources than other groups.

The impact of this ICT solution on modal shift is noticeable. From those who have possibility to use car 2.3% will certainly switch to bus if this improvement is introduced with further 29.9% very likely and 25.9% doing it on some occasions.

Electronic ticketing by mobile phone or Internet

Possibility to electronically book ticket either by mobile phone or Internet is considered necessary feature of coach transport by 6% of respondents, very useful by 14%, useful by 30.4%, of little use by 20.85 and useless by 28.8%.

Considering different distances this application is not surprisingly most useful for longer distance travellers. Amongst them 18.8% consider it necessary improvement, 31.3% finds it very useful and 27.1% useful. Only 8.3% considers it of little use while 14.6% declares that they would not use it. Similarly high usefulness of electronic tickets is perceived by middle distance travellers who in 7% believe it essential improvement, 14% treats it as very useful and 53.5% as useful. 14% dose not find significant role for this application and 11.6% considers it useless. This proportion changes in short distances. Here service is more frequent therefore usefulness of preordering tickets via electronic means is lowered. Only 1.9% deems it necessary, 8.8% very useful and 25.2% useful. Majority either does not plan to use this ICT (37.7%) or is very reluctant towards it (26.4%).

This application is most sought after by middle aged people. This is most likely because the travel more frequently with preset purpose. For age group 15-18 it is 7.1% users who find it necessary followed by 9.5% who consider it very useful and 21.4% - useful. 45.2% does not find it especially relevant while 16.7% reject this improvement.

But in age groups 19-29 and 30-45 the situation is different. In the first segment 10.7% of passengers find it necessary feature, 30.4% very useful and 37.5% useful. Only 10.7% each - consider it of little or no use. In the later segment 6.6% of passengers expresses certain need for this solution followed by 14.8% to whom it is very useful and 41% to whom it is useful. 19.7% finds it not too useful with 18% declaring that would not use it at all.

Again a turnabout could be noticed in regard to older travellers. For 46-60 year olds it is as many as 43.9% who does not plan to employ this ICT, significant number, which rises even more for age group of over 60 years when it equals 67.6%. Only 14.7% of all users from oldest age group find this solution of some use, while in regard to 46-60 age range it is 28.1% with small group of likely users (8.8% - finding it very useful and 3.5%- necessary).

The unwillingness to pay extra for this possibility fits into general picture – users are not likely to accept innovations including electronic ticketing if they are asked to pay more for service. In case of electronic ticketing it is a strong majority of 79.2% of all respondents who reject

that possibility. From those who are willing to pay the highest percentage of accepters could be found in groups which support introduction of this feature most (19-45 year old range). Even among those who accept payments dominant view is that it should be very small payment with 52% accepting up to 1 PLN and 27 % no more than 2 PLN.

Impact of modal shift in this case is similar to previous ICT's. 5.7% declare switch to coach from car in case this solution is introduced with 19% being likely switchers and 17.6% declaring changing to bus on selected routes.

Real time travel time and vehicle positioning mobile services

This ICT allows for exact information as to the location of particular vehicle. This in turn allows to save time by elimination of waiting times at bus stops. Customer could plan his departure to the minute due to the knowledge of every time location of coach he plans to use. This ICT is considered necessary by 5.2% of passengers, very useful by 21.6% and useful by 24%. 22.4 % of users do not believe in its potential while 26.85 rejects it.

Again distance dimension is significant factor in shaping acceptance. The longer the distance the more importance is given to this tool. For short distance only 3.1% of passengers consider it necessary while figures for medium and long routes are 7% and 10.4%. Similarly as very useful this tool is treated only by 17.6% of short distance travellers and by 27.9% of medium and 29.2% of long distance travellers. As useful it is accepted by 22.6% local users and 20.9% of medium range and 31.3% of long distance passengers. Acceptance levels change with age almost proportionally. For youngest users highest acceptance is 7.1% (age group 15-18) and 10.7% (age group 19-29). For both groups very useful valuation was given by correspondingly 21.4% and 41.1% and useful assessment by 40.5% for the first group and 21.4% for the second. In other age groups results were as follow: for 30-45 range: necessary – 4.9%, very useful – 18%, useful 26.2%. for 46-60 years – necessary ranking was given by 1.8%, very useful by 12.3%, useful by 22.8%. Age group 60+ ranks this solution as very useful in only 11.8% of answers and useful in 5.9%. Within this group there is a strongest resistance to new technology based tools – 61.8% of users reject it while for 20.6% it is of little use. Corresponding figures for 46-60 category are: 40.4% and 22.8%, and for 30-45 years respectively: 19.7% and 31.1%.

