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Profiling Future Air Transport Passengers in Europe

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Abstract

Gaining detailed insights into socio-economic characteristics and behaviour of air passengers constitutes a major benefit for stakeholders in the industry. Understanding passengers' diverse expectations, requirements and needs can open up new revenue sources in the form of innovative products and services. Being the first mover can thus create a competitive advantage towards opponents. Market segmentation approaches help to identify key consumer groups, to design marketing strategies accordingly and maximise profits. Additionally to current passengers' research, this paper applies an a priori technique to determine six future air passenger profiles for 2035, reflecting major developments faced by the European transport sector such as changing environmental awareness, increased use of information and communication technologies or disruptive developments like autonomous driving. Profiles enable differentiated insights into future passenger behaviour to derive implications for the transport sector.

Keywords: air transport passenger; passenger behaviour; market segmentation

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Nomenclature

App	application (for mobile devices)
DATASET	DATA-driven approach for Seamless Efficient Travelling in 2050 (EU project)
DORA	Door to Door Information for Air Passengers (EU project)
EFTA	European Free Trade Association (member countries are Iceland, Liechtenstein, Norway and Switzerland)
ESPAS	European Strategy and Policy Analysis System
EU	European Union
EU28	European Union 28 member countries (since July 2013)
GA	Grant Agreement
GDP	gross domestic product
GfK	Gesellschaft für Konsumforschung
H2020	Horizon 2020
IATA	International Air Transport Association
ICT	information and communications technology
IoT	internet of things
IT	information technology
OAG	Official Airline Guide
OECD	Organisation for Economic Co-operation and Development
SITA	Société Internationale de Télécommunications Aéronautiques
WBCSD	World Business Council for Sustainable Development
WTP	willingness to pay

1. Introduction

Traditionally, (air) travellers have been categorised according to their trip purpose, however, this differentiation seems to be proved insufficient over recent years as within many academic studies passengers' characterisation is continuously becoming more distinguished (Boland, Morrison, & O'Neill, 2002; Freathy & O'Connell, 2012; Wittmer & Hinnen, 2016). This is driven by the large variety of passengers' cultural background, an ageing society, the increasing digitalisation within private and business life, the increasing bleisure (business & leisure) travelling or a growing environmental awareness among government and citizens. Travellers' needs and expectations during their journey can thus differ largely. In order to identify different requirements and related passenger profiles, the various stakeholders in the air transport industry (airlines, airports, manufacturers) make use of market segmentation approaches to gain a better understanding of different consumer groups and to tailor offerings effectively, provide enjoyable experiences, incur cost-savings, and identify new revenue sources (Wittmer & Hinnen, 2016). Due to the mid- to long-term focus of many aviation stakeholders, resulting from long innovation and investments cycles (aircraft, airports incl. runways), forecasting future passenger demand and respective travel behaviour is a challenging task. Hence, it is crucial to properly derive long-term air transport passengers profiling as a way to avoid future mobility bottlenecks, gaps and barriers in the air transport sector and related industries.

Market segmentation methodologies are applied for various purposes in academia, industry and marketing with the main goal to better understand consumer behaviour and tailor products and services in a more effective way. This can be done on the micro level using detailed consumer data on behavioural traits and specific expectations, as in Boland et al. (2002) or Teichert et al. (2008). The former apply a value-based segmentation approach that distinguishes passengers by the amount of revenue they incur for an airline and their travel frequency over a given period. Using this approach, an airline can assess the willingness to pay (WTP) of different passenger groups when introducing new products or services and thus evaluate its respective investment decisions. Teichert et al. (2008) also argue that a more differentiated customer segmentation in the airline industry is required and propose five different segments to which passengers are assigned according to their preferences. The segment "catch all/flexibility" comprises travellers from top management who exhibit a high flight frequency and require individual alignment of flight schedules, thus being able to change flexibly between flights, for example. Applying data on Spanish airport passengers, Vela and García (2010) derive four passenger segments, focusing on the tourist segment and differentiating by socio-economic characteristics and aspects concerning the trip. Other studies conduct a more aggregated, or macro level market segmentation, which does not focus on a particular airline or airport and respective passenger data but which use either data on a regional level or produce qualitative descriptions of passengers' travel behaviour, as seen in Future Foundation (2015) and Henley Centre HeadlightVision (2007). In these studies, different passenger profiles, their respective attitudes and behaviour during the journey are described qualitatively. One of the reasons for focusing on this type of segmentation is the time horizon of these studies, with the years 2030 and 2020 respectively.

Since the majority of research concerning air passenger market segmentation focuses on current traveller profiles, this paper¹ contributes to the current research landscape of segmentation studies by 1) focusing on future passenger groups (the time horizon is 2035), 2) conducting an analysis on the European level, and 3) applying publicly available data and state-of-the-art market segmentation methodologies. Section 2 outlines currently applied methodologies and discusses the feasibility of these for this particular paper, based on the research question and the data availability. Furthermore, those criteria that drive passengers' travel behaviour, socio-demographic characteristics, mobility and behavioural aspects are described. Applying the most feasible methodology and respective segmentation criteria, using both qualitative and quantitative data on the different characteristics, Section 3 depicts six European air transport passenger types for today (2014) and for the future (2035). This section also gives an insight into developments that may alter future travel behaviour and demand. Section 4 discusses the findings and concludes the paper.

