Paper II

Common preferences of different user segments as basis for intelligent transport system: case study – Finland

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Common preferences of different user segments as basis for intelligent transport system: case study – Finland

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Abstract: The ultimate purpose of the transport system is to serve the needs and expectations of the end users, who in turn shape the system by their own behaviour, actions and investments. This work examines, within the framework of the Large Technological Systems theory the possibility to categorise users of the transport system into homogeneous segments on the basis of their differences in daily mobility and transportation of goods. Furthermore, the potential to deepen this segmentation to describe the needs of, but later in the policy process also the social acceptance by, different user groups for new transport technology or policy, is examined.

1 Introduction

A transport system, international, national or local, relates closely to the definition of large technological systems: 'Technological systems contain messy, complex, problem-solving components. They are both socially constructed and society shaping' [1]. The state of the transport system is a result of the measures and actions carried out by the producers, operators and users of the system. Producers and operators are organisations or companies, which can be categorised according to their main duties, such as: policy formulation, infrastructure construction and maintenance, production and operation of services for the transport system, and production of transport-related services (e.g. vehicle manufacturing and fuels). Individual people, actually the whole population, are the users of the passenger transport system. In freight transport, users are companies and organisations in the fields of industry, transport and commerce. Basically, the ultimate purpose of the transport system is to serve the needs and expectations of the end users, who in turn shape the system by their own behaviour and actions. The system is thus both socially constructed and society shaping (Fig. 1). Producers gather information on the state of the transport system and also receive feedback from customers, that is, the users of the transport system. They make plans on the grounds of expert knowledge (design principles), and decisions based on generic or special decision-making principles. Within the process, information about the system gathered by the producers is, or at least should be, transformed into policy measures, aiming to lead the transport system into an intelligent as well as sustainable future (e.g. [2–5]). By the intelligence of the transport systems and policy measures we refer here mainly to the transport and traffic information services offered and transmitted via information and communication technology (ICT), usually labelled as telematics or ICT-based mobility information services [6].

As we are rapidly approaching the capacity limits of transport systems in many parts of the world, especially in urban areas, different information services for transport users are offered as one solution to the problem. The general assumption is that the use of infrastructures can be optimised by improved information for transport system users [6]. On the other hand, however, it seems that the world is becoming more and more turbulent, and the information-based 'knowledge society' too fast – faster than the structures of private and public organisations or even private lives are becoming resilient. In transport this means that while there are no general restrictions to the supplying of traffic information services from a technological point of view, users are still quite reluctant to accept these services (e.g. [6–8]).

Recently, interest in and understanding of the systemic nature of transport has increased (e.g. [4, 5, 9–11]). Consequently, this development has highlighted the importance of the user-centric approach, especially in ICT-related transport technology development (e.g. [12–15]), but also in the transport policy process in general. New technology or policy brought into a transport system requires, in addition to operational functioning, acceptance and a motive for itself among the different users facing it according to their individual preferences. In some recent studies on mobility information services [6, 16], a technological application is defined as useful if: (i) the potential user can profitably use the functions of a service for the tasks in his (everyday) life context and (ii) the configuration of the system fulfils the requirements of the user in terms of both operability and functionality.

As it is not possible to survey the needs of and acceptance by each individual transport system user, this paper examines the possibility to categorise users of the transport system into homogeneous segments based on the differences in their daily mobility. Furthermore, the potential to deepen this segmentation to embody the different user segments' common mobility needs and preferences on one hand, and the acceptance of new technologies and services on the other is discussed. The theoretical background of our work stems from the framework of the LTS (Large Technological Systems) theory developed by Thomas P. Huges [1, 17], which is complemented by the

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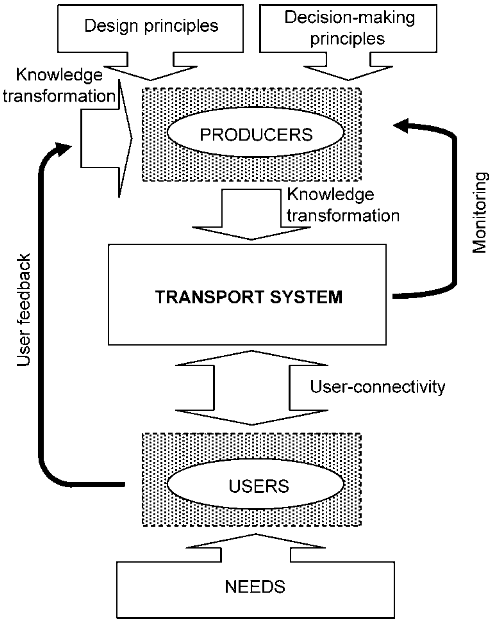

Fig. 1 *Producers, users and interactions within the transport system*

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Social Construction Of Technology (SCOT) approach of Pinch *et al.* [18]. As a case study, we use Finnish national demographic statistics and passenger transport survey data [19] for passenger transport, and annual goods transport statistics in the context of a general logistics concept, developed by VTT Technical Research Centre of Finland, for freight transport.

