



## **Development of Digital Customer Experience in Air Navigation Services**

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## Abstract

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The aim of this thesis is to study the formation of a digital customer experience and clarify how customers experience digital services in air navigation services. The commissioner of the thesis is Finnish air navigation services company Fintraffic ANS. Increasing the degree of digitalisation is part of commissioner's strategy, and based on the research results, development proposals are presented to improve digital customer experience.

The research was conducted as a quantitative survey in April 2022. The target group includes 3 Finnish flight schools and general aviators. A total of 45 respondents replied to the questionnaire. The questionnaire consists of 23 questions. Most of the questions are opinion scale arguments that measure the general attitudes towards digital services, the functionality of current services and certain functionalities related to new flight preparation application. In addition, the questionnaire has open questions for a deeper analysis. The results were analysed using percentage distributions and weighted averages. For open questions, similarities were sought from answers and combined using cluster analysis methods.

The theoretical part deals with digitalisation in aviation, as well as the digital customer experience and its formation. Both Finnish and foreign literature sources, internet publications and scientific articles have been used as sources of origin. Digital customer experience is a subjective view of a company formed by customer when visiting any digital touchpoint during the customer journey. The digital customer experience is a very individual issue, which can be influenced by the background of the customer, situation, and emotional state of the individual.

According to study, the most important individual factors in formation of customer experience were easy access to services, the possibility of self-service and the possibility to personalise services. The results indicate, that current Fintraffic ANS digital services are at good level. However, there were things to develop, for example in the flight plan process, in retrieving and filtering data and in the presentation of information graphically. The study also highlighted the need for better information sharing for aircraft in-flight at lower airspace.

The study showed that a good and effortless customer experience is important and has an impact on flight safety. The commissioner's strategy and digitalisation project aim to centralise fragmented services that will enhance customer experience. However, improving customer experience requires a holistic vision and implementation. Improvement will not be achieved through silo-like technology projects alone. Digitalisation enables the company to further improve airspace management, increase safety and create conditions for a good digital customer experience.

**Key Words**

Air Navigation Services, Digitalisation, Customer Experience, Aviation, Application

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## 1 Introduction

The purpose of this thesis is to clarify how air navigation service customers have experienced digital services and how digital services could be developed. Digitalisation is in the core of the commissioner Fintraffic Air Navigation Services (ANS) new strategy. The strategy aims to improve traffic safety and smoothness with new smart solutions and digital services. In air navigation services, the purpose is to improve operating conditions by centralizing the digital data in a single platform.

Aviation is highly data-dependent industry, where accurate information change is critically important. Properly timed up-to-date data is not only critical for safety, but also for smooth operations between all participants. In the aviation sector, digital information has been available for a long time. The transformation to the digital era has gone through digitization of paper data and the further evolving of multiple digital services.

Transformation is continuing and is needed, as aviation is projected to increase. Another factor accelerating the need for digitalisation, is the new forms of aviation, which need to be integrated into the airspace. For example, urban air mobility (UAM) and drones have already impacted traditional aviation. In the future, all these new types of operations and flying vehicles will form even more complex airspace structures. Accurate flight advisories are important for both air operators and air navigation services to maintain safety and enhance efficiency of the airspace usage.

Fintraffic ANS has an ongoing project for a new platform that serve all airspace users. The goal is to create user interface, which has structured and centralized data available and access to most services. An application is designed to be user friendly one-stop shop where operators can for example draw up a flight plan or make announcements of drone flights. Air navigation service providers (ANSP) are also responsible for aeronautical information services (AIS). The purpose of the AIS is to ensure that all pilots and operators receive all critical data regarding their operations. With a new platform, data will be provided with visual appearance to enhance situational awareness of real-time airspace.

### 1.1 The aim of the thesis and research problem

This thesis aims to find out customer-oriented and value-producing features for a new digital service. The target group are general aviators who use Fintraffic ANS services. The

goal is to get an accurate picture of how the commissioners digital services are seen and how they can be further developed. The research is also trying to find development suggestions for the new digital platform. Usability suggestions are created by mapping the current problem areas. All development proposals made, aim to enhance the digital customer experience holistically.

The research focuses on finding out what impacts on digital customer experience and how the customer experience could be improved in air navigation services. The following three questions will be used to address the research problem.

1. How customers generally perceive digital services?
2. How customers experience current services?
3. Which functionalities would enhance the digital customer experience?

## **1.2 Structure of the thesis**

Chapter 2 presents the background of the thesis and the commissioner. It focuses on the tasks and duties of the commissioner and presents the partner of the digitalisation project.

Chapter 3 is the first theory part of this study, and it defines digitalisation in general and how digitalisation affects in aviation. Digitalisation has brought efficiency in operations as well as wider opportunities for information management. Still, digital transformation appears with some challenges and fragmented services. Theory presents among other things the projects that are underway worldwide to promote digitalisation. Chapter also includes a SWOT analysis on how digitalisation impacts aviation.

Chapter 4 is the second part of theoretical framework, and it focuses on digital customer experience. Theory explains how digital customer experience is formed, and how it can be developed. The section also presents what trends exists in digital customer experience, as well as key features for leading and measuring digital customer experience in industries.

Chapter 5 explains the methods used in this research. This thesis was a study aimed at developing customer experience, so quantitative research extract was chosen as the method. The research was conducted as a survey and the implementation is presented in this chapter.

A survey results and a summary of results are presented at chapter 6. The last section, chapter 7 contains reflection and conclusions, and includes development proposals. The reliability and validity of the research are also stated in this chapter. Lastly, author assesses the thesis process and his own learning.

## **2 Background for the thesis**

The topic for the thesis was first introduced by the commissioner and further developed through discussions. The new strategy of the commissioner aims to increase digitalisation rate of the whole Finnish transport system. Goal is to find solutions for reduction of transport emissions and improve accessibility of the whole country of Finland. The plan to achieve these improvements, is done by building comprehensive real-time situational picture of events and infrastructures on land, at the sea and in the air. The picture will be presented through digital platform of traffic data.

The commissioner Fintraffic Air Navigation Services (ANS) is within the process by developing a new situational awareness system for the airspace users. System is targeted to serve especially the further increasing unmanned aviation and conventional (manned) aviation. The system will display real-time situational picture of whole Finnish airspace and airspace reservations. System will also include functionalities that support pilots or other persons who participate in flight operations. Filing and managing flight plans, activating, and closing flight plans, making airspace reservations or drone flight announcements are few examples. The system contains also weather and aeronautical information, so users receive all service centralized from one place.

Fintraffic ANS has entered into agreement with Astra UTM to supply new situational awareness system in January 2021. The development process is still going on in cooperation with parties, and the goal is to introduce the system at summer 2022.

### **2.1 Fintraffic Air Navigation Services**

Fintraffic ANS is a Finnish air navigation service provider (ANSP). Fintraffic ANS is part of traffic management company Fintraffic. Fintraffic is a special assignment group, which operates under the ownership steering of the Ministry of Transport and Communications. Fintraffic ANS key services are air traffic services, including air traffic control and flight information services. Aeronautical information services and technical air navigation services are also responsibilities of Fintraffic ANS. The purpose and special assignment are to ensure safe, smooth, and environmentally friendly mobility in Finland, by road, rail, water, and air (Fintraffic 2021a).

## **2.2 Air traffic services**

Fintraffic ANS has a legal mandate to manage and control the Finnish airspace. Fintraffic ANS provides flight route and air navigation services at 22 airports in Finland. The most visible and well-known task is air traffic control (ATC). Before Covid-19 pandemic Fintraffic ANS processed nearly 300,000 flights per year, of which around 53,000 were overflights. The customer base consist of airports to which company provides air traffic services (ATS). ATS can be defined as service that regulates and assists aircraft in real-time to ensure safe operations. ATS at airports are either air traffic control or flight information services. The other half of the customer base are real airspace users. Commercial aviation industry is the most prominent customer, but also others such as state and military aviation, general aviation, flight schools and unmanned aviation use and require air navigation services. Fintraffic ANS mission is to provide safe services, that match customers need and deliver these services in a smooth and punctual manner (Fintraffic 2021b).

## **2.3 Aeronautical information services**

In addition to air traffic services, Fintraffic ANS is responsible for providing several other services. Production and distribution of aeronautical information in Finland is one of the responsibilities. The task of aeronautical information services (AIS) is to take care the operation of international aeronautical information system in Finland. The purpose is to ensure organized, timely and accurate information flow, which is necessary for the safe, regular, and economical air traffic operation. The AIS products consist of variety of publications. AIP Finland is a manual for operations in Finnish airspace and at airports. AIS also produce and maintain different map products. En-route maps, airport maps and approach charts for example, are widely used by ATC and pilots. Aeronautical chart (ANC) is the biggest map that displays different airspace, danger areas, restricted areas, prohibited areas and obstacle data. ANC is especially used by general aviators. One significant source of information is Notice to Airmen (NOTAM). NOTAM is a short notice or advisory that alert pilots of any possible hazards, which may affect the flight on route or at airports. NOTAMS are collected to so called pre-flight bulletin (PIB), that each pilot goes through when preparing flight.

Fintraffic AIS operates in accordance with international regulations. Data is collected from various sources, such as airport operators, defence forces and surveyors. AIS further processes the data into aeronautical information products in a global format. There is a



need for information to be exchanged digitally and distributed as data forward (Fintraffic 2022).

#### **2.4 Astra UTM**

Astra is a Dubai based company that provides UTM (unmanned traffic management) system for authorities, ANSP's, and drone operators. Astra UTM is one of the worlds leading UTM technology provider. Fintraffic and Astra UTM has made agreement of implementing a new UTM-centric system in Finland. A new system will include situational awareness and briefing facility modules. Situational awareness module has access to real-time map-based status of airspace, as well as see planned activities for the future. Briefing facility module aims for better customer experience by combining situational awareness and flight plan acknowledgement. There will be also possibility to monitor flights and retrieve previous flight plans. Astra UTM aims to serve both unmanned and manned air traffic. Astra UTM describes this project unique showcase of combining conventional air traffic management and UTM (Astrautm 2021).