2. Methodology applied for passenger segmentation analysis

The term and concept of market segmentation was first published by Smith (1956), originally an element belonging to the field of marketing strategy, to create competitive advantages for firms within the changing market environment of an increasingly heterogeneous demand side. A set of individual users is grouped into smaller, more homogeneous user groups. In doing so, groups of individuals sharing similar characteristics and preferences are developed (Smith, 1956), also called sub-groups or market segments (Wittmer & Hinnen, 2016). There are ranges of methodological approaches to identify different market segments or user groups. The appropriate market segmentation approach strongly depends on the data available on consumer characteristics. Depending on the data, it can be distinguished between a micro and a macro approach. Macro data includes variables such as aggregated consumer demographics, geographical location, or different economic factors. It is usually easier to access than micro data, which refer to individual consumers and their specific characteristics (Bruning et al., 2009). These different approaches can also be combined by first structuring passengers according to their regional distribution and respective geographical specifics, i.e. using macro data, and in a second step using micro data, dividing these groups into further segments based on individual characteristics, as applied in Bruning et al. (2009).

Tirenni et al. (2007) apply the decision tree approach to determine different passenger segments in the airline industry. This method uses disaggregated data to identify the customers' relevance for a firm's product. A value-based customer segmentation method is applied by Boland et al. (2002), which enables the assessment of the level of profitability associated with each customer. This methodology goes beyond the traditional approach of using aggregated passenger demographics and attaches a distinct monetary value and the number of air trips per year to each passenger segment. For this purpose, detailed disaggregated data is required to determine the individual monetary value of each passenger segment. This type of approach can also be found in Teichert et al. (2008) who apply data from stated preference surveys of airline passengers in a latent class modelling approach. The authors distinguish between a common-sense (a priori) approach and a data-driven (a posteriori or post-hoc) approach, as also outlined by Dolnicar (2006; 2008). Within the a priori approach, pre-defined segmentation criteria are applied to a group of individuals, for instance socio-demographic factors such as country of origin, main travel purpose or income level. Users are grouped into segments, which are further profiled by common personal characteristics of these individuals belonging to this segment (Dolnicar, 2008; Freathy and O'Connell, 2012; Haley, 1968). In the a posteriori approach, segments are typically derived based on already conducted data collections (surveys, census or other relevant information) (Dolnicar, 2006). Wittmer and Hinnen (2016) distinguish between the (1) situational segmentation methodology, based on the travel context of the passengers; the (2) socio-economic segmentation, based on personal characteristics of passengers; and the (3) psychographic segmentation, based on criteria such as personal values, behaviour and attitudes, measuring of these segmentation criteria can be difficult though.

Vela and García (2010) conduct a cluster analysis using passenger survey data from a Spanish airport. Cluster analysis is a tool commonly used in order to determine distinct market segments. Within this approach, individual passengers are grouped according to the variables and their respective values obtained within a survey. Thus, passengers who demand a high comfort level during their flight might be assigned to the same group that is characterised by a high WTP for an increased level of service quality, for example.

As stated, the feasibility of a particular methodology strongly depends on the type and extent of data available on the investigated customer groups. Since this paper focuses on the derivation of European air passenger profiles

¹ This study was part of the work package on passenger demand profiles within the DATASET2050 project. For more information, please refer to Kluge, Paul, Tanner and Cook (2017); Paul and Kluge (2016) or <http://www.dataset2050.com>

and includes the EU28 and EFTA countries, it has to be ensured that data for all or most of these countries is available in order to define respective passenger segments. The EU28 with the EFTA countries (Iceland, Liechtenstein, Norway and Switzerland) are used as a proxy for European passengers. For the application of those methodologies that require detailed disaggregated passenger statistics on individual consumer preferences and buying decisions this kind of data would thus have to be available for all the considered countries. However, since only aggregated demographic and socio-economic data was accessible for this particular study, the most suitable market segmentation methodology is selected accordingly. For profiling future European passenger groups, the situational criteria outlined in Wittmer and Hinnen (2016) including booking time and date are not available. Hence, the situational segmentation methodology is not feasible as is the psychographic segmentation approach and the a posteriori market segmentation approach. Consequently, the a priori technique in combination with socio-economic segmentation criteria offers a well-suited methodology. In the first step, segmentation criteria are explored and defined, which include socio-economic factors and are considered to be relevant in influencing passenger travel behaviour and demand (Kluge and Paul, 2017; Kluge, Paul, Cook and Cristóbal, 2017). Following this, a meta-analysis of existing passenger profiles has been conducted, identifying those passenger groups currently travelling within the European market. Based on this and taking into account the previously defined segmentation criteria, six different passenger profiles are derived. These passenger profiles represent the diversity of current European air passengers and are aligned with publicly available data on socio-economic or travel characteristics. By this, distinct values for each segmentation criterion are assigned to each group and can thus be uniquely identified. The results of this analysis are taken as a basis to develop six future passenger profiles for the year 2035. For this purpose, the outlook and development of the relevant segmentation criteria are analysed and incorporated in the profiling. The six future passenger profiles represent future developments, which are expected to have an influence on the way and degree future consumers travel by air. Furthermore, additional future developments on the supply side of the transport system are discussed, which could have a significant impact on future travel behaviour as well.