In the following sections we first summarise the literature on LTS and SCOT in relation to user preferences and user-oriented research carried out within the transport sector. We go on to explain how user segments can be identified with the help of household surveys, demographic and goods transport statistics, and the logistic concept. Moving on to the results, we show that in Finland, users of the passenger transport system can be initially clustered into 11 segments and users of the freight transport system into 6–11 segments based on the differences in daily mobility and transportation of goods. We conclude with a set of recommendations on how to use and elaborate the segments identified in order to uncover deeper preferences as well as acceptance of intelligent technologies and services for the basis of transport policy development.

2 Previous work

In recent years, there has been too little attempt to bring together such work as studies concerning technological innovation and sociological studies of new knowledge (e.g. [18]), although they could benefit from each other. This argument also holds true within the transport sector, especially in the case of intelligent transport system (ITS) applications or artefacts with new types of contexts and interfaces to be faced by the end user. In transport, the main problem seems to be the linking of the acceptance of intelligent transport services, travel behaviour and use of ICT [6].

How do objects, artefacts and technological processes come to be stabilised? And why do they take the forms that they do? The LTS approach developed by T.P. Huges [1, 17] and applied in our study understands technological innovation and stabilisation in terms of systems metaphor. The argument is that those who build artefacts do not concern themselves with (technological) artefacts alone, but must also consider the way in which the artefacts relate to social, economic, political and scientific factors. That is to say, technological systems are open systems and all these factors are interrelated. Technological systems are thus both socially constructed and society shaping. Among the components in technological systems are physical artefacts, organisations, scientific and legislative components, and natural resources. According to T.P. Huges [1], the evolvement or expansion of LTS can be presented in the following phases: invention, development, innovation, transfer, growth, competition and consolidation. LTS theory also presents other useful concepts, such as technological momentum (which systems acquire as they mature), technological style, and reverse salient, that can help in discovering or understanding new aspects in technological development. In this paper our particular interest lies in the consolidation phase of LTS evolvement, as we see the identification of homogeneous user segments for a transport system and their common pattern of preferences as a novel attempt to describe the needs, but later in the policy process also the social acceptance, for new technology or policy brought into the transport system.

A complementary approach to the LTS theory is presented by Pinch *et al.* [18] and called the SCOT. In this constructivist approach to the study of technology, the ‘closure’ concept is presented as follows: ‘When the social groups involved in designing and using technology decide that a problem is solved, they stabilise or consolidate the technology. The result is closure. Various groups will, however, decide differently not only about the definition of the problem but also about the achievement of closure and stabilisation’.

Both of these approaches suggest that technological stabilisation can be understood only if the technology in question is seen as being interrelated with a wide range of non-technological and specifically social factors [20]. The recent research on adopting new technology in the transport sector has, however, paid fairly little attention to the importance of the varying opinions of different users in introducing and stabilising new technology, that is, in identifying the ‘closure’. As Tuomi [21] argues, new types of ICT are implemented in all spheres of modern society, in everyday life, in production systems, in institutions and in culture. Consequently, research on the usability and functioning of new technology should include as wide a range of social factors and end users as possible. Also in the context of ITS there seems to be a strong discrepancy between knowing about the applications and using them, for example, mobility information [16]. A wider social discussion on gaining legitimacy (Legitimacy can be defined as a generalised perception or assumption that the actions of an entirety are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs and definitions [22, 23].) as well as designing strategies for intelligent transport technologies and services thus needs to be carried out. We leave that discussion, however, to the agenda of future research.

The main focus in the transport sector has been on the quite narrow field of Human-Technology Interaction (HTI) research, shaped by rapidly developing ICT and its applications in new types of user interfaces (e.g. [13, 14, 24]). The central aim of HTI research has been to improve the implementation of information technologies in solutions that are more functional, usable and meaningful for people. Research on new technology’s implications for society at large has been quite modest. A couple of attempts to cluster transport system users into homogeneous segments on the basis of their common expectations and needs can, however, be identified (e.g. [11, 25–27]). Yet, the approaches cover only a small fragment of transport system users (e.g. public transport users), not the system as a whole. Concepts like the travel behaviour and journey quality of certain user segments as a basis for transport policy formulation have also been examined only lightly (e.g. [6, 16, 28–31]). These studies indicate that the importance of user needs in the study of the 'closure' of technological and service innovations as well as in the design and development of the whole system has been identified also within the transport sector.

3 Research gaps revealed

The formulation of a transport policy (ICT-related or other), and especially the implementation of one, is a process of successive compromises. Although the environmental, economical, social and equity objectives are all well known by researchers and often referred to by politicians, other decision-makers and civil servants, actual decisions are too often based on the needs of the majority, whether real or presumed.