### **3 Digital transformation**

This chapter discusses the basic concepts of digitalisation and the short presentation of digitalisation in aviation. Digital transformation and digitalisation are the hottest topics in business today. Services and system are digitised, and this will affect the way service producer and end-users operate. In the aviation sector, digitalisation aims to create more efficient, flexible, and environmentally friendly operations. The chapter also contains a SWOT analysis of digitalisation in aviation industry.

#### **3.1 Digitalisation**

Digitalisation means that something physically delivered is now being done digitally. A simple example, a traditional letter has transformed to email, or a department store operates now as an online store. On the larger scale digitalisation refers to the transformation of the entire operating environment and is not only limited to own organisation. Digitalisation also transforms the peoples' behaviour, market dynamics and the core business. Digitalisation is about innovations, customer orientation and new uses of digital technologies. From the perspective of companies, it means not just digitalizing one channel, but a completely new way of doing business (Hämäläinen, Maula & Suominen 2016, chapter 2).

On a company level digitalisation is not only an opportunity. It is a necessity to meet the changing expectations of customers. First impression of digitalisation is usually seen as web pages, online stores, applications, and electronical transaction services. However, digitalisation means wider and deeper upheaval of companies' activities. Transformation and renewal are in the core of digitalisation. Digitalisation is about creating new business models, as well as creating new products and services. New digital processes bring benefits for both companies and customers. Digitalisation however requires new approach to management and whole corporate culture. Renewal is required in competences, task organizations, and in operating models. With proper vision and daily determined work, the goal of digitalisation can be achieved. Companies that have been able to innovate through digitalisation, have reach new customers, have improved their services, are operating faster, more efficiently and with higher quality (Ilmarinen & Koskela 2015, chapter 1 & 2).

### 3.2 Digitalisation in aviation

Aviation business has been one of the major pioneers in digitalisation. Especially airlines have been converting many analogue data processes into digital ones. Digitalisation has been one of the cornerstones of the emergence of new business models such as low-cost airlines.

Digitalisation impacts basically all fields of aviation. Single European Sky ATM research SESAR is a collaborative project that support the modernisation and harmonisation of European airspace and air traffic management (ATM) systems. SESAR was launch by European Union in 2007. SESAR's goal is to define, develop and deploy mode technologies and innovations that are needed to increase the performance of European ATM systems. Modernisation is crucial for the sustainability of European aviation, as air traffic is projected to increase. ATM includes basically all phases, which assists aircraft from departure, through airspace, and land at the destination airport. Air traffic services (ATS) is a part of ATM service that regulates and assists aircraft in real-time to ensure safe operations. It is seen that current ATM systems are not conceived to cover increasing air traffic and new forms of aviation (SESAR 2021, Uniting Aviation 2020).

EUROCONTROL, the European organisation for safety of air navigation, contributes by many initiatives to the digitalisation in European region. Harmonized digital information exchange in various critical data domains, such as aeronautical information management, meteorological information and flight and flow information plays critical role facilitating smooth interoperability across Europe (Eurocontrol 2021a).

ICAO (International Civil Aviation Organisation) introduced SWIM (System Wide Information Management) as a global initiative for harmonising aeronautical information. SWIM is a part of ICAO's 15-year Global Air Navigation Plan for 2016-2030. SWIM concept aims for seamless information access and sharing between all ATM information users. SWIM takes best information management business practises from the ICT-sector and applies them to ATM. For example, Service-Oriented Architecture, open standards, and the use of main-stream web technologies ensures the availability of interoperable and user-driven information services. When implementing interoperable systems that reduces costs, it makes aviation data markets more competitive (Eurocontrol 2021b).

### 3.3 Fintraffic ANS digital services

Fintraffic ANS is responsible for managing the use of Finnish airspace and providing air traffic services in Finnish territory. In addition to that Fintraffic ANS is also responsible for the production and distribution of aeronautical information and flight briefing services. These services are presented in chapter 2.3. Fintraffic ANS provides aeronautical information services in accordance with international regulations, agreements, and national regulations. The purpose of the aeronautical information system is to ensure that the information necessary for aviation safety is properly published and accessible to those in need (Fintraffic 2022).

The pilot-in-command shall be responsible for familiarising himself with aeronautical data prior to each flight. It is an important part of safe operation and is also regulated in the operational requirements. Another important task in terms of flight preparation is to draw up a flight plan. The purpose of the flight plan is to inform a ATS unit of the intended flight. The flight plan contains important information about the flight, such as type of aircraft in use, intended flight route, and several other information related to the flight. A flight plan submitted and approved is mandatory on specified type of flights. This thesis is about to find out the customers experiences how services are working currently and seek for possible improvement proposals.

Fintraffic ANS has compiled all aeronautical information service products and services under one website. The website [www.ais.fi](http://www.ais.fi) contains many links to publications produced by Fintraffic ANS and other data providers. For example, Finnish Meteorological Institute is exclusively designated authority for providing aeronautical meteorological services in Finland. The information from the sites is free of charge and it is up to each user to retrieve the information. Fintraffic ANS has made an agreement with commercial online map service producer Aviamaps Ltd, to replace previous airspace use plan (AUP) and Navigation Warning (NAV WRNG) maps. Aviamaps Ltd provides a comprehensive, up-to-date, and modern digital map for all airspace users.

The flight plan process also passes through [www.ais.fi](http://www.ais.fi) site. The website contains the link to the electronic flight plan form. In order to ensure the arrival and to obtain approval of the flight plan, the consignor must still call the Flight Planning Centre (FPC). Changes and cancellations of the flight plan shall always be called to the FPC or advice ATS unit concerned.

Fintraffic ANS provides services in accordance with all regulations and in the form in which they are to be presented. It should be noted that the services are not particularly user-friendly. There is a lot of information and filtering it to different needs is at each user's own responsibility. Flight preparation requires a combination of data from multiple sources. In this way, it can be challenging to form a situational awareness of operational environment. The development work currently under way will especially focus on improving user-friendliness. In the conclusion of this thesis, I will present development proposals for improving the digital customer experience.

### 3.4 SWOT analysis of digitalisation in aviation

SWOT analysis is one of the most popular strategic and management tools. It is used to help organisations to identify strengths, weaknesses, opportunities, and threats related to new projects or businesses. It can be referred as situational assessment of a situation analysis. SWOT analysis examines both internal and external factors of each case. Strengths and weaknesses are considered as internal affairs that organisations can have influence. Opportunities and threats are, on the contrary, external factors that you can predict, but not really influence. To get the best analysis, you need to find as many internal and external factors as possible and analyse their effects accurately. Swot analysis is usually presented in a four-field matrix (Mindtools s.a). Figure 1 below, presents a swot analysis of the impact of digitalisation on aviation industry.

<b>S</b> STRENGTHS	<b>W</b> Weaknesses	<b>O</b> Opportunities	<b>T</b> Threats
<ul style="list-style-type: none"> <li>• Common awareness</li> <li>• Co-operation</li> <li>• Existing ecosystems</li> <li>• Transparent uniform rules</li> <li>• Common safety orientation</li> <li>• Umbrella organizations</li> <li>• Attractiveness of aviation</li> <li>• Skilled labour</li> <li>• Projected growth</li> </ul>	<ul style="list-style-type: none"> <li>• Fragmentation</li> <li>• Regulations</li> <li>• Different needs</li> <li>• Multiple data producers</li> <li>• Multiple technologies</li> <li>• Lack of integration</li> <li>• High fixed costs</li> <li>• Technology dependency</li> <li>• Vulnerability</li> </ul>	<ul style="list-style-type: none"> <li>• Efficiency</li> <li>• Connectivity</li> <li>• Accessibility</li> <li>• Better customer experience</li> <li>• New mobility system</li> <li>• New business opportunities</li> <li>• Sustainability</li> </ul>	<ul style="list-style-type: none"> <li>• Global economy</li> <li>• Geopolitics</li> <li>• Component shortage</li> <li>• Political factors</li> <li>• Security issues</li> <li>• Terrorist attacks</li> <li>• Cyberthreat</li> </ul>

Figure 1. SWOT analysis of digitalisation in aviation

The development of digitalisation in the aviation sector is an absolute necessity. Digitalisation can be used to achieve more efficient, safer and environment friendly operations. The collective awareness of this can be counted as a strength. International co-operation and existing digital ecosystems are also an absolute strength. Similarly, aviation's open uniform rules and safety orientation, controlled by aviation umbrella organisations, can be considered as strength. The attractiveness of aviation also brings skilled labour to the sector, as well as passengers which guarantee continuous growth development (Hausweiler & Mattig, 2017)

There are number of weaknesses in the aviation sector from a digital perspective. The biggest weakness that unites many of them, is the fragmentation of the industry. The aviation sectors are driven by different needs. Legal issues between countries can also be very complex. Data is produced by numerous different parties from their own systems, which are not integrated into each other. In the aviation sector, fixed continuous cost is high. The creation of new technologies requires major investments. And in the end, the more dependent the aviation industry becomes on digitalisation, the more vulnerable it is. For example, the collapse of crucial software or communication systems may have serious impact for entire aviation ecosystem (Lamb, 2018; Silling 2019)

Digitalisation brings huge opportunities for both the individual passenger and the entire aviation ecosystem. In today's world, air transport is about efficiency, speed, connectivity and, accessibility for all. By developing shared facilities, practises, and procedures many synergies can be applied. And it is not just a question of improving air transport services in its current form. Digitalisation and cutting-edge technology, such as autonomous devices and open data sharing, create opportunities to transform entire mobility system by enabling new business models and mobility services. Unmanned aerial vehicles, artificial intelligence, biometrics, and electric aircraft are just a few examples of concrete innovations that only become possible by digitalisation and technology (ICAO s.a.; Hausweiler & Mattig 2017)

Digital transformation always contains threats, which are important to identify. There is always a continuity plan in aviation for events like this. In this context, However, the threats are caused by external factors, so not all threats can be fully prepared for. For example, the aviation is strongly influenced by the global economy. Economical fluctuations and geopolitical situations create uncertainty in aviation, which is reflected in the ability to invest in digitalisation. Rising fuel prices and component shortages are good examples of this. During uncertain times cost are cut and businesses are focused on core

activities. Political and security issues also affect the digitalisation of aviation. There is no opportunity for completely transparent sharing of information. Aviation has always been vulnerable for terrorist threats as well. And as the degree of digitalisation increases, cyberthreats have also emerged strongly (Lamb, 2018; Satair 2020).