3. Derivation of current and future passenger profiles

3.1. Criteria applied in passenger segmentation analysis

Passenger demand for air transport is influenced by a variety of factors stemming from a person's or a household's socio-economic or behavioural characteristics (Kluge and Paul, 2017; Kluge, Paul, Cook and Cristóbal, 2017), of which some are applied as criteria in the following passenger segmentation approach. Only those factors are selected where data for the considered European countries is available – age, income, travel purpose, transport expenditure, use of ICT (information and communications technology), number of trips per capita, travel party size, luggage requirements, and airport access mode choice. Following this methodology, each passenger group defined in the following section can be assigned a unique value in each category (see Table 1). To begin with, the overall population figures and growth define the general mobility demand in Europe (Suryani et al., 2010). The age structure of passengers influences travel demand and travel behaviour. For instance, people aged 65 and above are usually retired and have more free time available as well as sufficient financial funds to travel for leisure purposes (Young et al., 2009). The number of people within this particular group increases up to 2035 (Eurostat, 2016). Today's travellers of the ages 65+ have a lower overall travel activity than their younger counterparts (IATA, 2016). However, the latter, i.e. those with the highest travel activity today, will constitute the elderly travellers in the future. Furthermore, as applied within other market segmentation studies, such as Wittmer and Hinnen (2016), passengers are typically distinguished according to their trip purpose (leisure versus business trips). Here, we also differentiate between work related and private travel as well as a third category, namely bleisure, which represents the increased blending of these activities during a trip. Income and expenditure on transport are also essential factors to take into consideration. Looking specifically at the development of gross domestic product (GDP) per capita (which will be taken as a proxy for income), people in 2035 will probably have a higher income, which might increase the discretionary income spent for holidays and hence possibly increase the travel frequency (with stable fare at the same time) (IATA, 2016).

Another important driver to discuss and include in this segmentation analysis is the (future) household composition, i.e. how many people live in a household and of what age are these people, since this may affect people's future travel behaviour in terms of travel party size (OECD, 2011). There are several data indicating that the composition in Europe is going to lean towards smaller households with fewer children compared to today (2014). For 2020, the average number of children per household is predicted to decline both for Eastern and Western Europe, with the average number of children per household expected to drop to 0.5, compared to 1.0 in 1980 in Eastern Europe and around 0.9 in Western Europe (Euromonitor International, 2013). There are several

reasons for this development: an increasing amount of women in employment, delayed family planning, or increasing costs of raising a child (Euromonitor International, 2013). It can also be assumed that households with fewer or no children possess a higher discretionary spending and more available time. This could lead to increasing travel activities and holidays, which ultimately drives (air) travel demand. The influence of the life stage and family status on travel behaviour has already been examined in some studies, such as Kattiyapornpong (2006) who shows that childless singles and couples travel more. In addition, the number of one-person person households is predicted to increase, with this household type having the highest growth index in 2030 worldwide (Euromonitor International, 2014), a trend which can already be observed in Europe. For instance, within the years 2025 to 2030, one-person households could already constitute around 40 per cent to 45 per cent of all households in the United Kingdom, Austria, Germany, Norway, Switzerland, Netherlands and France (OECD, 2011). One reason for this development is the ageing population (OECD, 2011), showing how demographics and household composition can influence each other. An increasing amount of people living alone also leads to a higher share of single travellers.

The usage of ICT changed the everyday life (both at work and in private) and will exponentially continue to do so. There is a rapid development of internet usage bringing many improvements but also challenges to the future world (European Commission, 2016). The internet user penetration in Western Europe in 2019 will be at 76 per cent of the total population, indicating that this region has already reached a certain maturity level at this point in time. In comparison, Central and Eastern Europe will reach a penetration level of 64 per cent, over 10 percentage points less compared to Western Europe. A similar development can be seen when looking at mobile phone usage. Moreover, the "internet of things" (IoT), big data, cloud computing, 5G mobile internet, smart clothes are among other trends and emerging technologies, digital breakthroughs, which are going to increase until 2030 (ESPAS, 2015; Future Foundation, 2015). By 2020, over 50 per cent of the total population in Western Europe will be active in an online social network, at least once a month (eMarketer, 2016). The usage of the internet, mobile devices, online social networks and associated technologies will increase within the next years. An application example in the aviation industry can be found at airports concerning their IT (information technology) strategies. The airport IT survey by the SITA (2016) reveals that a large amount of participants are planning mid-term trials concerning new, emerging technologies: For instance, 78 per cent of airports are planning to launch context- and location-aware apps (applications) for passengers until 2026. Passengers' benefits from such apps could be a hassle-free journey, timesaving and the overall improvement of their travel experience. As supported by other sources (Future Foundation, 2015), future travellers may prefer to use their own devices for booking as well as preparing flights and, in general, demand to control a high level of their journey on their own and at their own pace. This result is not surprising when looking at the digitally savvy generation of Millennials (people born in the 1980s and 1990s) who will be in their forties and fifties in 2035. Certainly, the generation Z following them will be even more digitally savvy as they grow up with advanced technology, deeply embedded into their daily habits and behaviour (Civic Science, 2016).