We argue that the emerging user-centric design within the ICT-related transport sector has focused on too narrow a field of users at a time (e.g. the working population, public transport users and the elderly). The LTS evolvement perspective with phases from invention to consolidation has had too little attention. We claim that policy planning too often serves a 'middle-class male car user', which causes conflicts between policy goals, decisions and implementation. Conflicts might be alleviated if the policy formulation would be carried out with a wider range of users in mind. On the other hand, the too large a number of heterogeneous user groups involved within the transport sector is presented as one factor hindering the user-oriented approach to policy development (e.g. [11, 12]). In the transport sector the field of users and other stakeholders is quite complicated because almost everybody may be considered a user of the transport system, but at the same time a vast majority do not feel directly involved with some parts of the system, that is, those that they do not use or are not affected by.

Generally, ICT-related transport technologies or services are considered as an attempt to optimise travelling. They aim to improve a user's information level to ease his or her decisions about adaptive behaviour, concerning, for example, the choice of transport modes or routes. However, in an everyday context, people often act as they did before in the same or similar situations. They reconsider the way they act only if situations are completely new or unknown so that previous behavioural patterns do not fit. The actions taken also depend very much on the potential user groups, because general requests for mobility information exist throughout diverse social classes [6, 16].

To start a wider discussion on the acceptance of transport-related ICT technologies, we present in the following chapters a tentative method to generally categorise all transport system users into a limited number of segments, based on their differences in daily mobility and transportation of goods. In addition, we argue that these segments can be used as a starting point and elaborated upon further to uncover the mutual needs, expectations and acceptance of these user segments for the development of transport-related innovations as well the transport system as a whole.

4 Method

The empirical data used in this study stems from a national research project financed by the Ministry of Transport and Communications, Finland. The project introduced a novel approach to classify users of the transport system into a limited number of homogeneous segments and identify their mobility needs.

4.1 Passenger transport

In Finland, passenger transport surveys are conducted every 6 years, the latest in 2004–2005. The data in this paper stems, however, from an older survey, carried out in 1998–1999 [19]. The survey method used is a preinformed computer-aided telephone interview (CATI). Although the survey is directed at a single person in the household a lot of information is gathered on the household as well. Regarding trips, a full-day travel diary and a separate record of long trips during the past 4 weeks is obtained. The survey covers the whole year and altogether nearly 12,000 persons over the age of six. The sample basis as well as the demographics to assess the fitness for purpose of the sample and to enlarge it to represent the whole population, has been obtained from Statistics Finland.

For the purpose of the study the data was analysed as follows: the aim was to classify the entire population into a minimum number of person groups by their demographics using differences in daily mobility as the criteria. Daily mobility was defined as the number of trips, the distance travelled and the time used in travelling; the mode of transport was not used in this phase. People were characterised according to gender, age group, activity, location and type of residential area and also the household's car ownership. The analysis was started using an initial detailed classification of around 100 person groups. The starting position was based on the basic survey analysis and reporting as well as previous research on the daily mobility of Finnish people (e.g. [26]). In addition, the aim was that the groups could be predictable in the future and thus could serve as a basis for the development of new ICT services. In the first phase, groups with fairly similar daily mobility patterns were merged, and groups with very few representatives were merged with the major groups. This brought us to 30 person groups, the characteristics of which were identified as the most descriptive criteria for clustering: living environment having three subgroups ((i) six biggest cities, (ii) other densely populated areas, (iii) rural areas); age having three subgroups ((i) 6–17 years, (ii) 18–64 years, (iii) over 64 years of age), activity having two subgroups ((i) active people: working people, schoolchildren and students; (ii) others) and household car ownership ((i) yes, (ii) no) having two subgroups.

The second phase of the analysis was to reduce the number of groups further on the same basis of similar travel behaviour but now focusing also on the daily needs for similar ICT services, both for public transport and travel by car and for familiar and unfamiliar trips. This new criteria set out new constraints for the formation of the groups. People groups with access to car could not be merged with groups without a car, large cities were to be kept separated from other areas as the transport system, and especially the supply of public transport differs significantly. The differences in the freedom of travel choices, particularly in timing, between active people (working, schoolchildren and students) and non-active groups are relevant for the ICT services required. For instance, the routine trips of active people are familiar and thus do not need any assistance in beforehand planning but real-time information and guidance during the journey is needed instead. In the second phase, the age and activity groups were at first merged into three subgroups ((i) 6–17 years of age, (ii) working people and students 18–64

