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Developments in personal identification

The Finnish henkilötunnus

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Abstract

This master's thesis reports on the national identification numbering system of Finland. It focuses on three themes within this topic: first, a historical summary of population registration and personal identity numbering in Finland; secondly, the current status of the national identification numbering system including a description of use cases and outstanding issues; thirdly, the future of the system through a designer's eyes.

The national identification number of Finland is called the *henkilötunnus* ("personal identity code" in English). Finland is currently in the process of reforming the *henkilötunnus* and the processes related to it. Globalization and digitalization have caused several issues with the current system to surface, which need to be fixed sooner rather than later. The reform is projected to be complete by the end of 2019, which makes this a perfect time for a designer to bring knowledge and input to the discussion. This thesis concludes by proposing solutions for a few selected issues.

Most of the available literature and information about the *henkilötunnus* is written in Finnish. This thesis project is a part of a greater goal: to have an overview of each Nordic national identification numbering system available in English. The Nordic countries were trailblazers in introducing universal personal numbering schemes in the twentieth century, and observers in other countries could potentially benefit from studying the Nordic systems and the challenges they have faced.

Acknowledgments

Ian Watson, an associate professor at NTNU and the supervisor of this thesis, approached me in August 2017 and suggested this master's thesis topic, which would suit a Finnish-speaking interaction design student especially well. At that point I had not put much serious thought into deciding my topic, which made me very grateful for this suggestion. Throughout the fall semester I looked more into the subject and it ended up being an easy choice to make. I was also lucky that Dr. Watson is very knowledgeable about the field of civil registration, and he gave me invaluable advice time and time again.

I would like to thank Kimmo Mäkinen, who is working in the reformation project as the chairman of the expert group. Meeting and interviewing him after exchanging some emails was the first face-to-face contact I had with the reformation project group. My gratitude extends to the entire reformation group who have been very transparent in their work. Their first public seminar was very welcoming and inspiring to me.

Possibly the most helpful source material for my research was Tuomas Salste's web article on the henkilötunnus. I thankfully got in contact with him and exchanged a few emails. He is interested in the henkilötunnus and civil registration in general, and offered to read through my thesis before I finished it. His comments and suggestions were useful when adding some finishing touches to my work. It was also great to receive some comments on my text from someone in addition to my supervisor.

As I started with only a very basic knowledge of this topic, the project was a constant learning experience as I delved deeper. At times I felt burnt out and overloaded with information, but was able to keep making at least a little bit of progress each day, which proved quite stress-relieving. It was also a relief to see my friends, fellow thesis writers, every week and to know I wasn't alone in this. I would like to thank those who set up the thesis seminars throughout the semester, setting a stage to talk about the work and process, which helped me to get out of my head and hear new ideas.

Gjøvik, June 1st 2018

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1 Introduction

Most countries around the world have embraced some method of population registration as a way to keep track of their citizens. The most common reasons for this are taxation, election control, military conscription, and social services. Population registration and some kind of system of established identity can be considered fundamental to many of the operations involved in running a modern country, such as the aforementioned taxation, elections, conscription, and services (Caplan and Torpey, 2001, p. 1). Nationally standardized identification numbers or codes form part of many population registration schemes, and are used as tools to make administrative work more effective by making it easier to identify people across different systems. Names are not unique and can be changed, but a series of numbers (or letters) can be made unique and static. National identification numbering systems have not, however, been adopted universally throughout the globe.

Different countries exemplify different viewpoints and opinions on national identification numbers. The different emphasis of two opposing interests, privacy and practicality, has given rise to different solutions. For example, Germany and Portugal go so far as to have constitutional prohibitions against the establishment of a single national identification number intended for multiple purposes; these countries have separate identification numbers for each purpose (Watson, 2010, p. 77). The United States does not have a legal requirement for its residents to have a national identification number, but does require one in practice (Pear, 1998). In Canada, the national identification numbering system is more closed and the identification numbers are regarded as confidential personal information, which is why their use as a general identifier is limited (Fraser, 2003).

The Nordic countries, however, have all embraced relatively open national identification numbering systems. In all the Nordic countries the numbers are widely used in many spheres of activity, extending well outside the public sector. These systems in Iceland, Norway, Denmark, Sweden, and Finland have their differences, but they are all based on similar principles that suit the Nordic countries well. The national identification numbers in all the Nordic countries are based on the birthdate combined with additional identification digits and check digits. Some of them also include information about gender. The Finnish henkilötunnus consists of 11 characters and is used as a unique personal identifier in many different systems connecting an individual and their personal information. Although the numbers differ somewhat in form, and the extent of their use varies, the basic purpose of national ID numbers is the same in all the Nordic countries: the numbers are essentially abstract, additional names which are given to people and used as unique personal identifiers in many different systems which connect an individual to information about them.

When considering the extent of population registration and identification practices, the appropriate balance between practicality and effectiveness on the one hand, and privacy and information security

on the other, is a topic of constant debate. The registration of personal information has generally become more elaborate and detailed over centuries and especially the last few decades, and is now in a stage which makes people sceptical about new developments in this field. Especially the potential to include biometrics in population registration has raised suspicions. One frequently sees a tendency towards function creep, where systems originally intended for a specific purpose are brought into wider use for reasons of convenience. While history has shown that civil registration can be used for surveillance and oppression, others point out that it supports inclusion in society by giving people access to services and ensuring freedom of movement (About, Brown and Lonergan, 2013). Even those with opposing views can agree that the future of personal information registration and individual identification now requires a farsighted and prudent design process that can minimize the risk of pitfalls. Redesigning huge systems like this can become costly and one wants to do it right the first time.

1.1 Concepts explained

It is very important to keep apart two closely connected concepts that involve human identity. This thesis will for the most part deal with **identification**, which is the process of distinguishing an individual **identity** among other identities. Identification in this thesis generally means the minimum action required to distinguish a person from others. Identifying someone does not necessarily mean disclosing every facet of their identity or personally knowing them. For example, booking a doctor's appointment might require a person to identify themselves so that the appointment can be tied to an individual. The other process, **authentication**, is also relevant to this thesis and means verifying that an individual has a certain identity they claim to have. As an example, a person might have to authenticate themselves when buying alcohol products to confirm they are the person they are claiming to be (this typically takes place through showing the sales clerk a government ID card with a photograph which matches the person's physical appearance at the same time as it lists their birthdate).

A **national identification numbering system** is used by governments of many countries to keep track of their citizens and residents to streamline taxation and government-provided public services. Each individual and their personal information is tied to a unique number or code, which appears on official identity documents such as passports and driving licences. The number itself is used to identify an individual, and combined with an identification document it can be used to authenticate the individual.