## **4 Digital customer experience**

This chapter discusses about digital customer experience (DCX). Digitalisation touches and changes basically all areas of life. Most of the industries, functions, and even society, is touched by digitalisation even wider than we can imagine. More and more everyday operations are handled online, and processes have been automated. Data flow around us makes services more personalized. This has also changed customer behaviour and expectations regards customer experience. Ilmarinen & Koskela describes the transformation of customer behaviour as the most important driver of digitalisation. The way we buy and use services, obtaining and sharing information, communicating, and even building one's own identity has changed with digitalisation. In today's digital world, the customer determines how, where, and when they want to do business (Ilmarinen & Koskela 2015, 52-58).

### **4.1 The formation of digital customer experience**

Customer experiences arise when an organisation and a customer interact with each other. Digital customer experience may start from company's website, or include mobile apps, chat bots, social media, or any other channel with virtual touchpoint. Löyttänä & Kortesoja describes customer experience as a sum of the encounters, images, and emotions that the customer forms about the operation of the company (Löyttänä & Kortesoja 2011, chapter 1). According to Filenius (2015, 30), a digital customer experience arises, when the user utilises any terminal or interface, in which the service is digitally produced, and can perform desired operation or part of it.

It is a wrong assume that digital service is only limited into computer terminals, mobile phones, or tablets. The role of digital service might be quite small in the supply chain, but still, the decisive factor for the final customer experience. Digital service is a part of multi channel service chain, where the quality of digital service determines, what kind of customer experience is created (Filenius 2015, 76).

Traditional digital customer experience can be structured into different service processes. Liang, Zhilin & Minjoon (2013) defined service processes as 6 different steps.





Figure 2. Service Process Phases (Adapted from Liang, Zhilin & Minjoon 2013)

- Accessibility – Is service accessible at all circumstances?
- Search – How to find the company and service?
- Evaluation and decision making - How to evaluate and choose product or service?
- Transaction – How to perform desired operation?
- Possession – How to get and manage service after the transaction?
- Post-purchase – How customer care and support is managed?

As customer experience is a sum of many encounters, the term “convenience” reflects the goal of digital services. To achieve a good digital customer experience, digital services in every phase should be easy and convenient to use regardless of the industry or the business. This issue about air navigation services is studied in the empirical part of the thesis through a survey.

The customer experience cannot be generalized in any way, but it is always very individual and personal. The digital customer experience is affected by, for example, individual’s skills and attitude towards digital services. The importance of competence is especially emphasized because success requires knowledge of the use of technical equipment. It is still common for customers’ technical skills to be overestimated. Negative attitude towards the company may also weaken the customer experience. This is common especially for public services (Filenius 2015, 25).

The formation of customer experience is also situation specific. Emotional state varies depending on how urgent or important the action is (Filenius 2015, 26). Ilmarinen & Koskela explains how customers expect services to be always available and by all terminals. Many of the customers live so called “an instant life,” where everything needs to happen immediately when they need it. For example, waiting or queuing for phone service in the era of smart technology, causes poor customer experience (Ilmarinen & Koskela 2015, 54)

## 4.2 Digital customer service trends

The ever-evolving digital environment has created new trends and expectations for customer-centric services. Consumers expect personalized and round-the-clock services, which answers their needs immediately. Therefore, to ensure successful customer experience, interaction must be seamless across all customer and company communication channels (Gag Gemini 2019). Technologies transfer many services proactive and at the same time invisible for the customer. Proactive services identify and solve problems even before they occur for the customer (Gerdt & Eskelinen 2018, chapter 1.1). These following trends are discussed in chapter 6, in the context of the survey results.

Digital customer service can mean a many different things. Adding a chat function to a website, switching telephone platform to VoIP (voice-over internet protocol), adopting customer to a new web-based self-service features, or transforming customer service agents to work from home, can be categorized as digital customer service. These features are important, but insufficient. According to DeLisi & Michaeli (2021, chapter 1), for gaining absolute win-win from the digital customer service model, it is vital to understand, that every part of customer service interaction, must happen on the customer's own screen. All the virtual, automated, or live assisted elements must take place where they started. Whether it is customers desktop, laptop, tablet, or mobile device all interaction goes through them. If there is a need for verbal communication with the customer service agent, the customer experience becomes entirely different. Therefore, it is important to distinguish a customer service interaction that includes some digital touchpoints and real digital customer service experience (DeLisi & Michaeli 2021, chapter 1).

The strong trend today is, that customers are expecting and even demanding service interactions to take place directly on their screens. Single customer journey can include various service elements, which are presented on customers own device. Delisi & Michaeli presented their views on onscreen services that enhance the customer experience. (Delisi & Michaeli 2021, chapter 1)

OnScreen communication has become familiar in personal life, in the form of chat, video chat, messaging, and use of social media platforms. Today, customer expect the same methods to be available for business or services. OnScreen collaboration gives the

service agent a full transparency on the customers screen in real time. This way an agent can help the customer while is on the company website or in the mobile application. OnScreen collaboration includes also features like co-browsing and screen or file sharing. (DeLisi & Michaeli 2021, chapter 1)

Smooth omnichannel experience, where customer can move seamlessly between different channels and still get a cohesive customer experience, is the most important CX trend in 2022 according to Forbes. An omnichannel customer experience is created when individual customer touch points are connected over different channels. Companies should expand their appearance and support in multiple channels like web sites s, social media platforms, applications, and allow customers to interact between channels seamlessly (Marr 2021).

Personalisation is also a big trend in creating comprehensive digital customer experience. Previously companies have focused on creating a feeling of a personal customer service. For example, by adding the customers name on a marketing letter. Nowadays a sense of personality is no longer enough, but customers truly expect personal customer experience (Gerdt & Eskelinen 2018, chapter 2.3). However, personalisation only produces better customer experience, if we can be sure that the right information is available at the right time and in the right place (Filenius 2015, 60)

The range of digitalisation tools has expanded, and companies need to think carefully what products or services they should digitize. Digitalisation of customer service and its components, such as artificial intelligence-assisted 24/7 self service and other automation projects are the hottest development trends at the moment. Customer portals, chat bots, virtual assistants, software robotics and speech bots are increasingly experimented in many organisations. Although consumer behaviour is changing with digitalisation, not everyone immediately embraces new digital practices. Customers expect to get real value from new services before they accept them (Hämäläinen, Maula & Suominen 2016, 25; Koponen 11.8.2021).

### **4.3 Measuring digital customer experience**

There are pros and cons to switching customer channels to digital channels. One good aspect for business is measurability. Customer touchpoints are more easily measured in digital channels. Correspondingly, one of the disadvantages is the failure to produce an

excellent customer experience. The negative customer experience spreads through social media to a vast number of people. Thus, the importance of the customer experience has grown further. Failures are being punished and it is possible to benefit from success. Referrals can be used as marketing resource more effectively (Trustmary 2022).

Measuring the customer experience accurately and unambiguously is in principle impossible. Customer experience is a very individual emotional state, which varies depending on the situation. However, to develop their operations, companies need to assess the level of customer experience they provide and identify development needs. Filenius (2015, 122) has summarized the goals of measuring customer experience into four fundamental areas (Filenius 2015, 122). Identifying these areas is also of paramount importance for the success of this thesis.

- Identify the current state, areas for development, and barriers to business
- Indicate progress to the past
- Comparison to competitors (benchmarking)
- Assist management in decision making

In a modern digital world understanding and evaluating the processes that measure customer experience is not so self-evident. Most of the technologies and processes are invisible. The customer cannot exactly know how or why the company succeeded in their service promises. In this case, the customer only thinks about the result, which ultimately decides what kind of customer experience is formed (Gerdt & Eskelinen 2018, chapter 2.3). Filenius clarifies that it is essential to understand the customer experience, which involves all interaction with the company or the brand. Therefore, raw data on customer experience metrics and measurements results alone is not enough. Combining analysis and creative thinking is needed. Data must be mirrored against business figures and find a correlation between them. And only when the correlation has been found, it is possible to systematically start developing customer experience (Filenius 2015, 122-123).

#### **4.4 Digital customer experience metrics**

NPS (Net Promoter Score) is a registered trademark which is well-known and widely used measure of customer service and customer experience. NPS is based on one simple question: "How likely would you recommend a product or service to other customers." In the survey customers are offered answer options 0-10. On the rating scale answers 0-6

are detractors, who are dissatisfied with the service and passes on the negative customer experience. Answers 7-8 are passives, who received acceptable service level, but expectations haven't been exceeded. Passives are not committed to the brand and may well switch to the competitors services. Answers 9-10 are promoters, who are very satisfied with their customer experience and conveys the positive message of the company forward. Actual NPS is calculated by taking the percentage of promoters and subtracting the percentage of detractors. NPS is especially useful when used on long-term basis, allowing trends of the customer experience development to be observed. The weakness of NPS model is, that the reporting only concerns the mental state after the whole transaction process. The NPS model cannot be used to interpret which areas of transaction have succeeded or failed (Pennanen 20.9.2018; Filenius 2015, 124-125).

CES (Customer Effort Score) is another useful metric especially for measuring customer service. The principal is similar to NPS. In this case customer is asked on scale 1-5, "how much effort had to be put into getting the matter done"? The CES model query can be implemented for each step of the transaction process, so it tells you more detail whether there are weak points. CES model is very reliable for predicting customer behaviour and overall satisfaction. As a disadvantage, CES does not tell you what exactly was considered difficult and why, during entire process (Questionpro 2022).

Visits to digital platforms generates massive amounts of data, which can be easily analysed by multiple web analytic tools. Visitor and user numbers are the most obvious metrics, but many things can also be inferred from customer behaviour. Average session duration tells how long a customer stays on company's web pages. The assumption is, that the longer customer stays, the better content is available. Bounce rate (%) tells in practice, how many of the customers loaded only one page, and then left. Pages per session on the other hand explains how many different pages customers visits, while staying on company's web pages. This metric is important for companies who has extensive site, and they wish customers to search information from more than one page. Web analytics also tells how customers navigate in online services. Each online service has own target, or a conversion. A conversion occurs often through certain pages, and by following these funnels, it is possible to analyse where the customer path breaks (Koivuniemi 2022).