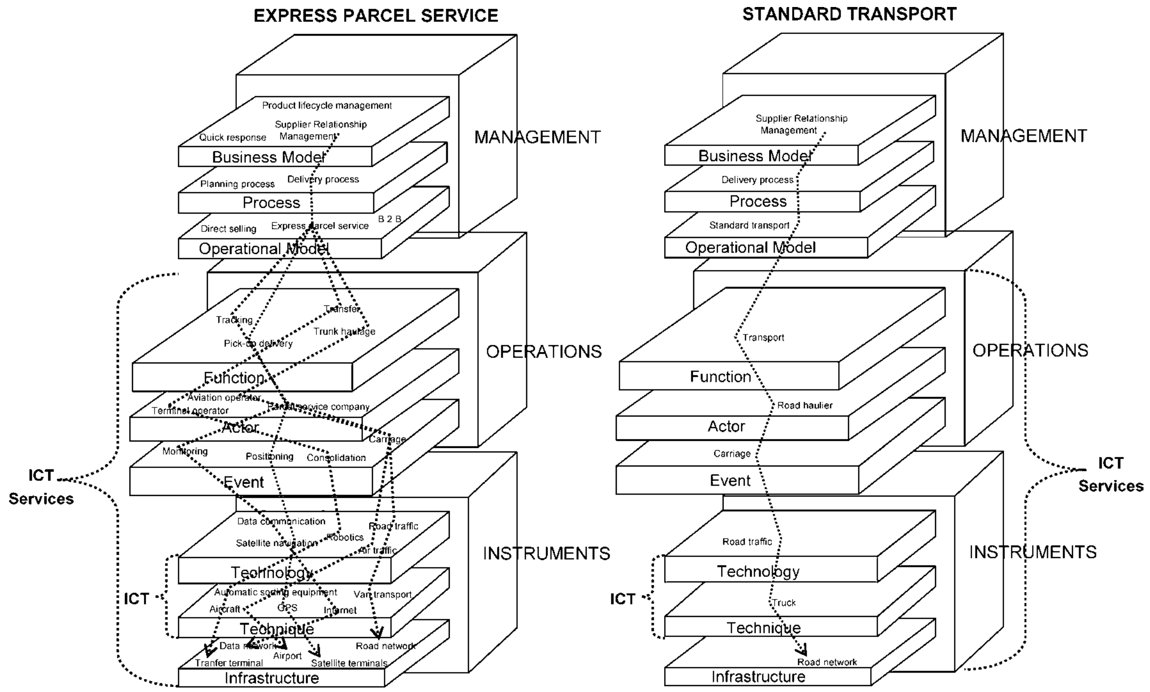

Fig. 2 *Two different operational models identified by the logistics concept: (i) express parcel service with a complicated structure and a large number of actors; (ii) standard transport with a more simple structure and only a few actors*

years, (iii) others 18–64 years of age or over 64 years) and second, where appropriate, smaller cities were combined with rural areas. The number of person segments was reduced to 11, which gives the possibility to obtain the size of each group from standard population forecasts in the future. The modal share distributions of the different person groups defined in each phase were used as check criteria for the success of the classification.

The strength of this classification method is in its extensive but on the other hand simple nature. First, the extensive data and the large number of groups in the beginning helps the analysts to identify the most descriptive criteria for clustering. Second, as the method proceeds by merging groups into major groups which still have sufficiently similar daily mobility characteristics, both the number of criteria and mobility groups are gradually reduced resulting to a limited number of segments as well as criteria. The former methods developed for this kind of clustering (see also Sect. 2) have been much more complicated and not so easy to carry out.

4.2 Freight transport

There are two traditional approaches by which the public sector has for long tried to enhance the logistics system. The first one is the enhancement of infrastructure (mainly investing in transport networks), nowadays backed up widely with ICT applications. This approach tries to influence the operational level of organisations in need of logistic services from the bottom–up, offering different kind of (new) technologies and techniques aiming to enhance the fluency of goods transportation. This approach lacks, however, the system perspective. The second one is a top–down approach, where the use of policy instruments (regulation, economic instruments and information provision) is directed towards the different businesses of trade, industry and transport. This approach can be seen to be more systemic and effective, as it affects all levels or activities of the logistic processes. It lends itself especially to situations when either the infrastructure is basically in adequate condition or when it cannot be extended further because of financial, spatial, environmental or political limitations.

Basing on one of these approaches, the users of the freight transport system have traditionally been approached horizontally through individual or mode-specific transport operations. However, the main decisions concerning the different activities (including logistics) of, for example, an industrial corporation are made at a high managerial level. Consequently, if the public sector desires to affect the system, it has to gain knowledge about the fundamental needs the industry has as an end-user for the transport or logistic system. This leads to the need to better understand the business and operational models of different industrial sectors as a basis for the transport or logistic system development. In order to gain a deeper understanding of the needs of the different actors within the logistic system, we suggest here to use a generic logistics concept, developed by VTT (see Fig. 2). The concept comprises of three vertical business activities or levels: management, operations and instruments. The aim of the logistic concept is first to help in identifying different transport chains or operational models within a certain geographical area. Second, different actors and their needs and preferences for the transport system within the transport chains are considered. The analysis is carried out by defining how many times the different levels of the logistic concept, including different actors, functions, processes and so on need to be passed to get the goods delivered. By opening up the structure of the logistic system, the logistic concept assists in identifying user or actor segments, with similar needs, within existing as well as new operational models for goods transport. Consequently, it also allows the recognition of problems for various actors within the transport chains.

The examples in Fig. 2 illustrate, that in the contemporary information society ICT is one, very important instrument, which public sector can use to develop the freight transport system, but that there are also lots of other aspects to consider. ICT is embedded in many different technological applications, techniques and infrastructure components within the instruments level of the logistic concept. ICT services instead, need a wider field of operation and are hence established and used by various actors within different events occurring both in operations and instruments levels.