The national identification number in Finland is called the **henkilötunnus** and it is often abbreviated as *hetu*, sometimes even in formal situations. The term *henkilötunnus* is used untranslated in this thesis to refer to the Finnish identity number. The literal translation of "henkilötunnus" is "person code," but in Finland the official English term for it is **personal**

identity code. It was also called the **sosiaaliturvatunnus** (*sotu*) from 1964 to 1970 and this term is still sometimes incorrectly used in unofficial situations. In Finland, the henkilötunnus and its predecessors are referred as “codes” instead of “numbers” for a reason: they can be alphanumeric. While a henkilötunnus is not confidential information, most people in Finland are reluctant to give out their full henkilötunnus without a good reason, as it could potentially be used in a harmful way. Therefore, no actual personal identity codes are listed in this thesis. For electronic authentication Finland has another system, the **FINeID**, an electronic identity which contains an identification code called an **electronic client identifier** (*sähköinen asiointitunnus* or *satu* in Finnish), among other identifying information for an individual. This thesis only briefly discusses the FINeID.

The central entity in charge of population registration and the henkilötunnus is the Väestörekisterikeskus (**VRK**). Its official English name is the Population Register Centre. In this thesis it will be referred as VRK. It has not been the only authority in the history of Finland to control population registration. VRK is only used to refer to the current Population Register Centre. The **Population Information System** (*väestötietojärjestelmä* or *VTIJ* in Finnish) is the official English name for the centralized collection of population information maintained by VRK in cooperation with the **Local Register Offices** (Maistraatit in Finnish), which are scattered around the country. This thesis distinguishes between the collection of population information and the physical register offices by using the terms **population register** and **register offices**, respectively. Another government entity central to this thesis is Tilastokeskus, known as **Statistics Finland** in English. It provides most of the official statistics and information services in Finland, and therefore information vital to the historical research in this thesis.

The Finnish Ministry of Finance established a work group in August 2017 to consider the future of the henkilötunnus and the Population Information System, and propose needed reforms by the end of 2019. This work group and their work is referred as the **reformation project** in this thesis.

1.2 Contributions

The thesis focuses mainly on three themes within the topic of the Finnish national identification numbering system: a summary of the system’s history explaining how it developed into what it is now; a look at the system’s current status and the different ways the number is used currently; and a designer’s view of the future of the system. Along with these main focus areas, this thesis looks at some other points of interest, such as: how the Finnish system compares to national identification numbering systems of the other Nordic countries, and which issues the currently ongoing reformation project hopes to solve regarding the numbering system.

The historical chapter is set up chronologically, discussing the main developments and events that led to the Population Information System and the henkilötunnus. The discussion of the current

status of the henkilötunnus focuses first on its form, secondly on the different ways it is handled and used, and thirdly on issues that currently exist in the system. The chapter concerning future developments will explain the reformation project and the issues it is expected to tackle. In this last chapter the author's opinions and propositions as an interaction designer are voiced towards the reformation project group.

Interaction design relates to population registration and identification numbering systems through the fact that these systems should be designed with the behavior of the users in mind right from the beginning. As the Population Information System was barely digital at its inception, the current extent of the system's use could have not been predicted by its designers. The same applies for the henkilötunnus, and the current reformation project needs now to take a more human-computer interaction-oriented perspective. The reformation suggestions in this thesis are a contribution to the field of information architecture, as information management and security have emerged as priority concerns.

Looking at the thesis as a complete product, it serves as an extensive English-language report about the Finnish population registration and identification system. This in itself is a significant contribution and allows the thesis to serve as a basis for comparison with equivalent systems in the Nordic countries and beyond. Many developing countries, especially in Africa, still lack a reliable civil registration system, and there is demand and interest in implementing one or improving existing implementations. An understanding of the Nordic systems could be helpful to designers in these other countries.

2 Background

The inspiration for this thesis came from Ian Watson who had previously supervised the master's thesis of Hanne Neverdal Frestad in 2017. Frestad's thesis *The Norwegian national identification numbering system: The history of a design process* covers the history of population registration and the identification number in Norway, the system's current status, and some proposed changes to it. It was also written in English to bring existing information to a wider audience in a coherent way. Watson was looking for a student interested in writing a similar master's thesis about one of the other Nordic population registration and identification systems. As a Finn living in Norway and therefore having practical experience of everyday life in both countries, I found this topic to be very suitable for me.

2.1 Methodology

A major part of this study was historical research, which in this case was almost exclusively qualitative. An understanding of history is necessary in a far-reaching and delicate design process such as this, not least to avoid making the same mistakes twice. Summarizing the history in an effective way required finding out which developments and events had the largest impact on the system. The developments were then interpreted and analyzed, as “at its core, historical research deals with the meanings of events” (Leedy and Ormrod, 2015, p. 296). Historical data was found in government reports, laws concerning the system, debates around those laws, old newspaper articles about the system, and everyday evidence of people actually using the system. The historical research was carried out without formal cooperation with the authorities, as the information needed is completely public. Finding the information was not easy and did not happen in one instant of discovery; rather it trickled in bit by bit through the duration of the project. It would have been greatly beneficial to be in closer contact with Väestörekisterikeskus and Tilastokeskus at this stage, as it might then have been easier to find and access certain obscure resources. However, I managed to put together an outline of the history by the end of January 2018, and supplemented it throughout the rest of the project with additional sources.

The second part, an explanation of how the Population Information System and the henkilötunnus currently work, is the necessary glue between the history and the future. Researching the current status of the system was also a qualitative endeavor. Qualitative research digs deep to collect different perspectives that build a coherent picture of the research topic (Leedy and Ormrod, 2015, p. 269). The researcher needs an open mind to accomplish this. Researching laws, documents, and articles helped with finding the facts, but arguably more important was to analyze the issues the system has and the controversies around it. Traces of debates were found in old newspapers and articles, but at this point it was useful to be in contact with the reformation project group to get a

clearer view of which issues are priorities for the government. I anticipated that this phase of the research could take a lot of time, and felt it was important to start it early, in February, right after the historical outline was clear. By mid-March I had a reasonable understanding of the current situation with the henkilötunnus, just in time for a trip to Finland to attend the reformation project's public seminar.