The best way to find out customers experiences, is to as it directly from themselves. Customer feedback is collected by different methods in different situations. Feedback can be divided into desired feedback and unexpected feedback. We are all familiar with

feedback surveys in pop-up windows after completing something online. Usually, these surveys are structured, and answering is fast. Yet, these surveys are often perceived as disruptive and left unanswered. When you are tempted to respond with rewards, the response rate increases, but reliability of the results decreases. Processing structured feedback is typically easy and quick. Unfortunately, these surveys often cover only areas that organisations consider important. Instead, broader surveys with open questions deliver valuable insights. Even the analysis is more time-consuming, the information is far more valuable, as customers tell in their own words about their experiences. Unexpected feedback is collected daily in customer encounters, when reactions and emotions towards company services are raised. Still this feedback is rarely collected and further used. Reclamations and complaints are usually taken seriously. It depends on the company and the business model, what kind and how often the feedback is collected. Good tactics include short surveys frequently and a longer customer satisfaction survey, for example on a quarterly basis (Filenius 2015, 133-134; Koivuniemi 2022).

#### **4.5 Leading digital customer experience**

Improving and digitizing customer services is a major development target for many companies. It is widely acknowledged that good customer experience and satisfaction are cornerstones of the success for more and more organisations. However, it is important to understand that the developing and digitizing the customer experience requires precise overall strategy. The digitalisation of customer service can consist of several components such as artificial intelligence-assisted self-service and automation projects, customer portals, chatbots, virtual assistants, software robotics and so on. It is therefore important to develop the whole service chain, and not to focus on silo-like development projects. Digitalisation is not just a technology project, but it also involves a modernisation of multiple processes and even the way the staff works. Gerdt & Eskelinen (2018, chapter 2,3) state, that technologies are not important at all. The most important thing is the result, those technologies aim for. Therefore, leading this transformation requires a holistic vision and a long-term development roadmap (Koponen 2021).

It is easy to find similarities in the literature, articles, and companies' websites on strategies and ways to improve digital customer experience. When implementing new strategies, brands need to engage with customers, recognise customers perspectives and understand customer experience paths. Then identify how digitalisation fits into overall customer experience journey (TTEC 2022).

Customer experience thinking must be incorporated into the business strategy. Corporate management must be engaged, and the strategy put into practise. Already in project planning, informing, and involving customers and employees is paramount. Thus, a low understanding of customer and employee needs, as well as organisational silos can be avoided. The things above are common root reasons for many development projects to fail (Filenius 2015, 180-181; Koponen 2021)

From a functional point of view, same features were emphasized when creating a digital strategy. There is clear consensus in the literature, how to excel in digital customer service. Gerdt & Eskelinen (2018, chapter 2.3) summarize development of the digital age customer experience in four main areas: speed of service, personalisation, and user friendliness, supported by well built technology environment. Digitalisation has inevitable taken these areas into whole new level.

Omnichannel customer service with seamless channel flexibility is emphasized in all contexts dealing with the digital customer experience. Consistency of information across all channels and ability to switch channels without losing the context is most preferred feature. Definition and planning of customer journey must consider that the transition according to the need, is effortless and clear.

## Consider the Journey

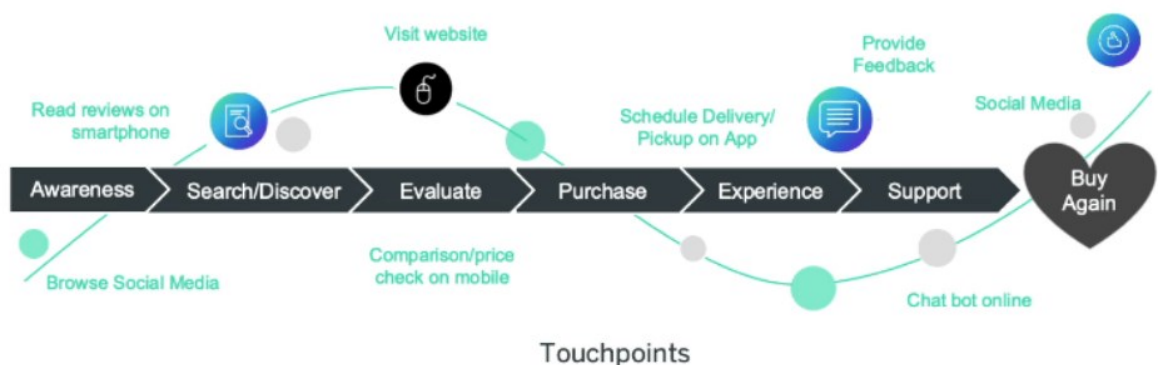


Figure 3. Customer Journey Consideration. (Qualtrix s.a.)

A service layer model, presented in figure 4, is one effective way to improve digital customer experience. Service layers can be used to provide the customer with a different style and level of service at various stages of customer journey. Service layers 0 and 1 are self service and layers 2 and 3 are personal service levels. Layer 0 provides mainly predictive information and layer 1 provides proactive information and tools for handling the issue. Service layer 2 provides personal service and that is where most of the problems are solved. The layer 3 is the top specialist layer, on which the most challenging problems are figured out (Finnchat 2022).

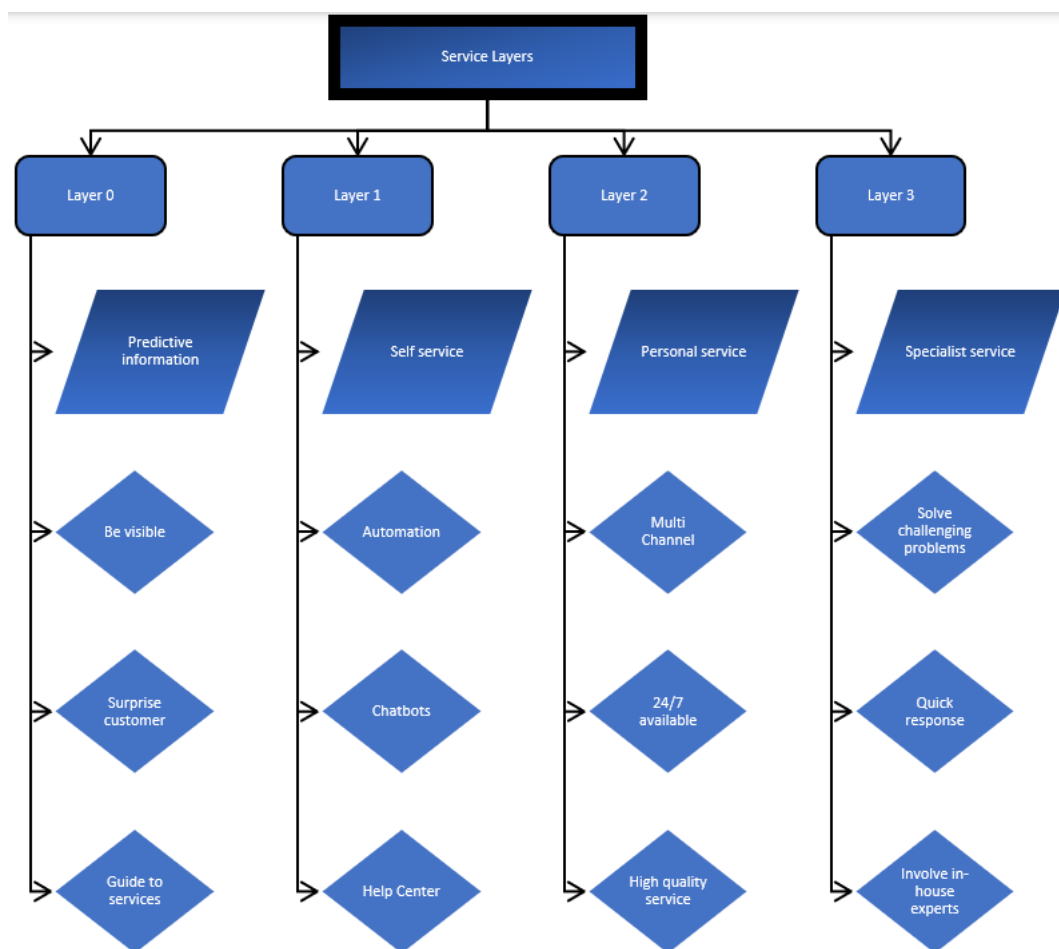


Figure 4. Digital service layer model (adapted from Finnchat 2022)

Service layer zero is meant to surprise the customer with service before he has even asked for it. Such a proactive service can be implemented e.g., chat as opening conversations, targeted emails of other active information sharing. The layer 0 is designed to reduce the demand for personal customer service and guide customers to self-service (Finnchat 2022).



Layer one is automated self-service level, however where there is still constant interaction with the customer. Automation, chatbots and help centre will guide the customer to take care of their own business, while reducing the workload of customer service representatives (Finnchat 2022).

When the self service does not produce the desired result, it is time for personal service. Layer two includes fast and timely customer service via chat, email, or another channel. The service layer three is intended to solve the problems that could not be solved at lower levels. At this level, the experts of organisations are involved in these challenging service situations (Finnchat 2022).

## **5 Methodology**

This chapter presents the research and data collection methods used in the thesis. The purpose of the thesis is to find out how commissioner can develop customer experience in their digital services. The research is based on primary data collected through a customer survey. Secondary data were obtained from literature review on the digital customer experience. Because the topic of the thesis aims for developing services, research is based on quantitative approach. Quantitative research is suitable for this type of study, which examines how customers perceive the quality of services. Also, open questions were asked to get insights how services should be further developed.

### **5.1 Research goal, questions, and development task**

The goal of the thesis was to find out ways to improve digital customer experience holistically in air navigation services. The main research problem is to examine how customers experience current services and how services should be developed from customers perspective. The main research problem will be solved with the following research questions:

4. How customers generally perceive digital services?
5. How customer experience current services?
6. Which functionalities would enhance the digital customer experience?

Based on these research question, a survey was designed. A survey will be presented in more detail later in this chapter. Development task of this thesis is to map current digital customer experience and to find ways to improve it. Development proposals are given in the last chapter of the thesis.