The logistic concept is by no means a completed method yet, it still needs further development. The results in the next section show, however, that it has potential which should be utilised in the future. The goods transport statistics (Statistics Finland) as well as transport statistics from the Finnish Road, Rail and Maritime Administrations have been used as basic data for the identification of transport chains and freight user segments.

5 Results

The following sections present the results of the study, that is, the usability of the method for identifying user segments. The results are discussed through a Finnish case study.

5.1 Passenger transport

On the basis of the empirical data, the Finnish population over the age of six was clustered, after several group mergers, into 11 transport system user segments. The user segments, their current travel behaviour and possible future trends are presented in detail in Appendix 1. The future appraisals are based on the demographics trends by the Statistics Finland and Knowledge Society Programme statements by the Finnish government complemented with the own deliberations of the authors. Some former studies have shown [6, 16] that the main objectives for individuals to use new transport technologies (e.g. mobility information services) are to optimise their travel behaviour not to change it. This phenomenon exists throughout diverse social classes. Especially, there does not exist much willingness to shift to other modes of transport, particularly not from car to public transport. Therefore the diffusion of new transport technologies will not necessarily lead to a better or smoother use of the transport system. However, a tendency to follow recommendations and guidance resulting in changes in initial 'decisions' with respect to routing of trips, for both public transport and car use, has been identified. Especially for trips to work this might have influence (e.g. [6, 11, 16, 28]). These aspects need further research, but allow us to assume that our three main criteria for clustering, that is, access to car, living environment and activity/age are relevant in the context of new technologies for transport as the needs for new ICT services are quite different for each of the segments. The age of the person, that is, transport system user, his/her daily activity, type of residential area and the transport system available, and last but not least accessibility to a car are the main elements for the mobility behaviour but also for the needs of ICT services.

The results of our mobility pattern case study indicate that Finland has become motorised: over 80% of the population live in households having at least one passenger car, and nowadays over 90% of young people, both men and women, obtain a driving licence. Among the singles, the group composed mainly of the elderly and population in the large cities, living without a car is most common. The adults in households with a car use it for the majority of their daily trips. They also chauffeur their children as well as members of households without a car, who otherwise mostly walk or cycle. In the largest cities, especially in the Helsinki region, public transport is used by all person groups (see Appendix 1), but in smaller cities, public transport is mainly used by members of households without a car and to some extent also by children from families having a car.

An average member of a Finnish household with at least one car makes on average three trips per day, spending around 70 minutes in the car and travelling approximately 45 km. In households without a car, the members make on the average 2.3 trips per day, on which they travel 22 km and spend 67 min in travelling. Comparing households with respect to car ownership we notice that the trip rate and time used in travelling is only somewhat higher for households with a car. The significant difference is seen in the daily distance travelled, as the members of non-car-households reach exactly half the distance those of car-households do. In addition, the differences both in the average number of daily trips and the travel time are actually mainly caused by persons with 'other activity' and the elderly who travel much less if they do not have a car. For the other person groups the only significant difference is the speed of the car, which takes the car-owning household further.

For households with a car all three types of residential locations can be distinguished, but for households without a car only the large cities differ from the other areas as they can offer a real alternative for the car, an effective public transport system. The 11 different user segments identified and their modal share distributions are presented in Fig. 3.

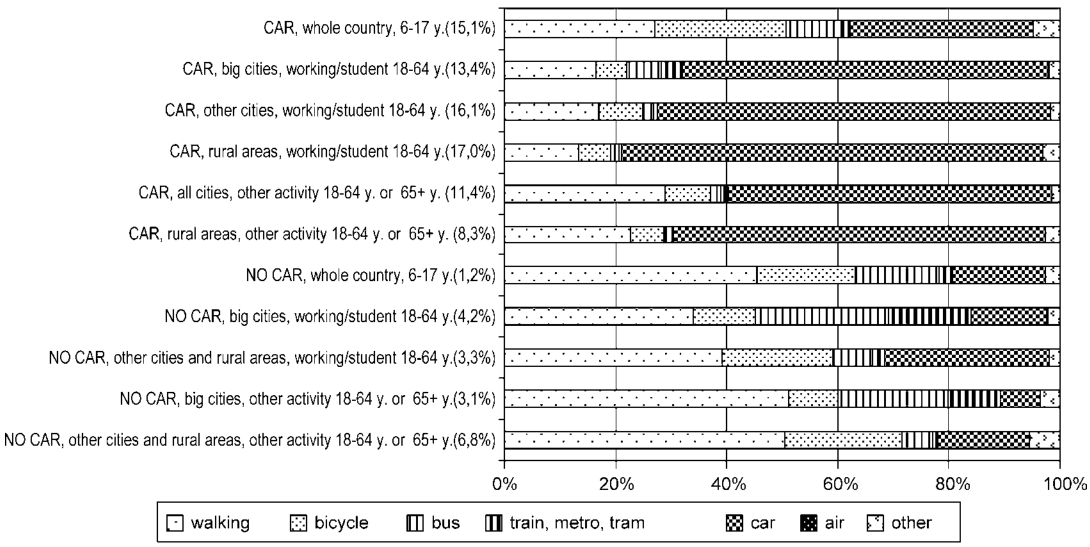

Fig. 3 *Transport system user segments in Finland and their modal share distribution*