Besides, consumers have increasing concerns about the environment, the economy and social issues (WBCSD, 2015). One of several examples can be found in Germany, where sustainable consumption and living is "trendier" than ever before. Participating in the sharing economy and buying organic food are high in demand and one could assume an on-going development of this movement within the next years and decades (Die Bundesregierung, 2013). Looking specifically at air transport, passengers also seem to have pro-environmental values and a basic understanding of carbon-travel impacting the environment. Yet, future environmental awareness and its influence on air passengers is a complex topic, difficult to quantify and driven by many factors and trends. One potential key driver is education (Bontoux and Bengtsson, 2015). An increase in tertiary education enrolments within Europe in the next decades is forecasted (Wittgenstein Centre Data Explorer, 2016), which could also lead to an increase in environmental awareness (Kluge and Paul, 2017). However, environmental awareness does not automatically result in pro-environmental behaviour change: choosing environmentally sustainable transport modes over air transport or paying for carbon offsetting schemes voluntarily. Pro-environmental behaviour change also depends on other factors, like the individual motivation (Steg and Vlek, 2009).

3.2. Meta-analysis of current passenger profiles

Having defined the market segmentation criteria in Section 3.1, the next step within this analysis involves the development of current European passenger profiles (base year is 2014). For this purpose, eight studies on different passenger groups have been considered and analysed: (1) (SITA, 2015); (2) (Skift, 2015); (3) (OAG, 2014); (4) (Future Foundation, 2015); (5) (GfK Mobilitätsmonitor, 2011); (6) (Henley Centre HeadlightVision, 2007); (7) (DORA, 2016); (8) (Ploetner and Schmidt, 2014). Across all studies, similarities and differences between the described passenger groups are identified based on the pre-defined segmentation criteria discussed above in 3.1. Figure 1 shows how these diverse passenger groups from all considered studies are clustered according to their age and travel purpose. The dotted lines group different passenger profiles together based on similarities, such as

those profiles referring to retirees or elderly travellers. However, a large amount of the already existing passenger groups is of qualitative nature and hence clustering of these cannot be conducted according to statistical clustering methods. These profiles are grouped based on the descriptions that are available in regard to travel purpose, destination choice, or experience sought as well as some quantitative data such as income level or age. In addition, existing passenger groups are classified according to their income level, their degree of travel activity (all modes), and other qualitative characteristics if available resulting in six newly derived current passenger profiles. Income alone has a great impact on travel budget and consequently on travel behaviour, such as luggage or access mode choice. Furthermore, as outlined above, the use of technical devices throughout the entire journey also differs by age groups. Hence, the six profiles below are characterised by a different level of frequency concerning mobile phone and internet usage. This translates to their booking and travelling behaviour. For instance, Youngsters are due to their age digitally savvy and more likely to complete travel related tasks online, compared to the group of Best Agers. Such processes along the travel chain could be checking-in online or generating a boarding card on a mobile device. The amount of nights spent at a particular destination differs both by travel purpose and by type of journey conducted. Business travellers tend to spend fewer nights per trip than leisure passengers do. Youngsters visiting friends in urban centres spend fewer nights than Family and Holiday Traveller on their vacation. This may influence the access mode selected, the amount of luggage, the time spent in luggage check-in processes, or during luggage collection at the destination airport. For instance, business passengers tend to reduce the amount of luggage in order to minimise time and effort accrued to respective handling processes.²

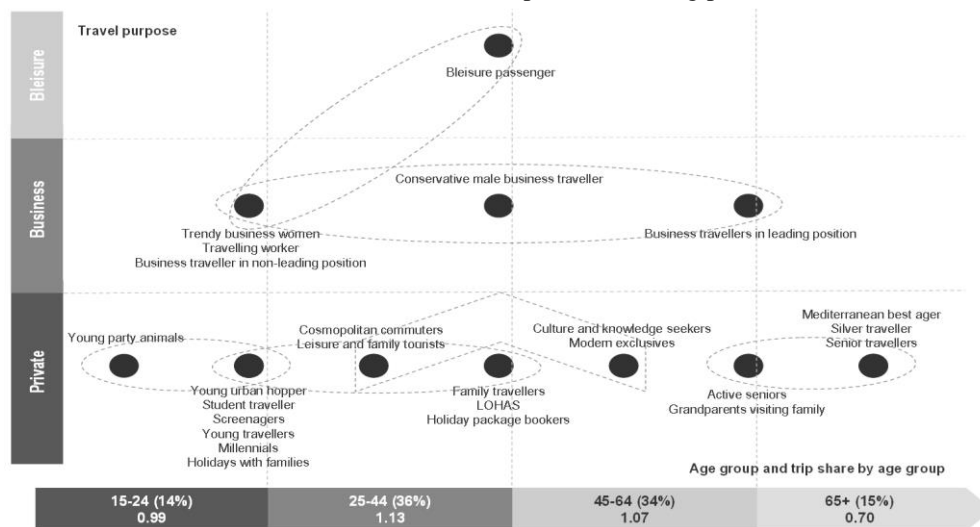


Fig. 1 Passenger cluster according to travel purpose, age and travel activity (all modes)

Table 1. Current passenger profiles (2014).