### **5.2 Research method**

A survey was selected as a research method for the thesis. In general, the research method can be defined as a means of solving the research problem. When choosing a suitable research method, it is basically a question of what kind of information is needed, and how the data can be collected. Research in general dictates what approaches to follow, so it is important that research methods support the work and data collection. The

right choice of methods will enable the necessary data to be collected and the final objectives of the research to be achieved (Bhosale, 2022). This thesis aims at development by quantifying how customer opinions are divided in the questions asked. The subject of the research is mixed sample of aviators who are using the commissioner's services. The survey was distributed to the three largest Finnish flight schools and to the members of two different Finnish general aviation federations.

The survey was selected as a research method as it is easy to implement and makes it possible to obtain extensive information. In a survey it is important, that the survey author has enough information on the topic, to be able to ask the questions that solve the right problem. In this case, the author's long experience in aviation industry supported the design of the questionnaire. When drafting the questions, it is worth bearing in mind the analysis of the feedback. Feedback might be useless if the collected data cannot be drawn to conclusions, which are refined to practical actions. Unsuitable questions may, at worst, produce unnecessary additional work in analysing the feedback. The main types of questions selected were two types, closed and open. The closed questions were chosen to gather more customer experience from several services. Closed questions are easier to respond and analyse. The downsides are, for example limited answer options and potentially leading questions. The disadvantage of the questionnaire in general, is the superficial information it may produce. To avoid this, the survey contained open questions, to which the respondent was allowed to explain own views with own words. The advantage of open questions is that the respondents think and answers more freely, so the answers may produce both surprising and useful information. As disadvantage of open questions can be mentioned, that it takes more time to analyse them and there is risk of misinterpretation (Sinijärvi 02.06.2016).

The study used a quantitative research extract by utilizing statistical data received from the survey. The aim of the study is not only to study the degree of customer satisfaction, but to find concrete ways to improve it. Therefore, the survey contains features of qualitative research when it maps customers' attitudes towards certain existing services and service forms. The decision to use chosen research method was due its practical and convenient implementation and possibility of reaching a wider range of respondents. The use of quantitative research was due to the easier analysis of large data. However, there was a desire to include open qualitative questions in order to obtain new fresh insights and development proposals from respondents. The formation of customer experience in the aviation and air navigation sectors consists of many distinct factors, and the general theory of customer experience may not be fully generalizable. The needs of the aviators

are varied according to the type of operation. Because this study sought a general view of overarching service, e.g., in-depth interviews were not considered a practical method.

The survey questionnaire was carefully prepared, and it has interfaces with the theory part of the thesis, as well as to current services. When drawing up the form, the possible analysis of the results by statistical methods were considered. The questionnaire was modified with the commissioner and assessed with the staff. The intention was, that the questions should certainly be easy to understand, and the main elements would be included in the questionnaire.

### **5.3 Conducting the survey**

The survey was conducted as an electronic survey using Google Forms survey tool, during April 2022. The questionnaire was conducted in Finnish. The questionnaire (appendix 1) contained total of 23 questions. The questions were divided into three sections. The first section charted the general attitude towards digital services. There were three arguments in the section and the response options were 1-5 according to Likert scale. Likert Scales are considered as one of the most reliable ways to measure respondents' opinions, perceptions, and behaviour. Therefore, its use to measure customer satisfaction and experiences is justified (SurveyMonkey s.a.). The second section focused on Fintraffic ANS current services. The section included structured multiple-choice questions, arguments to answer 1-5 on Likert scale and three open questions. The third section again surveyed the respondents' attitudes to certain functionalities, which could possible be added to services in the future. Again, the questions were arguments answered in accordance with Likert scale of 1-5. In the end there was open question in which respondents were asked to describe their wishes for future digital services to improve flight preparation.

The survey was distributed to those in charge of flight schools and aviation federations, who were asked to pass out the survey link in their organisations. These organisations were contacted, because they represent one of the most important customer segments of flight planning services. They will be users of the Astra UTM system in the future, so their opinions are important. Pilot students also represent the younger generation, who are more familiar with the opportunities of digitalisation. Also, their operations are diverse, and they are preparing their flights. By doing so, the aim was to ensure diverse respondent base that provides comprehensive response material.

45 replies were received by the deadline. The response rate cannot be verified because the survey was distributed through intermediaries, and the exact number of those who received the survey, is not known. According to a rough estimate, about 100-200 people have received the questionnaire link by email. Therefore, the estimated response rate is probably between 20-40 %. And as the target was set at 30 responses, the target was achieved.

## 6 Survey results

The first part of the survey examined the respondents' general attitude towards digitalisation and digital services. The aim is to create an understanding of the behaviour and attitudes of the future user base regarding the digital services. The three first questions were arguments with answering scale from 1 to 5 according to Likert scale. The options were completely disagreed, partially disagree, can not say, partially agree and completely agree. As described in Chapter 4, mapping this type of customer effort score for all point of service chain is an effective way to look for weak spots among existing services (Questionpro 2022).

The table below shows the distribution of responses for the first three arguments. The first number is the percentage distribution of the responses and the number of responses in brackets. The last column of the table shows the weighted average calculated based on number of responses.

Table 1. General attitudes towards digitalisation (N=45).

Argument	1. Completely Disagree	2. Partially disagree	3. Can not say	4. Partially agree	5. Completely agree	Average
I tend to be positive about digital services	2% (1)	4% (2)	0% (0)	22% (10)	71% (32)	4,6
I prefer digital self service	7% (3)	0% (0)	2% (1)	38% (17)	56% (25)	4,4
Social media is important channel of information	11% (5)	22% (10)	7% (3)	44% (20)	20% (9)	3,5

71 % of respondents were completely positive about digital services. 22 % were partially positive and only three respondents reported negative opinion of the claim. The average was 4,6, so it can be said that overall attitudes towards digital services are very positive.

In favour of using digital self services, more than half (55 %) of the respondents fully agreed. 38 % Partially agreed, and again only 3 respondents felt negative about digital self services. The average score 4,4 continues to indicate a positive attitude towards digitalisation.

The use of social media as an essential information channel divided more opinions. 20 respondents (44 %) partially agreed, and 9 respondents fully agreed. A total of 15 respondents disagreed this claim, 5 of whom completely disagreed. 3 respondents were unable to comment on the matter. The average score was 3,5, which nevertheless indicates the importance of social media today. Even though the commissioner provides public services it is still possible to utilise social media and create smooth omnichannel experience. Sharing information and being visible on social media improves the company image and often provides the first contact the service. As Liang, Zhilin & Minjoon (2013) described the service phases, the process usually starts by accessing and searching data, and ends with post-purchase where customer may communicate or share experiences on social media.

### 6.1 Current services

The second part of the survey focused on studying the respondents' experiences of Fintraffic ANSs' current services. First, it was mapped which device and which services customers mainly use. There were then again allegations of the easy and effortless use of separate services. The aim is to map the phases of the customer path. At the end, open questions were asked, which services worked the best and which were the worst. Finally, development proposals were requested for existing services.

Figures 5 and 6 shows column charts that represents the most common devices, as well as the services that customers use for Fintraffic ANSs' digital services.

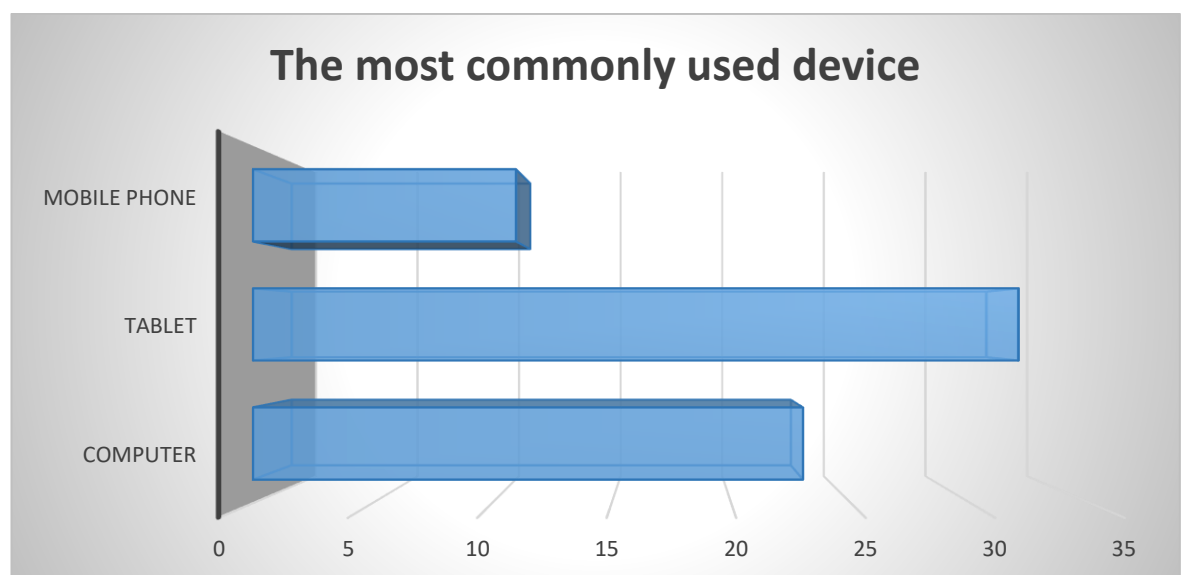


Figure 5. Most used device

The tablet computer proved to be the most popular tool for flight preparations. 32 respondents reported using tablet while the second most used terminal was computer with 23 users. Flight preparation by mobile phone was also in use by 11 respondents. It should be noted that it was possible to choose more than one option here. However, there is clear order for services that support mobile devices.