5.2 Freight transport

A wide range of different transportation chains can be identified within Finland's goods transport system with the aid of the logistics concept. Most of them can, however, be represented through the following operational models or freight transport chains, which may include several modes of transport: (i) import and delivery of daily consumer goods, (ii) export of unitised freight, (iii) long-distance haulage, (iv) regional business delivery, (v) import of raw materials, (vi) export of bulk cargo, (vii) air cargo transport (value goods) and (viii) transit transport across the country. These chains are illustrated in Fig. 4.

There are basically two different possibilities to segment the users of the freight transport system in the contexts of these transport chains identified by the logistic model (see Fig. 2). In case the development of transport networks is seen as essential, the operators of the freight transport system may be considered end users and categorised into segments, for example, as follows: (i) lorry operators, (ii) van transport companies, (iii) railway operators, (iv) shipping companies, (v) airline companies, (vi) railway terminal operators, (vii) port operators, (viii) airport operators, (ix) border-crossing terminal operators, (x) other store, depot and similar terminal operators, (xi) forwarding agents. By considering terminal operators to be end user groups of the freight transport system, the intermodal feature of freight transport is emphasised here.

Another perspective is to use different branches of industry as user segments for the freight transport system. This is a more traditional approach and might be used as the basis for wide strategic considerations but also for regional transport planning. The following segments are based here on the different transportation needs of different branches of industry and commerce in Finland: (i) forest industry, (ii) other basic industries, (iii) building trade, (iv) agriculture, (v) food industry, (vi) high-tech industry, electronics and so on.

In the event that the user segments of the freight transport system are used as a basis for the development of transport-related technological innovations or the system as a whole, it is important to keep in mind both of these dimensions for categorisation, in order not to exclude any essential segment.

6 Discussion

The LTS and SCOT theories presented earlier suggest that the evolvement and development of large technological systems and technological artefacts can proceed successfully only if the users' perceptions towards and reception of a problem, policy or new technological application can be identified. As Huges argued [1], even the problems are seen differently by different social groups.

This study was designed to test whether the users of a transport system could be clustered into a limited number of homogeneous user segments on the basis of their differences in daily mobility and transportation of goods. Furthermore, the study was to test whether these segments could be used as a starting point and elaborated further to describe the needs and preferences of, but later in the policy process also the social acceptance by, different user groups (i.e. consolidation, closure or legitimacy) for new technology or policy introduced into the transport system.

The method we presented and tested with Finland as a case study proved to be useful in the context of transport system user segmentation. The findings suggest that a basic, system-based framework for identifying the users' needs for the development of transport-related technological innovations, as well as the system itself, can be initiated by the segmentation approach. In our case study, users of the passenger transport system may be initially divided into 11 segments, and users of the freight transport system into 6–11 segments (depending on the purpose). The approach is currently being adopted by the authorities in the Ministry of Transport and Communications as well as the Road and Rail Administrations in Finland. Travelling is not a direct need for man, but a consequence of satisfying needs in different places. The similarities and differences in mobility