	Exclusive Experience Traveller	Family and Holiday Traveller	Best Agers	Youngsters	Executives	Price-conscious Business Traveller
Share in total transport trips	On average 90 per cent of European travellers (all modes)				On average 10 per cent of European travellers (all modes)	
Included passenger profiles from study ³	(4) (5) (6) (7)	(5) (6) (7) (8)	(5) (6) (7) (8)	(1) (3) (4) (5) (7) (8)	(6) (7) (8)	(2) (4) (7) (8)
Main travel purpose	Private	Private	Private	Private	Business	Business
Predominant age group	25-64	25-44	65+	15-30	40-65	25-44
Income level	Medium / high	Medium	Medium	Low	High	Medium
Amount for transport expenditure	Medium	Medium / low	Medium	Low	High	Medium
Use of technical devices and respective retrieval of information	Medium to high frequency	Low to medium frequency	Low frequency	High frequency	High frequency	Medium frequency
Travel activity (trips per capita)	1.1	0.9	0.7	1.1	1.5	0.8
Travel party size	1 - 2 people	≥ 3 people	1 - 2 people	1 - 3 people	1 - 2 people	1 - 2 people
Luggage requirements	Check-in luggage	Check-in luggage (several bags)	Check-in luggage	Hand luggage only (short trips) Check-in	Hand luggage only	Hand luggage only

² Please see Paul and Kluge (2016) for detailed information on the development of the current passenger profiles.

³ Reference of studies listed above in Section 3.2.

	Exclusive Experience Traveller	Family and Holiday Traveller	Best Agers	Youngsters	Executives	Price-conscious Business Traveller
Access mode choice	Public transport	Public transport Private car (park & travel)	Private car (park & travel) Kiss & fly	Public transport luggage	Taxi Private car (park at airport)	Public transport

3.3. Derivation of future passenger profiles

Within the next step, six future passenger profiles for 2035 are derived based on the current passenger profiles and at the same time considering the future development of the different segmentation criteria. To develop new passenger profiles, the current ones from 3.2 are either adjusted taking into account their ageing, or new profiles are created based on available data. For instance, the Cultural Seeker is a newly developed passenger profile but has similarities with the Exclusive Experience Traveller from the current passenger profiles. Typically, passengers are between 15 and 65 years old. His or her main travel purpose is for private reasons. This passenger type travels to cities, into the countryside, or to specific events. Taking around 0.5 to 1.5 trips per capita per year, he or she travels as often as the Family and Holiday Traveller. The income level is medium to high and the amount spent for transport expenditure is medium to low. Travelling with one or two people, the Cultural Seeker takes only hand luggage for short trips but checks in luggage for longer journeys. Public transport, taxi and car sharing are the access mode choices to and from the airport.

The Family and Holiday Traveller is already part of the current passenger profiles. However, in comparison to the current one from 3.2, the future Family and Holiday Traveller in 2035 will be a few years older. As the childbirth age rises, so will the predominant age group for this passenger type: from 24 to 44 years in the current profiles up to 30 to 50 years in 2035. This age range includes children below 15 years, as children older than 15 might have the tendency to take trips on their own or with friends. This group travels for private purposes, has a medium to high income and spends a medium amount of that income on transport. Passengers of this type use ICT with a medium frequency and conduct 0.5 to 1.5 trips per capita per year. As they often travel with children, their party size is around two to three people. Normally, they go on family trips for several days and hence, have the tendency to usually check in their luggage. They use public transport or the own car (park & fly) to travel to and from the airport. Travelling with children, they may also be likely to arrive early at the airport to have more dwell time. At the same time, European households are becoming smaller with fewer children and the number of one-person households is going to increase towards 2035, as already elaborated above. Hence, the Single Traveller taking a journey alone will also be an important passenger group in 2035. This passenger type travels on his or her own for private purposes and is around 44 years old or older. In comparison to the Cultural Seeker, this passenger type has a medium to low income. Spending only a low amount on transport, 0.25 to 0.5 trips per capita are taken per year. Compared with the other passenger profiles, the Single Traveller has the lowest travel activity. As an airport access mode, the Single Traveller chooses either public transport or kiss & fly (drop off by friends and relatives). He or she travels with hand luggage when going on short trips but checks in luggage for longer journeys. As long as Single Travellers arrive and depart on their own, they can be part of a travel group of several people organised by a tour operator.

The group of people with a typical age of 65 years or older will comprise around 25 per cent of the overall European population in 2035. Thus, the Best Agers (Next Generation) (in the following only referred to Best Agers) are going to be an important passenger group. The Best Agers travel around 0.5 times per year. Most people in this age are retired or about to retire within the next years. Hence, these passengers travel solely for private reasons either alone or with another person. They have a medium income and spend a medium amount on transport. Their use of technical devices is medium as well. In comparison to the Best Agers from the current passenger profiles, the next generation in 2035 is much more digital savvy. They prefer to check in their luggage and to use their own car or kiss & fly as airport access mode. The Environmental Traveller is a newly generated passenger profile in 2035. He or she tries to live as environmentally friendly as possible. Part of such lifestyle is to reduce air travel and to fly with as little luggage as possible. This passenger type is typically between 30 and 44 years old, has a medium income and spends little on transport costs. In line with an environment-friendly behaviour, most business trips are combined with some additional leisure time (bleisure). They might be WTP for carbon offset schemes compensating their own air journey. The use of technical devices is low to medium. The travel party size is one to two people, if a friend or spouse is being taken on a bleisure trip to spend the free time together. If really necessary, luggage is checked in. Otherwise, hand luggage is the norm. Every environment-friendly airport access mode is possible, such as public transport, car sharing or cycling. However, although many people in Europe have environmental friendly values, it might not lead to an actual behaviour change. Hence, the age range of this

passenger profile is rather small and based on the assumption that only a small proportion of people will do travel eco-friendly in the future. Finally, the Digital Native Business Traveller is the only passenger type of all six profiles who travels mainly for occupational reasons. However, due to the high usage of technological devices one can assume that this passenger type is hyper connected and that there is a constant digital connection with the private life, friends and family. He or she is around 24 to 64 years old, which is at present the digitally savvy generation Y and generation Z. The income level and transport expenditure is medium to high. 1.5 - 2 trips per capita per year are taken with one to two people. He or she does not mind checking in luggage but takes only hand luggage when going on short trips and access mode choices are public transport, taxi or car sharing.