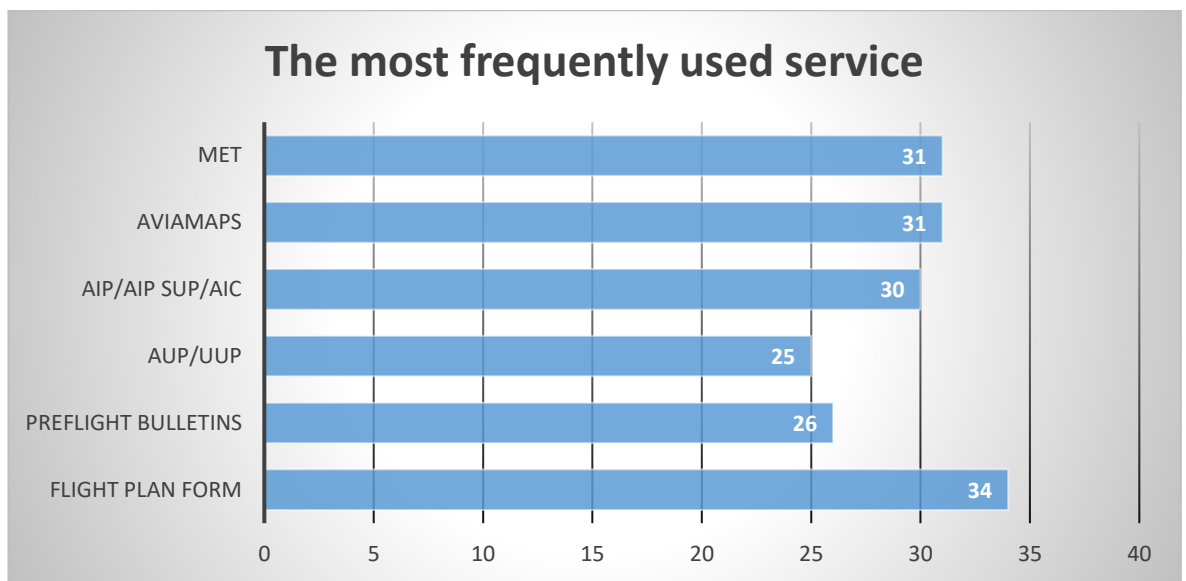


Figure 6. Most frequently used services

When determining which services customers use most often, the responses were evenly distributed. This is a good reflection of the situation, that careful flight preparation requires information retrieval from several locations. On a positive note, all services are used a lot. However, the flight plan form is the most common service and is partly explained by its nature and, in some respects, by its necessity.

Next, there were claims in the questionnaire concerning the existing services of Fintraffic ANS. The table below looks at the distributions of responses and their averages. Again, the number of replies given in brackets. The purpose of the claims is to find out how customers' experiences of the usability of existing services are.



Table 2. Experiences of existing services (N=45).

Argument	1. Completely Disagree	2. Partially disagree	3. Can not say	4. Partially agree	5. Completely agree	Average
Using services is easy and effortless	4% (2)	13% (6)	2% (1)	58% (26)	22% (10)	3,8
Filing and submitting a flight plan is easy and effortless	7% (3)	18% (8)	2% (1)	49% (22)	24% (11)	3,7
www.ais.fi is easy and effortless to use	0% (0)	20% (9)	1% (1)	49% (22)	29% (13)	3,9
Creating situational awareness is easy and effortless	2% (1)	22% (9)	7% (3)	53% (24)	18% (8)	3,7
All the information I need is easily available	4% (2)	31% (14)	0% (0)	49% (22)	16% (7)	3,4

The first argument was about the effortless usability of services as a whole. Most respondents (80%) found the use of the services completely and partly easy. 8 out of 45 respondents found it difficult to use services. With an average of 3,8, the user experience can be found to be at good level.

The majority of respondents agreed with the statement “drawing up and submitting a flight plan is easy and effortless.” 24 % of respondents fully agreed and 49 % agreed partially. The average was 3,7, when 11 respondents were against the claim. Again, average continues to indicate positive attitude towards the service.

www.ais.fi site, on which all of the information provided by aeronautical information service was compiled, found it easy to use up to 78 % of respondents. 20 % of users partially disagreed with the ease of using site. The average of 3,9 shows that the site is pretty good entity from the point of view of the users.

Creating an aerial situational picture and awareness is one of the purposes of flight preparation. It is important to familiarise yourself with the factors that may affect the flight, and the environment in which the flight is to take a place. The claim that creating situational awareness with present services is easy and effortless, the average of responses was 3,7. Partially agreed 53 %, and completely agreed 18 % of respondents.

Partially disagreed 22 % and only 2 % were completely against the argument. In the light of these figures, the site is a relatively good platform for flight preparation.

The last argument concerned the effortless discovery and availability of all information needed in flight preparation. This is where the most disintegration occurred. This claim was supported by 65 % of respondents and 35 % were against the argument. The average of the responses was 3,4, which, however, leaves the overall estimate somewhat on the positive side.

Next there were open end question in the survey. Respondents were asked to answer in their own words which services work best and why. A total of 28 answers were received and were aggregated according to similarities in the type of cluster analysis.

Aviamaps was mentioned 7 times as the best functioning service. Aviamaps was praised for its clear graphical presentation, and it gathers all relevant information in one place. Aviamaps was also praised for being quick to use and that it gives good overview.

Following arguments were present in the replies:

“Aviamaps is the best for VFR traffic and contains the most necessary information.”

“AUP map (Aviamaps), clearly presented with a lot of information in an easily accessible way.”

“The necessary information graphically in one place.”

Second highest number of mentions got the submission of flight plan. It was mentioned in 4 replies. There were hardly any arguments, except in one reply, the confirmation call after sending a flight plan was considered futile.

MET site was listed in 3 and notams in 2 responses as the best performing services. No further justification had been mentioned. The telephone service also was praised in two replies. Other individual comments were:

“The AUP/UUP/AIC/AIP SUP pages work well and are easy to find.”

“www.ais.fi website works very well, although it takes some time to study.”

“Flight preparation services are ok.”

Next, in the survey respondents were asked to list the services that worked the worst and argument shortly why. A total of 27 responses were received, which were collected for cluster analysis.

The submission of the flight plan was mentioned in 8 replies as a poorly performing service. The reasons for this were often mentioned as the difficulties in filling out the form and making a confirmation call.

Secondly poorly cited service mentioned in most cases was notams and preflight bulletins. In 4 replies these were identified as poor services, and all justified by the difficulty and confusion of retrieving information. In the same category, you can add the problems that were manifold in 6 responses to the fragmentation of information in general and the difficulty of finding relevant information. The reasons were specified, for example, old-fashioned and impractical interface, a site without filtering and non-existent software interfaces.

Two responses called for a real-time in-flight information service for an aerial situational picture. The lack of flight information service (FIS) is considered a problem, as the lower airspace has become increasingly fragmented, and a real-time situational picture cannot be transmitted to cockpits.

Individual mentions were received for example MET service and AIP. Following statements were the most typical:

“All flight related data has to be collected from different sources and a large amount of data, instead of e.g., provide a route and the service would filter the necessary information to flight briefing.”

“Hard to find a desired thing, same fault with all online services.”

Fintraffic's visibility was asked with question, whether respondents have visited Fintraffic's website or follow Fintraffic on social media. Responses were almost half divided. A small majority, 56 % of respondents have visited Fintraffic's digital channels. Today, a digital visibility is also very important part of the marketing of public services and transmission of information. Positive visibility improves the company image and improves the discoverability of services. As in the first part of questionnaire, the social media was

considered an important information channel by great majority of respondents, Fintraffic should put more effort to gain more followers and engage audience with useful content.

The open question of how you would develop Fintraffic's existing flight preparation services received a total of 25 responses. Similarities were still sought, combined, and analysed. The flight plan process was highlighted in several points. The identified user service level, where the user could manage their own flight plans, was cited as improving measures. In particular, it was hoped for its own mobile application with clear flight plan form with filling instructions, as well as the possibility to update the flight plan by itself, e.g., changing the departure time. It is said that digitalisation changed the way most businesses is done today. This issue is also supported by Ilmarinen & Koskela's theory, that customer now wants to decide where, when and how to manage matters. (Ilmarinen & Koskela 2015, 52-58)

Another clear trend in responses was to improve the customer experience by creating user-driven and needs-based services. Better simple directories and search functions had been mentioned as a means of doing this. Respondents also hoped for the use of map images and graphics, as well as better real-time service provision in dynamic airspace. This refers to theory by Filenius, where usability of services is very important. If usability creates bad user experience the whole customer experience will be failed (Filenius 2015, 29-30).

Three responses called for better services for aircraft on flight. The following comment from the respondent supports this proposal. "The only sensible and affordable way to address the growing safety concerns related to the lower airspace, is the introduction of ADS-B/UAT technology and the construction of a complementary ground station network so that airspace, traffic and weather related information can be obtained in real time on displays and EFB (electronic flight bag) systems of airborne aircraft in accordance of protocols already in use, so that all modern navigators and navigational applications can display that information."

## **6.2 Attitudes for functionality**

The last part of the survey focused on studying certain functionalities that can be used in digital services. The aim is to get research data, which can be used to develop new Astra UTM application for flight preparation purposes. Again, there were arguments in the

section, in which answer options were 1-5, from 1 being completely disagree, and 5 completely agree. The results are summarised in table 3.

Table 3. Attitudes to functionalities

Argument	1. Completely Disagree	2. Partially disagree	3. Can not say	4. Partially agree	5. Completely agree	Average
Mobile application is important	2% (1)	4% (2)	2% (1)	22% (10)	69% (31)	4,3
independent management of flight plans is important	4% (2)	0% (0)	18% (8)	33% (15)	44% (20)	4,1
Customer service can be provided via chat	13% (6)	9% (4)	7% (3)	44% (20)	27% (12)	3,6
It is important to have own FPL history easily available	4% (2)	4% (2)	18% (8)	38% (17)	36% (16)	4
Artificial intelligence /automation would be useful for flight planning	4% (2)	4% (2)	24% (11)	31% (14)	36% (16)	3,9

Availability of services on mobile devices was found to be an important feature. When asked about the need for specific mobile application, the respondents were very unanimous. As many as 91 % of respondents supported the claim and only 3 respondents did not see the application as necessary. The average of responses was 4,3.

The management and modification of flight plans currently requires a phone call to the flight planning centre. The argument, "it is important that I can independently manage my flight plans," was intended to map the willingness and ability of customers to independently ensure the timeliness of flight plans if there was a suitable digital tool. The average of responses was 4,1, which strongly indicated in favour of the claim. 44 % of respondents agreed completely and 33 % agreed partially. 8 respondents reported neutral opinion and only 2 respondents were against the independent management of flight plans.

The following claim dealt with customer service via chat. The customer service currently provided is mainly done via telephone and email, but would it be possible to add a new

service channel in future to flight planning services as well? There was some disintegration in the answers, but the majority of respondents were in favour of the chat service. 44 % replied that they partially supported, and 27 % fully supported the chat service. 22 % of respondents did not think that customer service via chat was good option. The average of replies was 3,6.