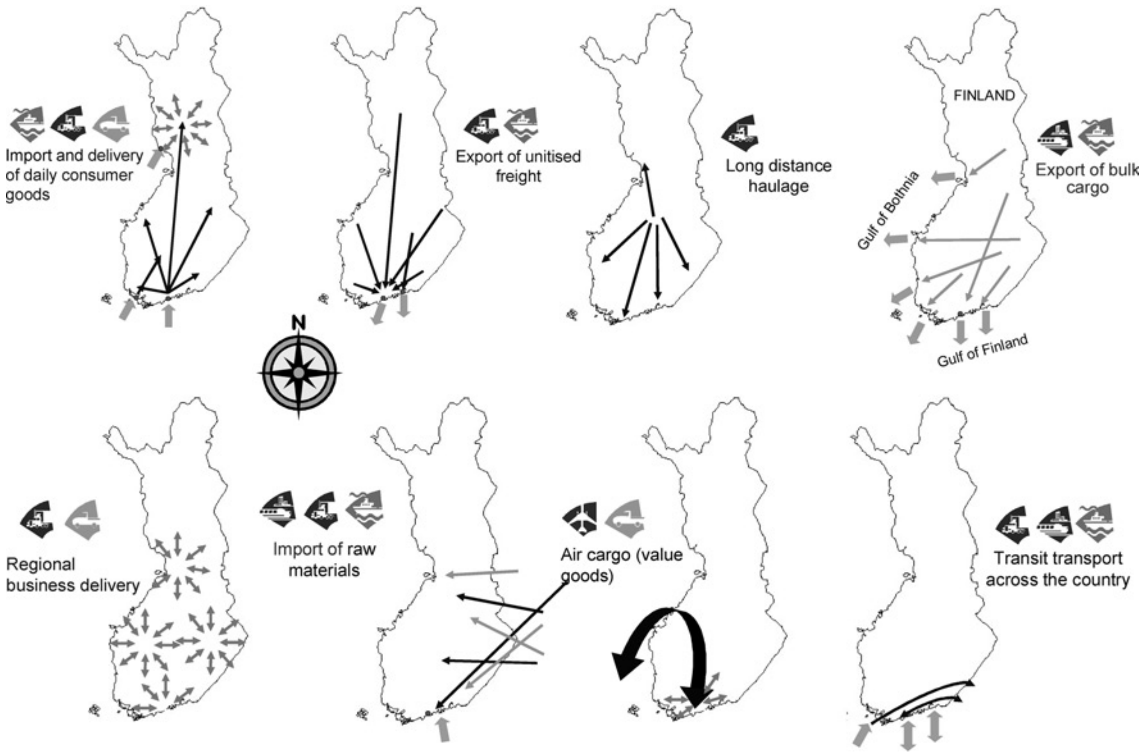

Fig. 4 *Most typical Finnish freight transport chains (including different transport modes) identified in the study*

and transport patterns cannot hence be seen as reflecting the ultimate needs and preferences of different user groups for the transport system. We can, however, expect them to be consequences of satisfying similar needs and hence we argue that the user segments can be used as a preliminary form of segments describing also the common preferences of and acceptance by the users for the development of transport-related technological innovations or even the system as a whole.

7 Conclusions

Transport system users use ICT services to improve their travel process. All transport system users should be able to make information-based decisions on the choice of transport modes and routes, which would hopefully lead to optimal travel behaviour. By offering ICT-based services tailored to the special needs of the end user groups, the best acceptance rate and benefits can be achieved. For instance, unnecessary car use can be reduced and use of public transport promoted by introducing new information services specially aimed at car users in big and medium-sized cities (around a third of the Finnish population) whose public transport use is presently less than 10%. In rural areas the stress should be on all initiatives to share car rides and also demand responsive systems, as there is no potential for frequent public transport. The continually increasing group of elderly people without a car in rural areas (presently around 7%) with all their special needs is a real challenge for the present society. Other examples of ICT-based services, where user segmentation could be applied, are, for example, identification and acceptance of routing services and electronic ticketing. Future research (e.g. in-depth interviews of different user segments and methodological development) is still, however, needed to specify the user segments more adequately, as well as to clarify the chain from needs to usage and behaviour.

In conclusion, the construction of new technology (which in the transport sector has become more and more ICT-based) also requires revealing the need and furthermore the meaning for the new technology among different user segments. As Tuomi argues [21], like Pinch and Bijker [18] and Huges [1] before him, new technologies and innovations are fundamentally about social change; they become articulated only when they are taken into meaningful use in social practice. In other words, meaningful use is grounded in social groups, here namely different user segments, within which technological change appears. Currently, the main objective for individuals throughout diverse social classes to utilise new transport technologies is to optimise their travel behaviour not to change it (e.g. shift to other modes of transport). To expand the influence of new technologies also to the travelling behaviour of different kind of transport system users, we need first to identify their mobility needs, expectations and also acceptance for intelligent technologies. The method we have presented for the user segmentation provides good premises for that.

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Appendix 1

Passenger transport system user segments and their travel behaviour

No	Passenger segment	Number of Persons	Description of current travel behaviour	Future
1	CAR, whole country, 6–17 years	720 796 (15.1%)	Children and teenagers of families with at least one car either walk or bike half of their trips. One-third of the trips are made as car passengers. They are clearly distinguished from the adult population in their active use of both bicycles and public transport. The total distance travelled as well as the average travel speed stay fairly low compared with other person groups because of the dominant use of slow modes.	No major changes in the mobility needs of children are expected. The safety and security aspects of using public transport as well as slow modes will affect people's choices and may lead to an increase in chauffeuring by car. In rural areas travelling on one's own will become even more difficult as the potential for conventional public transport decreases.
2	CAR, big cities, working/student 18–64 years	636 218 (13.4%)	In the big cities the working population with cars spend more time travelling than any other person group. Public transport is used more than in other cities or rural areas, in around 10% of trips, but two- thirds of all trips are still made by car. The daily travel distance as well as the average travel speed stays lower than for people living elsewhere because of the slowness of city traffic.	Because of increasing congestion, the potential demand for public transport is likely to increase among the working population in large cities. The high price of fuel also has an effect on people's choices. On the other hand, in accordance with the present trend, car dependency will increase as well. On shorter trips the use of slow modes may increase. Because of urban sprawl, travel times will get longer.
3	CAR, other cities, working/student 18–64 years	768 311 (16.1%)	In smaller cities a quarter of the trips of the working population with cars are made by walking or cycling, whereas the share of public transport trips is less than 3%. The use of bicycles is more common than in bigger cities. The average travel speed is higher and thus the daily distance is longer in spite of the somewhat shorter daily travel time.	In smaller cities congestion will not be a major problem. Car dependency is likely to increase, but the high price of fuel will also have an effect on people's choices. On shorter trips the use of slow modes may increase. Because of urban sprawl, travel times will get longer.
4	CAR, rural areas, working/student 18–64 years	808 068 (17.0%)	The working population with cars living in rural areas make nearly 80% of their trips by car. Slow modes are used less than in cities and public transport even less, actually not at all. The average travel speed is the highest, causing also the longest distance travelled despite the still shorter daily travel time compared with the population in the cities.	The car dependency of the working population in rural areas will continue to increase. The potential for conventional public transport will break down as the number of users will decrease. No major changes in travel times are expected.