Table 2. Future passenger profiles (2035).

	Cultural Seeker	Family and Holiday Traveller	Single Traveller	Best Agers (next generation)	Environmental Traveller	Digital Native Business Traveller
Share in total transport trips	On average 90 per cent of European travellers (all modes)				On average 10 per cent of European travellers (all modes)	
Based on current passenger profiles	/	Family and Holiday Traveller	/	Best Agers	/	Youngsters
Main travel purpose	Private	Private	Private	Private	Bleisure	Business
Predominant age group	15 – 64	30 – 50 + children below 15	44+	65+	30 - 44	25-64
Income level	Medium / high	Medium / high	Low / medium	Medium	Medium	Medium / high
Amount for transport expenditure	Medium / low	Medium	Low	Medium	Medium / low	Medium
Use of technical devices and respective retrieval of information	High frequency	Medium frequency	Medium frequency	Medium frequency	Low / medium frequency	High frequency
Travel activity (trips per capita per year)	0.5 – 1.5	0.5 – 1.5	0.25 – 0.5	0.5	0.5 (as few as possible)	1.5 - 2
Travel party size (in number of people)	1 – 2	2 - 3	1	1 - 2	1 - 2	1 - 2
Luggage requirements	Hand luggage only (short trips)	Check-in luggage	Hand luggage only (short trips)	Check-in luggage	Hand luggage only (short trips) Check-in luggage (if necessary)	Hand luggage only (short trips) Check-in luggage
Access mode choice	Public transport Taxi Car Sharing	Public transport Private car (park & travel)	Public transport Kiss & fly	Private car (park & travel) Kiss & fly	Public transport Car Sharing Cycling (if possible)	Public transport Taxi Car Sharing

4. Future developments affecting (air) travel behaviour

In recent years, different developments have been changing the behaviour of private travellers, commuters as well as business travellers in regard to if, when and how they conduct a trip. ICT, for example, lead to a change how people communicate, when they meet and how they interact affecting the time and way people travel (Hubers and Lyons, 2013). Within a corporate context, these technologies enable working from home or other remote locations and have been advancing the feasibility of telework (Hynes, 2016; O’Keefe et al., 2016), thus shifting or eliminating commuting times to and from work to avoid travelling during peak hours. Further, the use of these enabling technologies as well as internet accessibility in various transport modes has been relocating work-related tasks to be conducted during the journey. Other emerging technologies like virtualisation could also have different impacts on the future transport industry. On the one hand, virtual meetings, for example, could act as a substitute for a physical journey and therefore decrease the demand for travel (Rohr et al., 2016). On the other hand, virtual technologies, social networks and the ability to easily connect and exchange with business partners and people all over the world may foster the need and wish for meeting personally, hence increasing the demand for transport in general and air travel in particular (Senbil, 2003; Tillema et al., 2008). Another crucial development, which might significantly impact the future transport market, is autonomous driving technology. It can affect both the travel behaviour of consumers and the urban landscape in terms of use of space. In an ageing society, for example, autonomous vehicles may enable travel for those users, which are not able to drive a car by themselves anymore or for whom public transport is too strenuous in terms of physical effort required. In regard to urban land use, autonomous vehicles do not require parking space close to the user but can access the location where these are needed on time. Hence, those urban areas currently assigned for car parking would be available for other uses. Fraunhofer (2016a) focuses on user behaviour during the journey with semi- and fully automated cars and places a particular emphasis on the assessment of the WTP for different services during the trip. It shows that 75 per cent

of survey participants would be willing to pay for in-vehicle services such as communication or information services. Furthermore, the authors show that the use of autonomous vehicle may lead to a restructuring of commuting behaviour since different tasks can now be integrated into the journey instead of being conducted at work or at home. Yap et al. (2016) also investigate traveller preferences in regard to automated vehicles in order to understand traveller sensitivity towards different travel attributes. The study analyses the feasibility of using this type of transport for the last mile and finds that passengers with first class status are more likely to use (semi)automated vehicles for this purpose. This can also be an application case to air transport in providing convenient, on-time airport access, also from remote urban areas. Potentially connected with automated transport is the introduction of personal air vehicles (Fraunhofer, 2016b), which represent a decentralised and individualised form of air transport. This type of transport may also assist in connecting remote locations with transportation nodes or linking different locations directly. Currently, different market analyses are conducted in this area and some prototypes are already being developed (Lilium, 2017; Rest, 2017; Stewart, 2017).