In the following question we wanted to explore the need for personalized user experience, with the argument that it is important to have easy access to your own user history. In this case, the flight plan history of previous flights. Seeing your own usage of history was also considered a very important feature. 74 % of respondents reported a positive opinion and only 8 % against. The neutral opinion was reported by 18 % of respondents and the average of all answers was 4.

The use of artificial intelligence and automation, and its usefulness in the flight plan routing, were also investigated. Airspace restrictions sometimes causes difficulties in planning flight paths, so automation could be a good tool for this. The answers were evenly distributed between those who fully agree, partially agree, and those who reported neutral opinion. A total of 67 % though that artificial intelligence and automation would be useful additional feature and only 8 % did not see it was helpful. The average was 3,9, which indicated that these features would benefit a large number of customers.

The survey also included arguments on the importance of customer service via telephone and centralisation of services in one place. The answers were completely unanimous in favour of both arguments. So, on this basis, the current way of organising services should not be radically changed.

Lastly, customers were asked an open question about what they would like to see from digital services in the future to improve flight preparation, flight planning process and situational awareness. 22 responses were received, which gave a clear picture of customers' wishes. Automation and artificial intelligence (Ai), visuals, personalisation, mobile interface, accessibility, and real time data were terms that were repeated in answers. Examples of responses are listed below.

"I wish flight plan could be send simply and easily, perhaps somehow automated."

"The use of Ai and automation would be useful in planning flight paths."

"Artificial intelligence could streamline the flight preparation."

"Mobile interface, reducing recurring information when making flight plans."

“Storing your own basic flight plan template.”

“Visuality and the fact that all the necessary information can be found centrally in one place.”

“More information on the map! Notams on the map.”

“Providing a dynamic and real time airspace image for all users of Finnish airspace.”

“Facilitating and integrating the user interface so that all information that touches you, is easily accessible and would not have to be retrieved from many places.”

“Services similar to those now available with commercial applications.”

“ADS-B/UAT protocol FIS-B, TIS-B, and weather radar image for aircraft in flight with same services and the internationally approved equipment and protocols as it already operates in the USA. This service can still be complemented by real time information available elsewhere on drone and glider flying activities, and the rapidly changing airspace reservation situation. (e.g., police, rescue, search, etc..).”

### **6.3 Summary of results**

In conclusion, respondents are very positive about digitalisation and digital services. Digital service formats received the support of almost all respondents in the survey. On this basis, the development of digital services improves the customer experience and is clearly accepted by the respondents. Social media as an information channel divided some opinions, but it can still be said a fair majority was in favour of it. It is natural that social media cannot be an official information channel, and certainly not the only channel for a company providing public service, but it is of significant importance in strengthening visibility and the company image. Referring to Marr (2021), companies should expend their appearance and support in multiple channels like web sites and social media. This allows customers to interact seamlessly between different channels. According to the survey, slightly over half of respondents (55 %) follow Fintraffic websites or social media channels.

The second part of the survey concerned the Fintraffic’s existing services. Overall, the respondents have a good customer experience with the current services. Most commonly services are used on a tablet computer. A quarter of respondents’ use services on the mobile phone. Based on this, there is a need for the mobile user interface. The distribution of the most used services was relatively even, which indicates the importance of services.

The section also surveyed the easy and effortless use of current services with 5 different claims. The purpose was to map the accessibility and usability of services and their

appropriateness. As a whole, the services received a good rating. The average of all services was 3,7, with the scale of 1 to 5. As Filenius stated, usability of digital services and user experience are vital part for creating good digital customer experience (Filenius 2015, 29-30).

The website [www.ais.fi](http://www.ais.fi), which brings together all services and links received the best overall rating of 3,9. However, the easy access to necessary information was considered the worst with an average 3,4. This certainly involves the large amount and fragmentation of data, as well as poor opportunities to filter and integrate the information. The flight plan process and formation of situational awareness were also assessed as moderately easy using current methods.

Aviamaps, the service that combines data with a map template, received by far the most mentions in an open question about best performing service. The respondents were pleased with the large amount of data visually in one place. The flight plan process also received a few mentions of its functionality.

However, the submission of flight plan received the most mentions when asked about the worst performing services. The flight plan form is considered a difficult to use and the confirmation call to flight planning centre unnecessary. Notams, pre-flight bulletins and retrieving information in general were also mentioned. The lack of real-time information in lower airspace was also perceived as poor service.

Respondents were also asked for suggestions for improvements to existing services. The answers followed the elements already mentioned. Holistically, more user oriented and need oriented services were desired. The possibilities to personalising services, improving directories and search tools were mentioned. More self-service functionality for flight plan management and modern interface with visuality were also hoped for by many respondents.

The claims about functionality revealed the issues that have already been raised. Mobile usability is especially important, as is accessing all services from one place. Raising the level of self-service in managing the flight plans and bringing artificial intelligence and automation to support flight preparation were also considered positive. Maintaining the customer service over the phone remains an important prerequisite, but communication via chat was also viewed positively.



In a summary, based on the survey, the services of the future were hoped for ease of use, automation, opportunity to personalise, more visuals and real timeliness.

## 7 Reflection and conclusions

This chapter discusses the conclusions drawn from the theoretical framework of the thesis and the research findings. This section also outlines the development proposals for improving the digital customer experience of air navigation services customers. Finally, the reliability of research is assessed, and the thesis process is examined from the authors perspective.

### 7.1 Conclusions

Fintraffic ANS is a special task company owned by the state of Finland. The company is responsible for managing the use of airspace in Finland and providing air navigation services. These include the products and services used in flight preparation in accordance with international regulations. However, the digitalisation is one of the cornerstones of the commissioner's strategy, and the opportunities it brings also may improve the customer experience. Figure 7 shows the positive signals detected on the basis of the study and the things where there is the most room for improvement.



Figure 7. Conclusion briefly

The digitalisation has been and will continue to be a prerequisite for more efficient, safe and environment friendly aviation, as flight volumes increase, and operations diversify. As one of the digitalisation activities, Fintraffic ANS develops an application and user interface, that would provide as many services as possible for a pilot or any other person

involved in the preparation of the flight. Fintraffic ANS is aware of the fragmentation of the digital data and the fact that it is not centralised in one place. The same issue was raised several times in the survey. Therefore, the digitalisation project with the Astra UTM is very useful and welcome to improve the quality of services and the customer experience.

Fintraffic ANS has no previous experience in measuring only the digital customer experience. In the surveys conducted on general customer satisfaction, the results have been at a good level. Based on the survey conducted in this thesis, customers are also reasonable positive about current digital services. The most room for improvement is in the flight plan process, in the facilitation of information retrieval in general and in the transmission of real-time information to aircraft in flight. Aviamaps, the service that is not produced by Fintraffic ANS itself, received the most praise.

It is worth remembering that Fintraffic ANS is obliged to provide the services used in flight preparation and the company does not receive any separate revenue from these operations. Fintraffic ANS does not compete with companies producing commercial flight preparation applications. The aim of digitalisation is to improve safety and user friendliness by bringing services together in a new user interface.

## **7.2 Development proposals**

The following development proposals are based on both, the information from the theoretical part of the thesis, and the results of the survey. The first two proposals concern strategic actions made within the organisation, which lead to improving customer experience. Other development proposals concern digital services and their features and functionalities.

The digitalisation of customer service is not just about technological solutions, but it usually changes the working methods and affects work tasks. All of these affect the overall customer experience and therefore, when planning digitalisation, everyone whose work touches the service chain should be widely involved and the siloing of the project should be avoided.

Engage management to think customer experience as part of strategy. Figure 8 presents a roadmap, which defines the service layers of the future for flight planning services. In addition, company must define the measures to achieve them. Proactive information

sharing and visibility should be increased in a multichannel manner e.g., using social media channels. The level of self-service desired by customers will be raised with the help of new application. Actively continue to collect feedback and improve open dialogue with the customers.

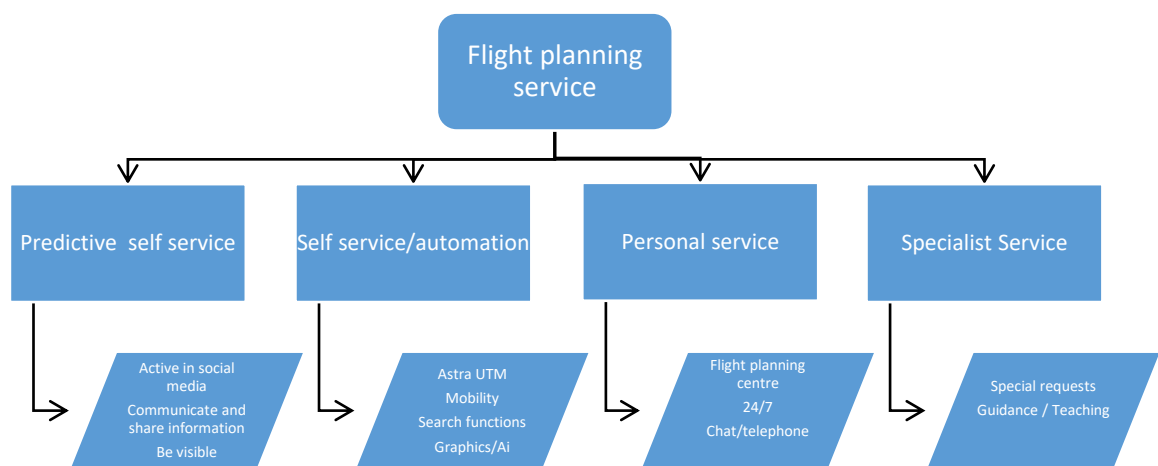


Figure 8. Service layers of flight planning process

The formation of customer experience is very individual matter. The services must be designed in such way that customers have the opportunity to modify the view to their liking. By personalising, the customers can easily access to their own information and interests. Customers must have the opportunity to create own templates for flight plans that reduces the number of things to repeat.

The new user interface must have clear directories, search functions and the ability to filter the data. Graphical presentation improves situational awareness and comfort. A real-time map service with the links to data must be available.