At the same time potential users are very unlikely to pay for real time monitoring of vehicles. Only 18% of them have expressed will to pay and even than 62% of those no more than 1 PLN and further 33% no more than 2 PLN.

Some modal shift effects could be expected from this solution. It should attract 1.7% current users of cars to the mode with further 11.5% probably shifting and 30.5% declaring occasional shift to bus. What is interesting it is that highest proportion of those who consider shift are youngest people. Considering that this question has been asked only to those who have access to the car and knowing that younger drivers are often more likely to use car wherever possible this result goes against popular beliefs.

On-board real time information

This ITC solution encompasses all information regarding route and time remaining to destination displayed in real time on board of vehicle. It is considered necessary by 10% of potential users, very useful by 37.2% and useful by 29.2%. Distance factor has some impact but does not change overall picture significantly. For local travel respondents answers range from necessary – 5%, very useful – 34%, useful – 32.1% to little use – 7.5% and no use at all – 21.4%. In medium distances those feeling that proposed improvement is necessary are 23.3%, very useful – 39.5%, useful – 20.9% with small minority either reluctant (11.6% saying it has little usefulness) or negating this application (4.7%). Positive trend is visible in long distances – here 14.6% of respondents point at necessity of this tool, 45.8% find it very useful and 27.1% - useful. Again only small portion of all respondents answers that it was of little use (2.1%) or reject it (10.4%).

Acceptance levels follow age pattern – younger users accept it more easily than older. Highest acceptance (expressed necessity for this solution) is in age group 19-29 years and reaches 23.3% followed by 15-18 year olds (9.5%). In other groups it is 6.6% (30-45 years), 5.3% (46-60) and 2.9% (60+).

Very useful rating is given by 38.1% of youngest users, 41.1% of members of 19-29 year old group, 42.6% by those aged 30-45, 35.1% by those between 46 and 60 years and 23.5% by aged 60 and more. As useful solution is accepted by 35.7% of users from first group, 25% from the second, 34.4% of 30-45 year olds, by 26.3% of 46-60 year olds and by 23.5% of oldest users. Opposition is strongest in 60+ group with more than 47% rejecting it followed by 46-60 age range group where opposition is at 19.3%.

This particular solution has lowest unwillingness to pay, although it is still high with as many as 73.25 of users refusing to pay for this improvement. From those accepting additional payments 69 % insist that it should not be more than 1 PLN, and 2 PLN is ceiling for another 25.4%. Impact on modal shift is possible with 2.3% of users expressing will to shit to bus from car, 22.4% declaring high probability of such a move and 28.2% offering occasional switch.

On demand services

Elastic bus services reacting to reported demand are surprisingly not sought after by users. Only 1.2 % of them consider them important while 10.4% find them very useful and 26.8% – useful. A total of 30.4% potential users do not find them useful and 31.2% rejects them. This is surprising result as demand responsive service allows for direct delivery in door-to –door system. There are no to many differences in user responses in regard to distance. For local travel 32.7% thinks about this solution as useless followed by 25.6% in middle distance travel and 31.3% in long distance travel. Little usefulness is attributed by 30.2% users in short distance travels, 25.6% in middle distance and 35.4% in long distances. 27.7% of short distance travellers find it useful. This number equals 32.6% for medium distance and 18.8%

for long distance travellers. Only 9.5 % of users find it very useful or necessary in short distance, 16.3% in medium distance and 14.6% in long distance.