5. Discussion and conclusion

Adding to the current research in the field of (air) passenger market segmentation, this paper applies an a priori market segmentation approach combined with socio-economic segmentation criteria, to determine six future passenger profiles for the European air transport market with a time horizon of 2035. Going beyond the mere differentiation of travellers by trip purpose, socio-demographic and behavioural aspects as well as future (technological) developments are taken into consideration. These profiles are not covering all potential air travellers but give indications to main consumer-related future developments being faced by the transport sector. The influence of digitalisation and the increased use of ICT by consumers as well as changing environmental awareness and associated actions in society are factors that constitute the basis for two of the six passenger profiles: the Environmental Traveller and the Digital Native Business Traveller. The former places high importance on the ecological footprint of her activities and makes travel decisions accordingly. The digitally savvy traveller may expect tailored services and products and may exhibit the respective WTP for such offers. Hence, understanding the needs and expectations may support airports and airlines in assessing the potential of new revenue sources by introducing new services and products. Moreover, the paper gives a brief outlook on technological innovations, which may have a significant impact on consumers' future travel behaviour by changing travel time, what type of transport mode they use or which activities they are able to conduct during the journey. Only little research has been conducted in regard to autonomous driving, personal air vehicles, or the impact of digitalisation on working and related travel patterns. Hence, further research needs to be placed on these aspects.

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6. References

- Boland, D., Morrison, D., O'Neill, S., 2002. The future of CRM in the airline industry: A new paradigm for customer management. IBM Institute for Business Values.
- Bontoux, L., Bengtsson, D., 2015. 2035 Paths towards a sustainable EU economy Sustainable transitions and the potential of eco-innovation for jobs and economic development in EU eco-industries 2035. <https://doi.org/10.2760/80294>.
- Bruning, E. R., Hu, M. Y., Hao, W. A., 2009. Cross-national segmentation An application to the NAFTA airline passenger market. <https://doi.org/10.1108/03090560910990009>.
- Civic Science, 2016. Gen Z is Making Waves in the Tech World. <https://civicscience.com/gen-z-is-making-waves-in-the-tech-world/>.
- Die Bundesregierung, 2013. Nachhaltiger Konsum liegt im Trend. <https://www.bundesregierung.de/ContentArchiv/DE/Archiv17/Artikel/2013/08/2013-08-02-nachhaltiger-konsum.html>.
- Dolnicar, S., 2006. Data-driven Market Segmentation in Tourism - Approaches, Changes Over Two Decades and Development Potential, CD Proceedings of the 15th International Research Conference of the Council for Australian University Tourism and Hospitality Education (CAUTHE), 346-360. Australia, Victoria University.
- Dolnicar, S., 2008. Market segmentation in tourism, in: "Tourism Management: Analysis, Behaviour and Strategy". In: Woodside, A., Martin, D. (Eds.). CAB International, Cambridge, pp. 129.
- Door to Door Information for Air Passengers project: Deliverable 2.2 for 2016, User Groups and Mobility Profiles.
- eMarketer, 2016. Social Network User Penetration in Western Europe, by Country 2014 - 2020. <http://www.emarketer.com/Chart/Social-Network-User-Penetration-Western-Europe-by-Country-2014-2020/190423>.
- European Strategy and Policy Analysis System (ESPAS), 2015. Global Trends to 2030: Can the EU meet the challenges ahead? <http://europa.eu/espas/pdf/espas-report-2015.pdf>.
- Euromonitor International, 2013. Special Report: The Family Structure of the Future. <http://blog.euromonitor.com/2013/07/special-report-the-family-structure-of-the-future.html>.
- Euromonitor International, 2014. Datagraphic population and homes: Proportion of single person households worldwide. http://www.euromonitor.com/medialibrary/PDF/pdf_singlePersonHH-v1.1.pdf.
- European Commission, 2016. Monitoring the Digital Economy & Society 2016-2021. <http://ec.europa.eu/eurostat/documents/341889/725524/Monitoring+the+Digital+Economy+%26+Society+2016-2021/7df02d85->