Studying the history and current status of the henkilötunnus and the system around it was quite straightforward work: it required gathering information from different kinds of documentation and organizing it all into a coherent report. However, research for the third part got more specialized. As it took some time to first identify what the issues in the system were, my attention turned to considerations for the future only later in the process, after most documentary research was completed. Though still qualitative, this research phase had some of the characteristics of a grounded theory study, even though the data collection before this phase was not quite field-based (Leedy and Ormrod, 2015, p. 274). However, the information collected was handled in an analytic and inductive way throughout the project. Based on different themes and issues found and comparisons to other countries, theories were developed to explain what causes the issues and how they could be fixed. As proposing solutions to all the system's problems was not possible within the time available, a few problems were then selected for a more in-depth focus. My work started turning towards these future considerations in late March, around the time I visited Finland and attended the seminar.

As the Population Information System has been in use for multiple decades in a very central role, it has inevitably developed dependencies on other systems and become very sensitive to changes. And while rigorous documentary research can help to understand the big picture, there are always details which are not written down. This is why it was important to get in touch with experts and organizations affected by the system, to hear their ideas and concerns. Living in Norway but having most of my research contacts in Finland was not particularly convenient. The first attempts to contact experts were made early on in January and February via email. I was able to get in touch with Tilastokeskus, Tuomas Salste, and the reformation project group. Through the chairman of the reformation project group, I was invited to the group's first public seminar and also got in touch with Kimmo Mäkinen and got to interview him. The interview took place in Helsinki, the day before the seminar. I focused on understanding his ideas, role, and priorities in the project. The session also served as a preparation for the seminar, which I will discuss further in chapter 5. It should also be noted that no personal information was collected in any interactions with experts, which focused purely on the henkilötunnus and systems relevant to it.

Most of April was spent writing about the future of the henkilötunnus and rounding up missing details for the sections on the history and current status. That allowed me to spend time in May polishing the final report. With the helpful comments of Ian Watson and Tuomas Salste, I was able

to improve the structure and text, add even more details here and there, and slightly shift the focus toward important things. In addition to all the great support, the structured and consistent progress plan made this thesis project quite pleasant overall.

2.2 Related literature

Hanne Frestad's (2017) thesis was the greatest inspiration to my thesis work, as our starting points were basically the same. As she was writing her thesis, Norway was in the process of modernizing its national register and identification numbering system, and Finland had its own reformation project in progress during my thesis. Frestad's thesis showed that this study was feasible and what the structure of this thesis could end up looking like. While I ended up structuring the thesis somewhat differently, the main themes remain very similar to those in Frestad's thesis. Besides the subject country, the largest difference between the two theses relates to the future of each national system. Frestad's thesis does not include the author's design proposals to the system, as the modernization project was in a later stage and the project group had already made their own proposals. As the Finnish reformation project was still in its early stages at the time of my writing, I made my opinions known and offered some proposals for the future of the system.

When dealing with a pervasive but relatively niche subject such as national registration and identification systems, the relevant literature can be very specialized. There have been a number of recent contributions to the field, of which I was able to review only a small selection of essential works. *Identification and Registration Practices in Transnational Perspective: People, Papers and Practices*, an edited collection of recent contributions to the history of identification, is a good example of how varied this field of study is (About, Brown and Lonergan, 2013). The book is a product of the research network called IdentiNet, established in 2008, which was an international community of academics interested in civil registration and individual identification (IdentiNet, 2010). *Documenting Individual Identity* is another, older collection by a group of scholars, most of who also became members of IdentiNet (Caplan and Torpey, 2001). IdentiNet is no more, but many of its former members are now active in the Bhalisa forum, a subscription-based email list for scholars specializing in civil registration and identification practices (Bhalisa, 2018).

Ian Watson, who is also a part of the Bhalisa community, has written two articles about the Icelandic identification numbering system. The former of these articles is titled "A short history of national identification numbering in Iceland" (Watson, 2010). He also wrote another shorter article titled "An unusually open identification number system: The Icelandic kennitala" focusing on the current use of the numbering system in Iceland (Watson, 2013). These two articles explain the Icelandic system thoroughly. Additionally, there are papers written by Karl Jakob Krogness (2011) and Jonas Ludvigsson et al. (2009; 2016) concerning the Danish and Swedish national identification numbering systems, and together with Frestad's thesis they start to allow a comparison of the different national

numbering systems in the Nordic countries.

Some information about the history of the Finnish population registration and current state of the henkilötunnus is already available in English, but it consists only of short summaries of less than 1000 words. These English-language summaries can be found at the official website of Väestörekisterikeskus (2018a). Most of the documentation is only available in Finnish, or in some cases Swedish. For history, the most useful sources to begin with turned out to be the websites of Tilastokeskus (2018) and Väestörekisterikeskus (2018b), both of which had sections with a chronological summary of the history. Tilastokeskus (1999) also has a more in-depth report on the history of population statistics, which I did not find until April. The back issues of the largest Finnish newspaper, *Helsingin Sanomat*, have been fully digitized and turned out to be an excellent historical source which added depth to the study.

The available sources explaining the current status and use of the Population Information System and the henkilötunnus are not quite as comprehensive, with the exception of the article on Tuomas Salste's (2018) website. He has put together an extensive collection of information about the henkilötunnus, including a list of sources, on his personal website. The evolution and form of the henkilötunnus is explained in an exceptionally detailed way, which is why his article was a very important source for those sections of this thesis. Other than Salste's article, a lot of the information concerning current status had to be pieced together slowly from a variety of sources. There are a few publications and articles which bring up specific problems with the henkilötunnus or its use, such as Anniina Jauhojärvi's (2016) thesis considering the use of the henkilötunnus in court decisions. Her work also explains some of the current flaws in the legislation related to personal information security. Väestörekisterikeskus's (2017) preliminary report on the current issues in the system explains many points in detail and connects to the reformation project.

The prospects for future developments with the henkilötunnus depend greatly on the ongoing reformation project, and since the project was in an early stage when I started my research, official information about it was scarce. Valtiovarainministeriö (2017a), the Finnish Ministry of Finance, has published a press release about the assembly of the reformation work group. A formal description of the project is also available online (Valtiovarainministeriö, 2017b). Especially this formal document summarizes what kind of issues the reformation group is expected to solve in its work. While this document is a starting point for understanding the government's position on the issues and the improvements needed, more up-to-date information and a wider range of ideas were available at the seminar I attended in March.

3 History of population registration in Finland

It is important to note that Finland was a part of Sweden when population registration in Finland began and until the early 19th century; therefore, the regulations and laws that established Finland's first civil registration institutions were Swedish. This part of the story belongs in most ways to the history of the population registration system of Sweden. It will be summarized in this section but it is not a major point of focus. In the late 18th century Finland gradually became more autonomous and this chapter will focus more on the time from that point onwards.