This solution is best accepted by middle aged customers. In 19-29 year old group acceptance is highest – 3.6% consider it necessary improvement, 7.1%- very useful and 41% useful. On the negative side 32.1% find it of little use while 16.1% of no use. In age group 15-18 there is 2.4% of highest acceptance, 16.75 of high acceptance and 28.6% find it only useful. Little usefulness attribute is given by 26.2% respondents and useless attribute by 26.2% respondents. In the 30-45 age interval 13.1% consider this very useful, 24.6% useful and remaining 37.7% of little use accompanied by 24.6% of those who find no employment for this feature. Least acceptable solution is among older passengers which is surprising as , especially in age group of 60+ there must be a proportion of people with impaired mobility. For 60+ group there is astonishing 64.7% lack of acceptance with only 5.9% finding this solution very useful and 26.5% useful. In age group 46-60 non acceptance is at 36.8% level, little usefulness is attributed by 40.4% of all users and 14% consider this useful with further 8.8% – very useful improvement.

Usual low willingness to pay occurs. Only 21.2 % of accepting solution is willing to pay for it. Among those on local routes strong majority (60%) does not accept higher rate than 1PLN. On medium to long distances it is relatively better from the operator perspective: about 28% accepts up to 1 PLN, about 12% up to 2PLN but as many as 45% of medium distance travellers accepts as much as 5 PLN (and further 18.2% even up to 7PLN) while for long distance travellers it is 28.6% willing to pay up to 5 PLN, 14.3% up to 7 PLN and 14.3% up to 10 PLN.

The surprising lack of acceptance for this solution translates into relatively lower impact on modal shift. Only 6.3% in medium distance travel will switch to bus when this solution is introduced with tiny 2.9% in long and 0.95 in short distances. Those who will likely switch to bus number: 8.3% for short distances, 9.4% for medium range and 5.9% for long distance. Biggest group of potential switchers is composed of those who are rather reluctant and declare that might sometimes use bus instead of car. Which is 31.5% for short, 43.8% for medium and 32.4% for long distance passengers.

IMPLICATIONS FOR RESEARCH AND POLICY

Our findings suggest that in order to use ICT solutions in more rural settings they have to be incorporated into public transport strategy of the region. The education of both society and transport companies has to be provided and technical solutions chosen for particular ICT have to be fitting to the region's technical advancement, demographic characteristics and economic conditions. The assessment of different categories of solutions provides a decision making tool for both transport policy makers and service providers.

The practical tests of some solutions conducted in one of the rural regions of Poland prove that highest acceptance levels for ICT solutions could be found among younger people who

operate in competitive environment from childhood and who are familiar with modern technology. For older users reluctance might result from deeply rooted behaviours but could also be result of fear of new technology and unwillingness to learn how to use it. Overall picture of user responses to proposed ICT solutions is summarized in fig.1.