Appendix 1 *Continued*

No	Passenger segment	Number of Persons	Description of current travel behaviour	Future
5	CAR, all cities, other activity 18–64 years or 65+ years	544 474 (11.4%)	Compared with the working population, the remaining adult population with cars (retired, devoted to housekeeping, unemployed and so on) make fewer trips and walk much. Also, the time used for travelling is shorter, which causes the daily distance travelled to remain clearly less than other people's.	For this non-active-working-life group congestion will not be such a problem that it would affect people's choice of transport mode, except in the Helsinki area. The number of retired, healthy people will increase as will their growing dependency on cars. In general, travel times will get longer.
6	CAR, rural areas, other activity 18–64 years or 65+ years	394 329 (8.3%)	In rural areas the non-working adult persons with cars, including the elderly, make fewer trips and spend less time travelling than persons living in cities. The share of car trips is greater and, because of the higher speed of cars, the daily mileage is also greater than for persons in the cities, in spite of the shorter time used.	No major changes are expected. However, the number of retired, healthy people will increase, as will most probably their dependency on cars.
7	NO CAR, whole country, 6–17 years	56 955 (1.2%)	Children and teenagers of families without a car or bike make half of their trips by walking. The three other modes, cycling, public transport and being a car passenger, share the other half evenly. Compared with young people in families with a car, walking is more dominant, as is the use of public transport, and thus the average travel speed and distance are lower. The majority of this small group lives in cities. In rural areas nearly all families with children have at least one car.	No major changes are expected. The safety and security aspects of using public transport as well as slow modes will be essential in maintaining the present modal share.
8	NO CAR, big cities, working/ student 18-64 years.	201 883 (4.2%)	In big cities the working population without cars use more time travelling than any other person group. Public transport is used for nearly 40% of trips. Also, the share of walking and cycle trips is double that of car owners (segment 2). They make fewer trips than persons with cars and the daily travel distance remains far below the car owners'.	According to present trends, there is potential for the size of this group to grow. However, no major changes in daily mobility are expected. Walking and cycling are likely to gain more success. The safety and security aspects will affect people's choice of transport mode, and may lead to an increase in chauffeuring by car.

(*Appendix continued*)

Appendix 1 ***Continued***

No	Passenger segment	Number of Persons	Description of current travel behaviour	Future
9	NO CAR, other cities and rural areas, working/student 18-64 years.	157 376 (3.3%)	The working population without cars living in smaller cities or rural areas make nearly 60% of their trips by walking or biking, of which biking is responsible for a third. The share of public transport is less than 10%, whereas the share of car trips is nearly a third in spite of not owning a car. The average daily travel time is the same as for persons with cars but shorter than in big cities. Because of the slightly higher speed, the distance travelled is the same as in the big cities, that is, around a half of that of car owners.	This group is likely to decrease. As the use of cars generally increases it will reduce the potential for more effective public transport. This group will be dependent on car-owning people in fulfilling their mobility needs. Travel times will become longer.
10	NO CAR, big cities, other activity 18-64 years. or 65+ years.	149 020 (3.1%)	Compared with the car-owning group in big cities (segment 5), the daily mobility of this adult person group with other activity than work or studying and without cars is clearly lower. The daily distance travelled is less than half of that of the car owners' and they make fewer trips as well. A half of the trips are made by walking, a third by public transport and the rest by bicycle and car.	The number of retired, healthy people will increase and their mobility needs are expected to increase as well. The safety and security aspects of the use of both public transport and slow modes are of great concern to this group and may affect people's choices concerning daily mobility. Travel times will get longer.
11	NO CAR, other cities and rural areas, other activity 18-64 years. or 65+ years.	325 990 (6.8%)	This fairly large person group is the least active mobility group in all respects. The number of trips, the daily distance and especially the time used in travelling stays far below that of those living in big cities and of persons with cars. A half of the trips are made by walking, nearly no trips by public transport and the rest by bicycle or car.	The number of retired, healthy people increases and their mobility needs are expected to increase as well. However, if the public transport services decrease this group will be more and more dependent on the car-owning population and their chauffeuring.