3.1 Before the identification number

The history of population registration in Finland starts in the 16th century. After the Kalmar Union between the Scandinavian countries broke down in 1523, Gustav I, the king of Sweden, started to reform the governance of Finland, which had previously been a relatively unorganized part of the Swedish realm (Tilastokeskus, 2018). To make taxation and military conscription more effective, Gustav I ordered farm property registers to be maintained in Finland. Soon after, a regulation was added that required keeping a record of each peasant on each farm in the property register (Tilastokeskus, 1999). Additionally, a separate register of men eligible for military service was introduced in the 1550s (Väestörekisterikeskus, 2018b). These two types of registers were the only source of information about the population in the 16th century, and they were far from complete collections (Tilastokeskus, 2018).

In the 17th century, two new branches of population registration emerged to co-exist with the farm property registers. From the year 1634 each tax-paying individual was listed in local population registers. Originally these were effectively just tax registers as displayed in figure 3.1, but they later evolved into an administrative tool to determine residence and help with military conscription and overseeing elections (Väestörekisterikeskus, 2018b).¹ They evolved to contain more detailed personal information than the property registers, which only listed people living on each farm. Only individuals over 12 years of age were recorded in the beginning (Tilastokeskus, 1999, p. 8). This population information was recorded by priests until 1652, then by tax commissioners until 1779, and after that by census officers.

¹ The Finnish source text uses the term "henkikirja," which does not have a direct translation but was essentially a local population book. "*Vuodesta 1634 Suomessa alettiin pitää henkikirjoja. Alun perin ne olivat luetteloita ns. henkirahaa eli veroa maksavista henkilöistä. Myöhemmin henkikirjoista tuli hallinnon apuväline myös muun muassa kotipaikan määrittämisessä, sotaväenotossa sekä vaali- ja veroluetteloina*" (Väestörekisterikeskus, 2018b).

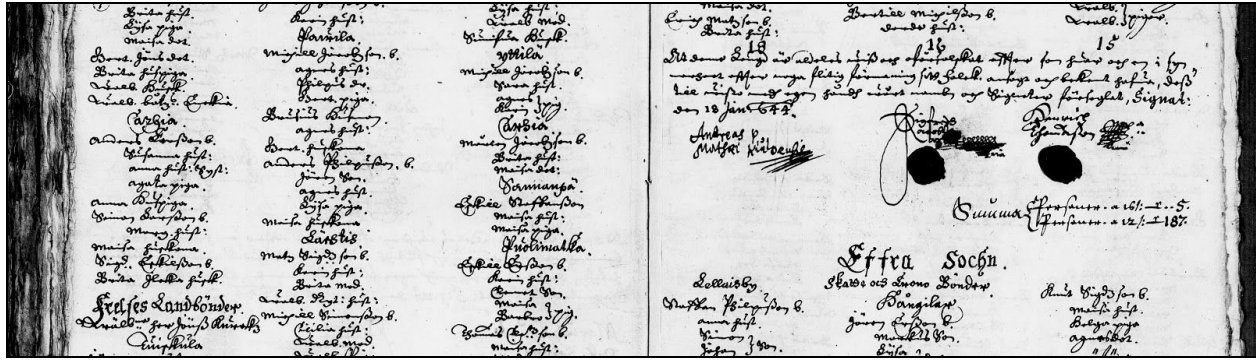


Figure 3.1: An excerpt from the local population book of the Pori province from 1644. These early books were not much more than lists of people categorized by location. (Kansallisarkisto, 2018.)

The other new type of population registration was managed by the church. Priests were to catalog every baptism, marriage, and funeral in Turku starting from 1628, following the example of churches in Central Europe (Tilastokeskus, 1999, p. 8). Under a new church law in 1686, the church books were to be kept countrywide. The church law created a base for continuous population registration in Finland, and was important to the development of population statistics because it regulated which information the priests needed to record (Väestörekisterikeskus, 2018b; Tilastokeskus, 2018).

In the 18th century Finland suffered by being the battlefield between Sweden and Russia in the Great Northern War (1700–1721) and two separate Russo-Swedish Wars (1741–1743 and 1788–1790). The wars took a toll on the population of both Finland and Sweden and led to a labor shortage, which raised interest in counting the population. Church books were originally meant to serve the church, but starting in 1736 priests were required to summarize information about baptisms and funerals annually and submit it to the temporal authorities (Tilastokeskus, 2018). However, this information was ultimately inadequate. Better and more complete statistics were needed, and therefore a new order to gather population statistics came in 1748 (Tilastokeskus, 2018). The first population tables were created in the year 1749 in Sweden and Finland. This can be considered the first countrywide census in the world, at least in the sense that population count changes have been recorded annually since then (Tilastokeskus, 1999, p. 3).

Priests gathered population information using forms which contained tables. The information was divided into two types: population change and population count. The gathering process was multi-tiered. Individual churches (*seurakunnat*) and registry offices (*maistraatit*) sent the filled-out forms onward, and they were summarized by parish (*rovastikunta*); parish summaries were then summarized by province (*lään*) and these summaries were sent to the central office in Stockholm and summarized countrywide (Tilastokeskus, 1999, p. 12).² Figure 3.2 below displays an example of

² The Finnish source text uses the old terms comparable to modern-day municipalities and regions.

a summarized population change table. The population change forms were filled out annually from 1749 on, but filling out the population count forms every year felt unreasonably burdensome to the priests (Tilastokeskus, 2018). Between 1751 and 1775, the population count forms were filled every third year, then every fifth year until 1880 and every tenth year until 1940 (Tilastokeskus, 2018).

TAB. I. 2

UTDRAG

AF
AR Mänduharju FÖRSAMLINGS KYRKO-BOK *utielandlag* HÄRAD
 1750 *Nygifte* LÄN, och *Borgå* STIFT, öfver the, öberstädes FÖDDE och DÖDE,
 samt NYGIFTE Personer, År. 1750.