- 698a-4a87-a6b1-7994df7fbeb7.
- Eurostat, 2016. Population statistics. <http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-database>.
- Fraunhofer, 2016a. The Value of Time. Fahren, Nutzerbezogene Service-Potenziale durch autonomes. https://blog.iao.fraunhofer.de/images/blog/studie-value_of_time.pdf.
- Fraunhofer, 2016b. Personal Air Vehicles. https://www.int.fraunhofer.de/content/dam/int/de/documents/EST/EST_0416_Personal_Air_Vehicles.pdf.
- Freathy, P., O'Connell, F., 2012. Spending time, spending money: passenger segmentation in an international airport. *The International Review of Retail, Distribution and Consumer Research* 22(4), 397–416.
- Future Foundation, 2015. Future traveller tribes 2030: Understanding tomorrow's traveler. UK, London. <http://www.amadeus.com/documents/future-traveller-tribes-2030/travel-report-future-traveller-tribes-2030.pdf>.
- Gesellschaft für Konsumforschung Mobilitätsmonitor, 2011. Airport Private Traveller Study - Reiseverhalten, Einstellungen und Werte der Privatreisenden am Airport, GfK Mobilitätsmonitor - GfK Roper Consumer Styles. http://www.munich-airport.de/media/download/bereiche/mediacenter/extras/deutsch/Airport_Private_Traveller_Study.pdf.
- Haley, R. I., 1968. Benefit Segmentation: A Decision-oriented Research Tool. *Journal of Marketing* 32(3), 30–35.
- Henley Centre HeadlightVision, 2007. Future Traveller Tribes 2020 - Report for the Air Travel industry. <http://www.amadeus.com/documents/future-traveller-tribes-2030/travel-report-future-traveller-tribes-2020.pdf>.
- Hubers, C., Lyons, G., 2013. New technologies for the old: Potential implications of living in later life for travel demand. *Transport Policy* 30, 220–228.
- Hynes, M., 2016. Developing (tele)work? A multi-level sociotechnical perspective of telework in Ireland. *Research in Transportation Economics* 57, 21–31.
- International Air Transport Association, 2016. The long-run drivers of air passenger demand. Presentation by David Oxley.
- Kattiyapornpong, U., 2006. Understanding travel behavior using demographic and socioeconomic variables as travel constraints.
- Kluge, U., Paul, A., 2017. Exploring factors influencing European passenger demand for air transport using a causal loop diagram, G.A.R.S. 14th Aviation Student Research Workshop. Netherlands, Amsterdam.
- Kluge, U., Paul, A., Tanner, G., Cook A. J., 2017. Future Passenger Demand Profile, Deliverable 3.2. DATASET2050 project.
- Kluge, U., Paul, A., Cook, A. J., Cristóbal, S., 2017. Factors influencing European passenger demand for air transport, 21st Air Transport Research Society World Conference. Belgium, Antwerpen.
- Lilium, 2017. The Lilium Jet. <https://lilium.com/mission/>.
- O'Keefe, P., Caulfield, B., Brazil, W., White, P., 2016. The impacts of telecommuting in Dublin. *Research in Transportation Economics* 57, 13–20.
- Official Airline Guide: OAG Trends Report for 2014, What is shaping air travel in 2015?.
- Organisation for Economic Co-operation and Development, 2011. The Future of Families to 2030. <http://dx.doi.org/10.1787/9789264168367-en>.
- Paul, A., Kluge, U., 2016. Current Passenger Demand Profile, Deliverable 3.1. DATASET2050 project.
- Ploetner, K. O., Schmidt, M., 2014. FASCINATIONS2050 project, finale report.
- Rest, J., 2017. Fliegendes Auto geht in Verkauf. <http://www.manager-magazin.de/unternehmen/autoindustrie/fliegendes-auto-personal-air-and-land-vehicle-pal-v-wird-verkauft-a-1134264.html>.
- Rohr, C., Ecola, L., Zmud, J., Dunkerley, F., Black, J., Baker, E., 2016. Travel in Britain in 2035: Future scenarios and their implications for technology innovation. RAND Corporation, Cambridge.
- Senbil, M., 2003. Simultaneous Relationships Between Telecommunications and Activities, 10th International Conference on Travel Behaviour Research. Switzerland, Lucerne.
- Société Internationale de Télécommunications Aéronautiques, 2015. Air transport industry insights: The future is personal, SITA - A 360 Degree Report. <http://www.missionline.it/wp-content/uploads/2015/08/360-report-the-future-is-personal-2015.pdf>.
- Société Internationale de Télécommunications Aéronautiques, 2016. Air transport industry insights. <https://www.sita.aero/globalassets/docs/surveys--reports/passenger-it-trends-survey-2016.pdf>.
- Skift: Yearbook for 2015. Megatrends defining travel in 2015, Issue: 01, Skift Travel IQ.
- Smith, W. R., 1956. Product Differentiation and Market Segmentation as Alternative Marketing Strategies Author. *Journal of Marketing* 21(1), 3–8.
- Steg, L., Vlek, C., 2009. Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology* 29(3), 309–317.
- Stewart, J., 2017. How Airbus dreamed up the wild design for ist flying car <https://www.wired.com/2017/05/airbus-dreamed-wild-design-flying-car/>.
- Suryani, E., Chou, S. Y., Chen, C. H., 2010. Air passenger demand forecasting and passenger terminal capacity expansion: A system dynamics framework. *Expert Systems with Applications* 37(3), 2324–2339.
- Teichert, T., Shehu, E., von Wartburg, I., 2008. Customer segmentation revisited: The case of the airline industry. *Transportation Research Part A: Policy and Practice* 42(1), 227–242.
- Tillema, T., Dijst, M., Schwanen, T., 2008. Electronic communication in social networks and implications for travel, 87th TRB Annual Meeting. Washington, DC.
- Tirenni, G., Kaiser, C., Herrmann, A., 2007. Applying decision trees for value-based customer relations management: Predicting airline customers' future values. *Journal of Database Marketing & Customer Strategy Management* 14, 130–142.
- Vela, M. R., García, E. M., 2010. A segmentation analysis and segments profile of budget air travelers. *Cuadernos de Turismo* 26, 235–253.
- World Business Council for Sustainable Development, 2015. Sustainable Consumption Facts and Trends. <http://www.wbcsd.org/Clusters/Sustainable-Lifestyles/Resources/Sustainable-Consumption-Fact-and-Trends-From-a-Business-Perspective>.
- Wittgenstein Centre Data Explorer, 2016. Share of population with tertiary education of total population, statistics. <http://witt.null2.net/shiny/wic/>.
- Wittmer, A., Hinnen, G., 2016. Airline Passengers, in: "Air Transport Management - An International Perspective". In: Budd, L., Ison, S. (Eds.). Routledge, London, New York, pp. 139.
- Yap, M., Correia, G., van Arem, B., 2016. Preferences of travellers for using automated vehicles as last mile public transport of multimodal train trips. *Transportation Research Part A: Policy and Practice* 94, 1–16.
- Young, D., Pilon, N., Brom, L., 2009. Challenges of Air Transport 2030. https://www.eurocontrol.int/ec/gallery/content/public/document/eec/other_document/2009/003_Challenges_of_air_transport_2030_experts_view.pdf.