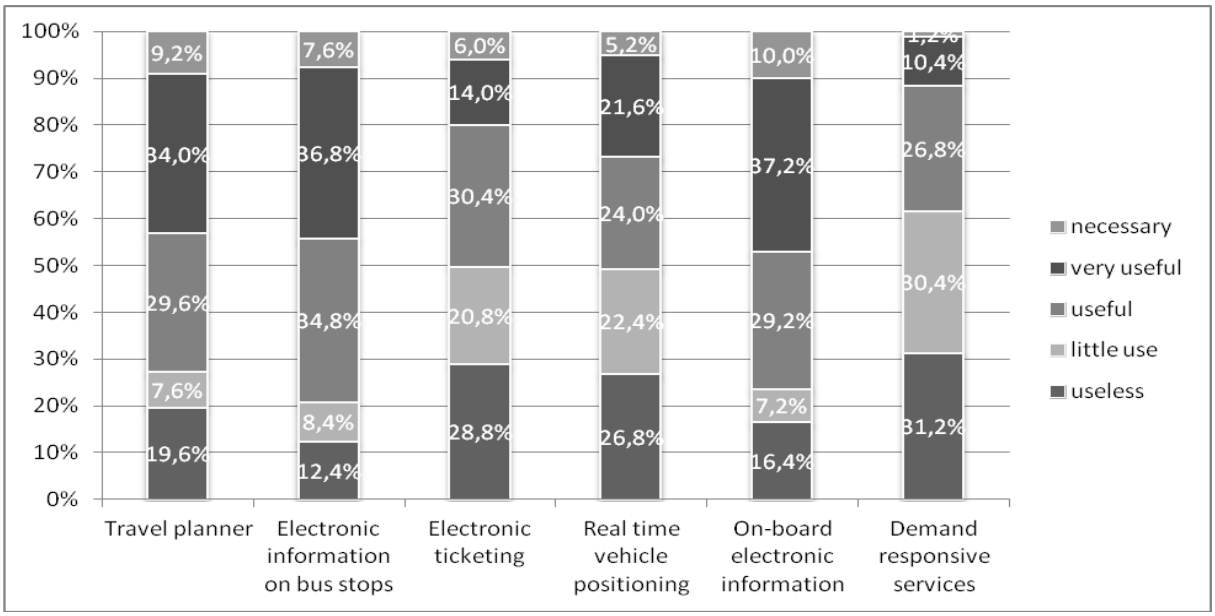

Figure 1 – Users acceptance of selected ITC solutions

Source: Own research results.

Applications of ICT solutions based on mobile phones and Internet is important especially for long distance travellers. Users who travel only locally (up to 40 km) rated this feature at 2.7 (adopted scale 1- definitely not useful, 5-definitely useful) while those travelling distances of 40-100 km considered it more useful with average rating of 3.12. At the same time those who travel over 100 km attach to this type of application even higher value rating it at 3.31.

Not surprisingly willingness to accept new internet or mobile phone based solutions is higher among younger people. For the age group of 15-18 years old real time information scored highest 3.74 points for those of 19-29 years it was 3.63, for travellers aged 30-45 the score was 3.5. At the same time older users were not impressed with those aged 46-60 rating this innovation at 2.18 and those over 60 years of age at only 1.56.

What is most interesting are the perceived time savings on the user part. For local travel passengers expect to save about 15 minutes, the same holds true for long distance travellers while medium distance expectation is of about 12 minutes. Altogether expectations are consistent and average at 14 minutes. It could be concluded that time savings of about 14 minutes are certainly more valuable to those travelling short distances. At the same time it is obvious that the main reason of time saving results from elimination of need to be at the bus stop earlier than necessary.

Interestingly the highest time savings are expected by members of age group 30-45 (20 minutes) while those who pointed at the proposed solution as most useful (younger users) expect to save due its introduction on average 13 minutes.

In regard to travel planners, electronic information on coach stops and on-board electronic information there is clear majority of supporters. At the same time electronic ticketing or real time vehicle positioning information is sought after by about 50% of users. Lowest interest is expressed in regard to demand responsive service with only 37% in favour of this measure. At the same time users are generally unwilling to pay for those additional services and expect that cost will be fully born by service provider (see fig.2).