MÅNADER.	DÖPTE.			BEGRAFNE.						HJONELAG.				
	Akta Barn.	Oäkta Barn.	Summa.	Barn under 10. år.	Ungdom och Ogift Folk.			Gift Folk.	Summa.	Uplöste.	Wigide.			
	Söner.	Döttrar.	Söner.	Döttrar.	Man-Kön.	Qvin-Kön.	Summa.	Man-Kön.	Qvin-Kön.	Summa.	Man.	Qvin.	genom Döden.	Par.
Januarius	III		4	1	1	2	3	1	1	2	2	2	1	
Februarius	I	III	4	1	2	3	3			3	3	3		
Martius	IIII	III	7	4	3	7	7			7	7	7		
Aprilis	IIII	III	7	5	2	7	9	II	III	5	4	3	2	
Majus	IIII	III	7	4	1	5	6	II	III	5	4	3	2	
Junius	IIII	III	7	6	II	III	7	I	I	2	2	2	1	
Julius	IIII	I	5	1	IIII	II	7	I	I	2	II	3	2	
Augustus	IIII	III	7	3	II	I	3			3	4	1	2	III
September	IIII	III	7	4	I	II	3	I	I	2	3	2	1	
October	IIII		4	3			3			3	1	1	1	II
November	IIII	IIII	8	2	3		5			5	1	1	1	II
December	IIII	IIII	8	2	3		5			5	1	1	1	IIII
Summa:	17	12	29	14	15	30	45	5	5	10	12	15	27	20
Års-Summan af FÖDDE.	56			37						Års-Summan af DÖDE.		60.		

Figure 3.2: The summarized population change table of the Mäntyharju parish from 1750. All official documents were written in Swedish at the time. Notice how the main columns are labeled *döpte* and *begrafne*, meaning baptized and buried. (Suomen Sukuhistoriallinen Yhdistys, 2017.)

The quality of even the first population tables was high, and is quite satisfactory for demanding researchers today (Tilastokeskus, 2018). The information was gathered from baptisms, marriages, and funerals until 1773, after which all births and deaths even outside church ceremonies were included in the forms. The information gathered in population count forms included gender, age, marital status, and profession (Tilastokeskus, 2018). Age classification used five-year groupings, with infants under a year old separated in their own group to make it easier to review infant mortality. An example of a summarized population count table can be seen in figure 3.3 below.

TAB. III.

År 1790 FÖRTEKNING efter Ålder, Køn och Giftermål på alla i Mäntyharju församling af B. 1790 H. B. J. varande Personer, jemte någre Husbålls - omständigheter.

FOLKHOPENS FÖRDELNING EFTER ÅLDREN.

ÅLDREN.	MANKÖN.	QUINKÖN.	ÅLDREN.	MANKÖN.	QUINKÖN.
a. Yngre än 1 år.	57	59	m. 45 och 50.	110	89
b. Em. 1 och 3 år.	104	140	o. 50 och 55.	99	90
c. 3 och 5.	170	167	o. 55 och 60.	64	70
d. 5 och 10.	328	347	p. 60 och 65.	93	97
e. 10 och 15.	226	188	q. 65 och 70.	22	43
f. 15 och 20.	206	108	r. 70 och 75.	8	6
g. 20 och 25.	197	228	s. 75 och 80.	10	9
h. 25 och 30.	192	175	t. 80 och 85.	2	16
i. 30 och 35.	167	144	u. 85 och 90.		5
k. 35 och 40.	156	133	v. efter 90.		
l. 40 och 45.	93	97	Summa efter Køn.	2164	2056
		Summa			4220

Figure 3.3: The summarized population count table of the Mäntyharju parish from 1790. (Suomen Sukuhistoriallinen Yhdistys, 2017.)

After 1809, the population registration system of Finland became administratively separate from that of Sweden. Russia took over that year and Finland got its own government and justice system, and gradually became more and more autonomous under Russian rule. Information scattered in different governmental entities was centralized in a single place, a statistics agency which was established in 1865 and is currently known as Statistics Finland (Tilastokeskus, 2018). Following the establishment of the statistics agency, publishing of population statistics began. The first publication was in 1870, reflecting the population of Finland at the end of the year 1865 (Tilastollinen toimisto, 1870). After 1870, population change statistics were published every year.

Urbanization in the 19th century brought an increasing need for information. Villages grew into towns and it became impossible to keep track of all local people with human memory alone. The available population statistics did not meet the expectations of the statistical authorities: information in the church books was not linked to the information in the local population register, and it was felt that the information would be more useful if each individual was recorded on a separate form rather than listing people in tables (Tilastokeskus, 2018). For example, information about newborn children was listed in a table sorted by the age of the mother (Tilastokeskus, 1999, p. 13). Introducing separate forms for each individual would allow gathering information about every mother who had

given birth, with the mother's birth date, marital status, place of residence, and so on. However, introducing this new type of census in Finland would have increased priests' workload, which is why the attempts to bring about this change were aborted (Tilastokeskus, 2018).

The first few decades of the 20th century did not bring any significant changes to civil registration due to wars and insufficient funding (Helsingin Sanomat, 1950). At the time, theoretically everyone was a member of a religious body, but some parents left their children unbaptized. For these children, a separate civil register was established in 1917, which began to serve everyone who withdrew from religious communities after the freedom of religion law came to force in 1923 (Uskonnonvapaus, 2018). Finland became independent in 1917 after the Russian Revolution. The power vacuum left by the revolution resulted in the Finnish Civil War, after which Finland finally became a republic in 1919. This, however, did not lead to any immediate developments in population registration. Only in 1938 did the Parliament pass a law establishing a new type of countrywide census, to be carried out every ten years starting in 1940 (Helsingin Sanomat, 1960). However, the 1940 census was cancelled due to World War II.

After the war, it was time to carry out the first direct census. The United Nations had begun to actively issue international recommendations for census taking, and the 1950 census in Finland was partially based on these recommendations (Tilastokeskus, 2018). Enumerators gave out survey forms to the head of each household, three days before the census date. An excerpt of an example form is shown in figure 3.4. After the turn of the year, the enumerators collected the forms – and would often have to help households fill them out. In addition to age, gender, and marital status data, the 1950 census gathered information about place of residence, place of birth, language, religion, nationality, general knowledge, education, industry, profession, professional title, employer type, as well as some information about the structure of families, households, and living arrangements (Tilastokeskus, 2018).