The submission of the flight plan must operate on fully self-service basis, and all matters related to management of flight plan must also be taken care of automatically. Increasing automation also for choosing flight routes improves the customer experience and speeds up the process.

For improving the situational awareness for aircraft in flight at lower airspace, Flight Information Service (FIS) should be provided with conventional methods, until the

implementation and deployment of necessary technology allows real-time airspace, weather, and traffic related information to be transmitted into aircraft displays.

### **7.3 The reliability of the research**

Reliability refers to the reliability of the research, the accuracy of the results and how repeatable the results are. The results should be the same if the research was repeated. Moreover, the results cannot generalise too much. In order to have reliable results, it is important the sample of the study represents evenly the sampled population. Too small sample of the study or low response rate makes the results coincidental and thus reduce the reliability of the research (Hiltunen, 2009).

Validity refers to the fact that the research measures the matter that was about to be investigated. Therefore, research must have certain objectives for examining the right things. Careful research planning and thorough data collection improve the validity of the research. The research questions in the form, which measure the right things and cover the whole research problem, also affect the validity of the study. Valid research requires the definition of the population and a good response rate (Hiltunen, 2009).

The reliability of the research was intended to be high, so the thesis could be successful and dependable. This was considered when the planning of the study started. The survey was addressed to flight schools and general aviation pilots, who represent the large amount of customer base. However, other types of operators are also frequent customers whose voice was not heard in this study. Although the number of respondents was over the targeted, it is not that large sample. This may have impact on reliability of the research. However, if the survey would be repeated, the results would be the same for the same target group. Still, the results cannot be generalised too much due to small sample size, but otherwise the reliability of the research was good.

The research was originally intended to be conducted as user experiences of the new application. Due to technical challenges, the application could not be provided for test use, so the direction of the survey became slightly more general. However, the survey had been decided in advance and the data collection method was considered and justified. The questionnaire was timely, and the questions were considered together with the commissioner. The form was assessed with the few of commissioner's employees, but not with the actual clients. The population of the study was defined as well as an adequate sample, and response target was achieved. The actual response rate is not known as the

survey was distributed via intermediaries. Since the research measures what was intended to be investigated, and the issues that improve validity have been considered from design to implementation, the research can be considered valid.

#### **7.4 Assessment of thesis process and own learning**

The process finally lasted about 6 months starting in November 2021. The aim was to be completed in the spring 2022. Getting the commission from your own employer and very close to your own job description, was pleasant and increased the interest toward the topic. Being involved in development of the new application has been rewarding, although there have been some challenges. Originally, the aim was to get new application for testing for a specific target group, but this was delayed due to technical issues. Thus, the topic of the thesis also changed to deal with the customer experience little more broadly.

My own actions during the process varied a lot, but graduation on schedule, maintained motivation. Combining the work and family sometimes produced scheduling challenges and especially towards the end of the process. Studying theory was challenging, but interesting. I can proudly say that I learned a lot from formation and leading customer experience. There is huge amount of material on the subject and not everything can be included. I focused to find a red thread and yet get a sufficiently diverse look at the theory.

Completing studies remotely made the process difficult, although my instructor was well available and assisted when needed. However, I tried to do independently as much as possible, but undoubtedly better outcome would have been achieved through closer contacts, and especially through meetings.

The thesis was a big and time-consuming project. In general, the process was very educative, but it requires a lot of self-discipline. The process was rewarding, and it teaches independent working and time management. At the same time, I got plenty of new learning, professional growth, and development in process management.

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## Appendices

### Appendix 1. Fintraffic ANS Digital Customer Experience Survey

#### Fintraffic ANS digitaalinen asiakaskokemus

Kyselylomakkeen tarkoituksena on selvittää miten asiakkaat kokevat Fintraffic Lennonvarmistuksen nykyiset digitaaliset palvelut lennonvalmistelu- ja lentosuunnitelmaprosessin tukena. Kysely on jaettu kolmeen osioon, joista ensimmäisessä on kysymyksiä yleisestä suhtautumisesta digitaalisiin palveluihin. Toisessa kohdassa on väittämiä nykyisten palveluiden toimivuudesta, ja kolmannessa osassa on kysymyksiä, joilla kartoitetaan tulevaisuuden kehityskohteita. Kyselyn lopussa on myös avoimia kysymyksiä, johon toivomme kommentteja sekä kehitysehdotuksia digitaalisten palveluidemme parantamiseksi.

\*Pakollinen

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Yleinen suhtautuminen  
digitaalisiin palveluihin

Tässä osiossa kartoitetaan yleistä suhtautumista  
digitaalisiin palveluihin

Suhtaudun yleensä positiivisesti digitaalisiin palveluihin \*

- 1. Täysin eri mieltä
- 2. Osittain eri mieltä
- 3. En osaa sanoa
- 4. Osittain samaa mieltä
- 5. Täysin samaa mieltä

Suosin digitaalisia itsepalveluita \*

- 6. Täysin eri mieltä
- 7. Osittain eri mieltä
- 8. En osaa sanoa
- 9. Osittain samaa mieltä
- 10. Täysin samaa mieltä

**Sosiaalinen media on tärkeä tiedotuskanava \***

- 11. Täysin eri mieltä
- 12. Osittain eri mieltä
- 13. En osaa sanoa
- 14. Osittain samaa mieltä
- 15. Täysin samaa mieltä

Fintraffic lennonvarmistuksen  
nykyiset palvelut

Tässä osiossa kartoitetaan Fintraffic lennonvarmistuksen  
nykyisten palveluiden käytettävyyttä

**Mitä laitetta käytät yleisimmin lennonvalmisteluun? \***

- 16. Tietokone
- 17. Tabletti
- 18. Puhelin

Muu:  \_\_\_\_\_

**Mitä Fintrafficin sivuilta löytyviä tai sinne linkitettyjä palveluita käytät useimmiten?**

\*

- 19. Lentosuunnitelmalomake
- 20. Reittitiedotteita
- 21. AUP/UUP
- 22. AIP/AIP SUP/AIC
- 23. Aviamaps
- 24. MET

Muu:  \_\_\_\_\_

Palveluiden käyttäminen on mielestäni helppoa ja vaivatonta \*

- 25. Täysin eri mieltä
- 26. Osittain eri mieltä
- 27. En osaa sanoa
- 28. Osittain samaa mieltä
- 29. Täysin samaa mieltä

Lentosuunnitelman laatiminen ja jättäminen on mielestäni helppoa ja vaivatonta \*

- 30. Täysin eri mieltä
- 31. Osittain eri mieltä
- 32. En osaa sanoa
- 33. Osittain samaa mieltä
- 34. Täysin samaa mieltä

[www.ais.fi](http://www.ais.fi) sivuston käyttäminen on mielestäni helppoa ja vaivatonta \*

- 35. Täysin eri mieltä
- 36. Osittain eri mieltä
- 37. En osaa sanoa
- 38. Osittain samaa mieltä
- 39. Täysin samaa mieltä

Ilmatilannekuvan ja tilannetietoisuuden muodostaminen nykyisillä palveluilla on mielestäni helppoa ja vaivatonta \*

- 40. Täysin eri mieltä
- 41. Osittain eri mieltä
- 42. En osaa sanoa
- 43. Osittain samaa mieltä
- 44. Täysin samaa mieltä

Kaikki tarvitsemani tiedot on saatavilla helposti \*

45. Täysin eri mieltä
46. Osittain eri mieltä
47. En osaa sanoa
48. Osittain samaa mieltä
49. Täysin samaa mieltä

Mikä palvelu toimii parhaiten Fintrafficin lennonneuvontapalveluissa ja miksi?

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Mikä palvelu toimii huonoiten Fintrafficin lennonneuvontapalveluissa, ja miksi?

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Olen vierailut Fintrafficin kotisivuilla tai seuraan Fintrafficia sosiaalisessa mediassa \*

50. Kyllä
51. En

## Miten kehittäisit Fintrafficin nykyisiä digitaalisia palveluita?

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## Toiminnallisuuksia

Tässä osiossa kartoitetaan toiminnallisuuksia, jotka parantavat lennonvalmisteluprosessia.

## On tärkeää että palvelut toimivat mobiililaitteilla \*

52. Täysin eri mieltä
53. Osittain eri mieltä
54. En osaa sanoa
55. Osittain samaa mieltä
56. Täysin samaa mieltä

## On tärkeää, että palvelut on saatavilla mobiiliapplikaatiossa \*

57. Täysin eri mieltä
58. Osittain eri mieltä
59. En osaa sanoa
60. Osittain samaa mieltä
61. Täysin samaa mieltä



On tärkeää, että voin itsenäisesti hallinoida lentosuunnitelmiani (DLA/CHG/CNL)

- 62. Täysin eri mieltä
- 63. Osittain eri mieltä
- 64. En osaa sanoa
- 65. Osittain samaa mieltä
- 66. Täysin samaa mieltä

Asiakaspalvelua voi antaa chatin välityksellä \*

- 67. Täysin eri mieltä
- 68. Osittain eri mieltä
- 69. En osaa sanoa
- 70. Osittain samaa mieltä
- 71. Täysin samaa mieltä

On tärkeää, että asiakaspalvelua on saatavilla puhelimen välityksellä \*

- 72. Täysin eri mieltä
- 73. Osittain eri mieltä
- 74. En osaa sanoa
- 75. Osittain samaa mieltä
- 76. Täysin samaa mieltä

On tärkeää, että lentosuunnitelmahistoriani on helposti saatavilla \*

77. Täysin eri mieltä
78. Osittain eri mieltä
79. En osaa sanoa
80. Osittain samaa mieltä
81. Täysin samaa mieltä

On tärkeää, että saan kaikki tarvitsemani palvelut yhdestä paikasta \*

82. Täysin eri mieltä
83. Osittain eri mieltä
84. En osaa sanoa
85. Osittain samaa mieltä
86. Täysin samaa mieltä

Tekoälyn/automaation käyttö olisi hyödyllistä lentoreittien suunnittelussa \*

87. Täysin eri mieltä
88. Osittain eri mieltä
89. En osaa sanoa
90. Osittain samaa mieltä
91. Täysin samaa mieltä

Mitä toivoisit tulevaisuuden digitaalisilta palveluilta  
lennonvalmistelun/lentosuunnitelman/tilannetietoisuuden parantamiseksi?

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Google Forms