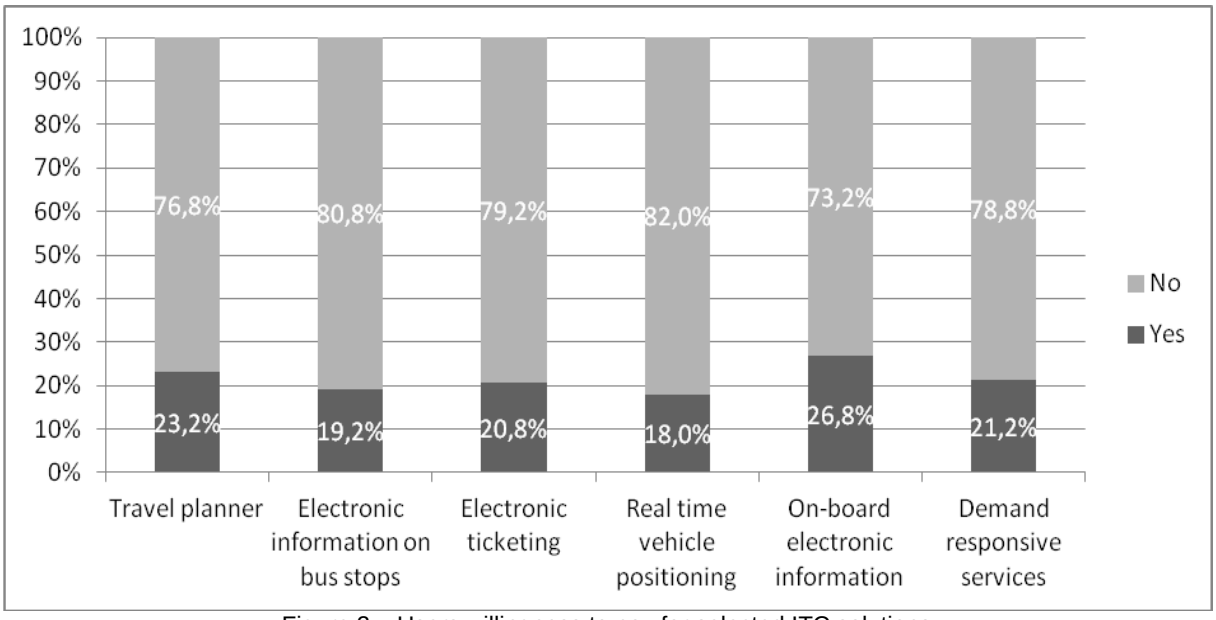

Figure 2 – Users willingness to pay for selected ITC solutions

Source: Own research results.

This of course could be perceived as serious handicap in development of ICT's and their practical introduction. On the other hand in-depth analysis as described earlier shows that willingness to pay is significantly higher among younger users thus those ICT solutions are much more feasible in the future.

Finally surprisingly even single ICT solutions have rather strong potential to shift users from private car use towards coach service (see fig. 3).

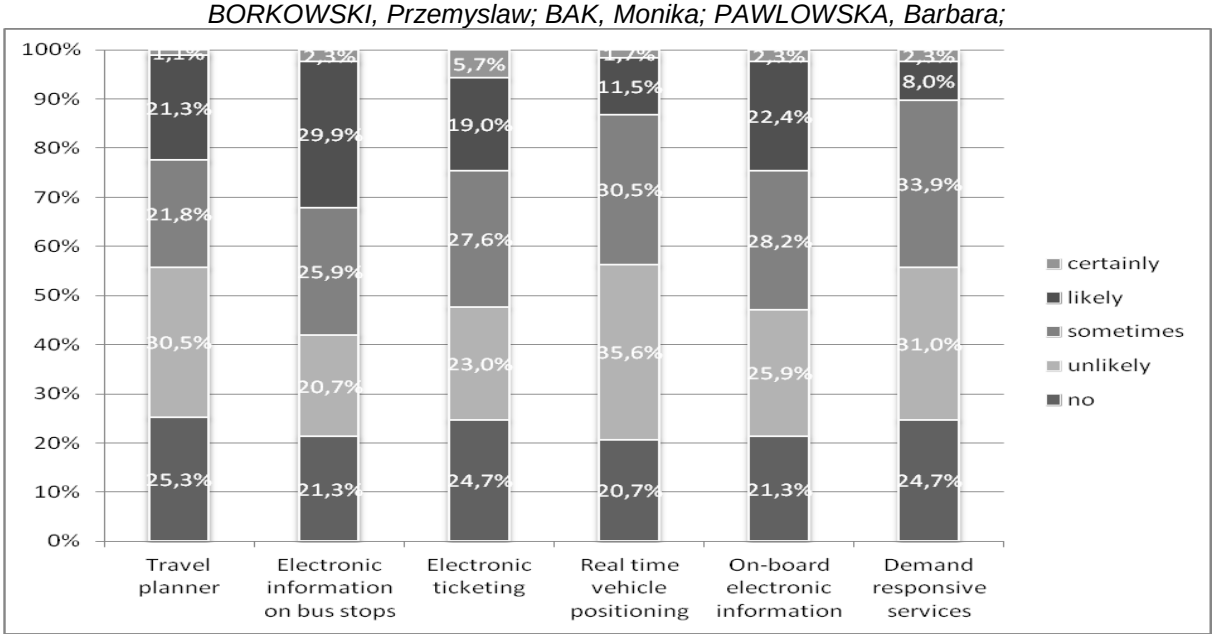

Figure 3 – Expected modal shift effects of selected ITC solutions

Source: Own research results.

It is rather unexpected result taking into consideration that in rural areas car is often considered primary and most elastic way of travelling, besides car owners in rural areas are supposedly much less inclined to abandon them in favour of public transport.

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