Väkilinainen asuinalue ja tarkka osoite		Asema siinä ruokakunnassa, johon asianomainen henkilö varsinaisesti kuuluu	Ellei asianomainen henkilö kuulu mihinkään ruokakuntaan tai ellei siitä ole tietoa, merkitään hoidokki, vankei jne. Tämä koskee lähinnä sellaisia henkilöitä, joilla ei ole laitoksen ulkopuolella väkivastusta asuinta	Sukupuoli [Merkitään rasti (X) asianomaiseen rautuun]	
Kunta	Tarkka osoite			Miespuolinen	Naispuolinen
Lihavien viivojen välissä on esimerkki kunkin sarakkeen täyttämistä (nivi O). Näillä esimerkeillä ei ole mitäänlaista sisällytystä keskenään		Päämies merkitään sanalla päämies Parheenjäsentä ja tukulaisista ilmoitetaan sukulaissuhteiden päämieheen, esimerkiksi vaimo, tytär, pojanpoika, veli, mini, anoppi jne. Muutta ruokakunnan jäsenistä merkitään esimerkiksi talousapulainen, täysihoidossa oleva jne.			
Ri- vi	Suku- ja etunimet (puhuttelunimi alleviivattava)				
0	<i>Meikäläinen, <u>Matti Juhani</u></i>	<i>päämies</i>	<i>hoidokki</i>	X	

Figure 3.4: Small part of the survey form used in the 1950 census. (Tilastokeskus, 2013, p. 68.)

3.2 Introducing a personal identification number

The first proposal for a national identification number came from the committee of population registration (Väestökirjanpitokomitea) in 1958 (Salste, 2018). The proposed ID number was called *henkilön tunnus*, consisted of nine digits and was meant to assist in the mechanical processing of personal information. At the time, mechanical processing meant punch cards and magnetic tape. However, due to the rapid development of data processing technology at the time, this number was never put into use. It was, though, a base for further development, and the basic ideas behind it resurfaced in the work pension number discussed below. (Salste, 2018.) In the 1960 census, collected data was recorded on punch cards, then transferred from punch cards to magnetic tape which allowed data to be processed with a computer (Helsingin Sanomat, 1960). An example of a punch card is shown below in figure 3.5. Improved data processing capabilities in the 1960s allowed the establishment of different new registers and therefore the handling of large amounts of data. This led to the introduction of a pension number in 1962.

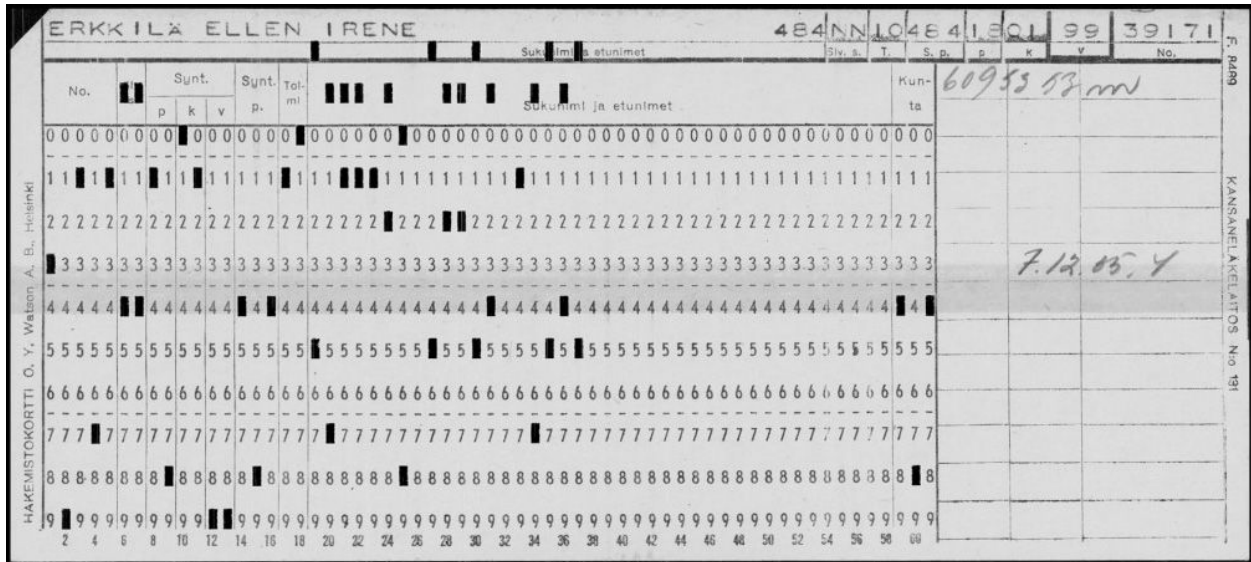


Figure 3.5: A punch card containing some personal information of an individual. The black rectangles in the card are holes, used by the tabulating machines to read the information. (Kansallisarkisto, 2018.)

3.2.1 Eläketurvakeskus and the work pension number

A new employee pension law, number 1961/395, was introduced in 1961, and the related regulation 1962/183 went into effect in 1962. As a result of the law, Eläketurvakeskus (the Finnish Centre for Pensions) was established. An employment register was created, in which every person to receive a pension was given a personal work pension number (*työeläkenumero*) based on birth date and additional individual numbers. The number was developed by mathematician Erkki Pale, and influenced by the Swedish *personnummer* which had been introduced in 1947 (Salste, 2018). Sweden had given its residents a three-digit “birth number,” which together with the birth date formed the *personnummer*. Iceland had also started using an 8-digit identification number, based on the birthdate, in 1954, and this later evolved into a 10-digit number called the *kennitala* (Watson, 2010, p. 56). The printed form of the Finnish pension number looked identical to the current henkilötunnus. The first six numbers were the date of birth in the form DDMMYY, followed by a hyphen, then three individual numbers and a check character (Helsingin Sanomat, 1962a).

An integral part of the pension number was an individual work pension card (*työeläkekortti*), on which the pension number was printed. The card was a small, laminated piece of paper, meant to be carried around in a wallet (Helsingin Sanomat, 1962a). It was originally meant to last a lifetime and people were encouraged to keep it safe, which was also one of the instructions written on the back side of the card. In addition to the pension number, which included the birthdate, the card had the person’s full name and place of birth, and the issue date of the card. An example of the pension card

is shown below in figure 3.6. The pension cards were distributed gradually; the first cards were sent to people with short employment contracts in 1962, and then in 1963 to employees with regular indefinite contracts (Helsingin Sanomat, 1962c). By the end of 1964, about 1.4 million employees were listed in the employment register (Salste, 2018).

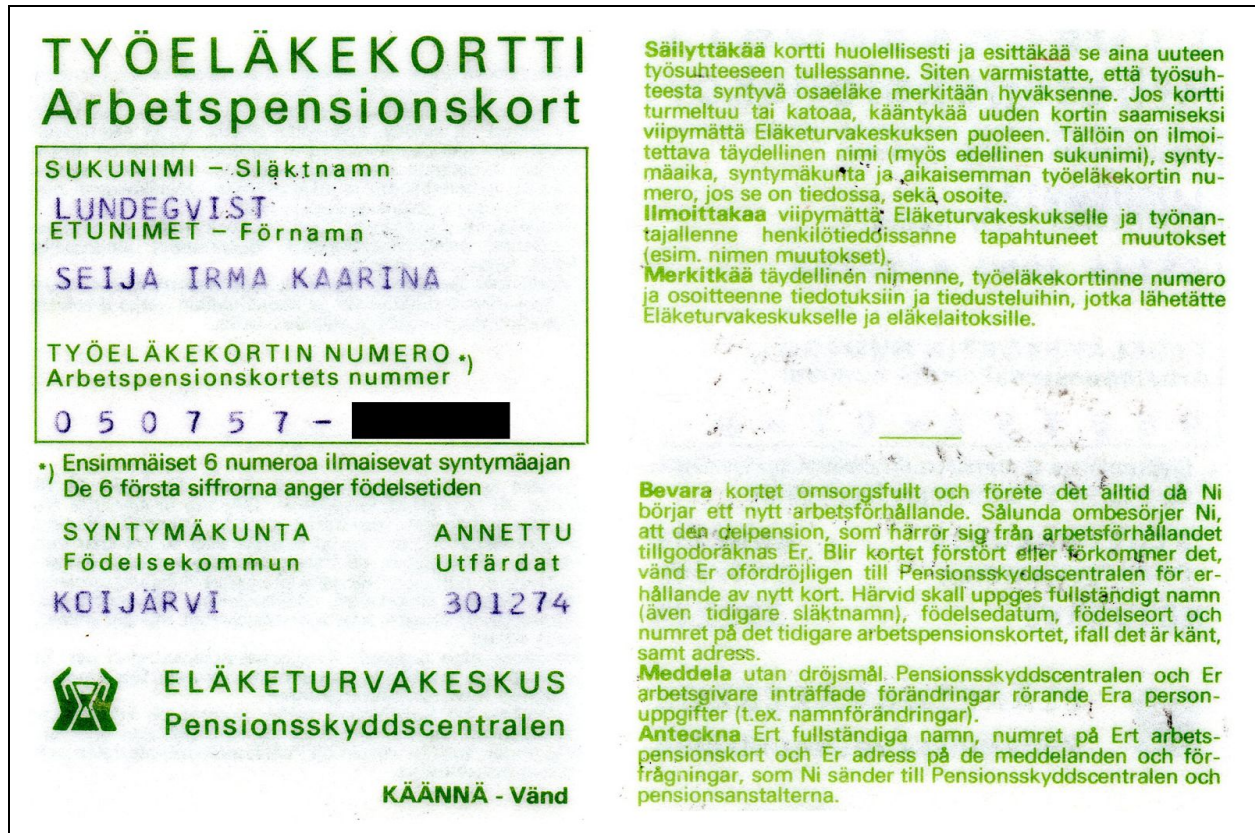


Figure 3.6: Both sides of the pension card. The last four characters of the pension number have been redacted. The back side has instructions concerning its use.

Distribution of the cards did not go perfectly, though. Some people received the wrong number or multiple ones due to erroneous birthdates or differences in the spelling of their names. The importance of clear spelling and writing was emphasized in several newspaper articles (Helsingin Sanomat, 1962b). In fact, the last name (*sukunimi*) in the card in figure 3.6 is spelled wrong. In this case the number itself was correct. The pension number was used by employers when submitting payroll information to the pension provider institutions. These institutions then used punch cards to store this information, and forward it to Eläketurvakeskus (Eläketurvakeskus, 1963, p. 1). The pension card and its number was not used as much as Eläketurvakeskus hoped (Helsingin Sanomat, 1964a). As the number was not required to apply for a pension but was just a tool to make sure a pension went to the correct person, it was not strictly necessary and was sometimes omitted.

3.2.2 Kela and the sosiaaliturvatunnus

In 1964 Kansaneläkelaitos (the Social Insurance Institution, officially abbreviated as Kela) was charged with managing the public health insurance system (Tilastokeskus, 2018). Starting in 1964, every newborn child was issued a “sosiaaliturvatunnus,” which is Finnish for “social security code,” and had their personal information recorded in Kela’s magnetic tape register (Salste, 2018). This personal information was based on the data gathered from the central population register, and in turn the sosiaaliturvatunnus was added to the central register (Helsingin Sanomat, 1964c). In population registration, the sosiaaliturvatunnus had another name: *väestörekisteritunnus*, which could be literally translated as “population register code” (Salste, 2018). Kela opened health insurance offices in 1964, and started issuing the sosiaaliturvatunnus to each new customer and their family members. By 1968, every individual permanently residing in Finland had a sosiaaliturvatunnus (Salste, 2018). Worth noting is that in the beginning, the sosiaaliturvatunnus was not issued to Finnish citizens living abroad, but they were finally registered in 1971 and 1972 (Salste, 2018). For a while, pension numbers were still issued by Eläketurvakeskus, but it ceased issuing them in 1970 and soon started using the sosiaaliturvatunnus on pension cards, which were ultimately discontinued in 1977 (Eläketurvakeskus, 1977, p. 1).

The sosiaaliturvatunnus was printed on a health insurance card, which was mailed to each customer. The health insurance card optionally included a photo, and was a kind of identity card originally meant to be used in all health-related matters (Helsingin Sanomat, 1964b). However, the original plan did not quite materialize, even though doctors were hoping for a universal health card to make visits to different doctors more straightforward, as well as avoid incompatible medications and procedures (Helsingin Sanomat, 1971). The card would have needed some further development to become more effective. The sosiaaliturvatunnus itself was quickly adapted to widespread use, first covering the population registration, social security, and pension systems. From the beginning, the plan was that it would eventually cover all public registers (Helsingin Sanomat, 1964c).

As the sosiaaliturvatunnus was rolled out, Eläketurvakeskus informed Kela of the existing pension numbers and personal information tied to them, and people were also encouraged to bring their pension cards when doing business at the health insurance offices (Salste, 2018). As the form of the sosiaaliturvatunnus was identical to that of the pension number, most people with existing pension numbers were able to get a sosiaaliturvatunnus that was identical to their pension number. However, about ten percent of the population received a new, different number (Salste, 2018).

Introduction of the sosiaaliturvatunnus was among the most important developments in the history of population registration in Finland, ranking with the beginning of population statistics collection in 1749. It allowed demographers to diversify their statistical products. It opened new possibilities for

demographic research; using the henkilötunnus to combine different statistical data sets made researchers' work more effective (Tilastokeskus, 2018). Some practical research methods changed; it was possible to gather some data without expensive interviews. Kela's social security register was available on magnetic tape, which allowed searching for personal information on an individual if their sosiaaliturvatunnus was known (Helsingin Sanomat, 1967).

3.2.3 VRK and the henkilötunnus

Väestörekisterikeskus (VRK) was established in 1969 to control population registration and supervise the process, as well as maintain the central population register. This register is currently called the Population Information System (Väestörekisterikeskus, 2018b). The sosiaaliturvatunnus also got a new name: henkilötunnus. Although the name sosiaaliturvatunnus was officially used only for a few years (until 1971), the henkilötunnus is still sometimes called that in informal situations. The register itself was for the most part based on Kela's register and was transitioned to computer in 1971. The Finnish Evangelical Lutheran Church and Orthodox Church still handled population registration duties in cooperation with Local Register Offices until 1999 (Väestörekisterikeskus, 2018b).

The basic demographic information such as age, gender, marital status, and place of residence has been available in the central population register since its establishment, whereas, for example, any information on economic activity had to be gathered with an inquiry to the individuals themselves (Tilastokeskus, 2018). In the 1980s, other administrative registers became reliable enough that it was possible to use them when conducting a census. This allowed an end to the use of physical forms filled out by individuals themselves. In 1990, the "census" was conducted in this way for the first time. Roughly 30 different registers were used, some of which are listed in table 3.1 below. At the time, Finland was the second country in the world, after Denmark, to conduct a census using only register data (Tilastokeskus, 2018). This register-based census-taking method makes it possible to generate almost all typical census data every year (Tilastokeskus, 2018).

Finnish	English translation
Väestötietojärjestelmä	Population Information System
Verohallinnon rekisterit	registers of the Finnish Tax Administration
Eläketurvakeskuksen työsuhderekisteri	employment register of the Finnish Centre for Pensions
Valtiokonttorin ja kuntien eläkelaitosten työsuhderekisterit	employment registers of the State Treasury and the municipal pension institutions
Tilastokeskuksen yritys- ja toimipaikkarekisteri	business register of Statistics Finland

Kansaneläkelaitoksen eläkerekisteri	pension register of the Social Insurance Institution (Kela)
eri opiskelijarekisterit	different student registers
Työministeriön työnhakijarekisteri	job seeker register of the Ministry of Employment
Tilastokeskuksen tutkintorekisteri	degree register of Statistics Finland
Pääesikunnan varusmiesrekisteri	conscript register of the Defence Command

Table 3.1: These registers were among the ones used to gather information for the 1990 census. (Tilastokeskus, 2018.)

3.3 Evolution of the henkilötunnus

The henkilötunnus, or sosiaaliturvatunnus as it was called in the beginning, has remained mostly the same since its inception in 1964. The largest change is that the henkilötunnus originally did not contain information about the birth century. Century coding in the henkilötunnus was not originally thought through or entirely planned out. The hyphen shown in figure 4.1, which indicates that the holder's birth year was between 1900 and 1999, was not originally a meaningful part of the number and was not mentioned in the first laws concerning the personal identity code. The early developments of the century character have remained mostly in the dark due to insufficient documentation. Due to the author's lack of access to certain sources existing only physically, this section is derivative of Tuomas Salste's (2018) web article. The section is essentially a translated and rephrased summary of Salste's work.

As the henkilötunnus did not contain information about the century of birth, in the first information systems the full birth year was recorded separately or, alternatively, not at all. The hyphen was occasionally added to the number's printed form and it had no meaning. It only served as a separator to help perceptual grouping. Since then, though, the specification of the century character has changed several times. (Salste, 2018.)

The plus character, used to indicate individuals born between 1800 and 1899, was used for the first time in the 1960s. However, the practice was somewhat haphazard. At the beginning, there was no general awareness of the plus character. The first documentation mentioning the plus character was VRK's system plan in 1974. According to the plan, the birthdate was to be separated from the rest of the characters with a plus or hyphen. The system based on this plan was put into service the same year, when VRK took over issuing the henkilötunnus from Kela. Regardless of VRK's internal plans, the hyphen and plus were used inconsistently throughout the 1960s and 1970s. In 1984, the century characters + and - received a more official status in a standard issued by the government.

The standard defined how the birth century should be indicated, and the henkilötunnus officially became 11 digits as it is currently. (Salste, 2018.)

The chaos concerning the century character should probably be seen in the context of the Swedish *personnummer* and how it was used as a model when the sosiaaliturvatunnus and its predecessor, the pension number, were developed. Sweden also used a hyphen in the early stages of the *personnummer*, but only for perceptual grouping purposes. This logic was copied to the sosiaaliturvatunnus. Later there was a need in Sweden, too, to separate newborns from centenarians to avoid running out of individual numbers for a certain birthdate or having to recycle already issued numbers. Sweden's response was to change the hyphen to a plus sign as people turned 100, essentially changing one character in their already existing *personnummer*. As mentioned earlier, Finland took a different approach to this problem. In both countries, the solutions remained unstandardized for years. (Salste, 2018.)

There are several reasons why the century character was originally not necessary. The henkilötunnus was meant to help identify people, not to record their birth dates or years. The date of birth just happened to be a series of numbers that was easy to remember and suitable for the construction of a unique identifier. In the beginning, pension numbers were only used to register pensions for individuals born in a span of roughly 50 years. The full birth years were easy to deduce using only the last two numbers. In the 1960s it was also extraordinary for people to live over a hundred years, and it was decided to not tailor the henkilötunnus to accommodate these exceptional cases. Possibly it was also not expected that the henkilötunnus would still be used in the 21st century, in almost the same form. In any case, it was common in most information systems to mark the years with two digits only. This saved space in computer memory and storage, on monitors, and on printouts. (Salste, 2018.)

The turning of a new millenium in 2000 was a challenge for information systems, including the Population Information System and the henkilötunnus. As the century of birth was now included in the henkilötunnus, a new character was needed for people born in 2000 and onwards. Several options were considered in the mid-1990s, including the equals sign, asterisk, slash, period, the letters A and X, and even the plus sign. All but the letters were rejected for different reasons, such as not being compatible with the bar coding system or the international character set used in passports (Salste, 2018). Giving the full birth year was also considered, but rejected because it was important that the code be compatible with the current information systems without significant changes (Salste, 2018). Letters as century characters did not provide as clear perceptual separation, but according to Laakso (1996) the director of VRK Hannu Luntiala stated that “the letter A was selected in the end as ‘the least bad’ option.”³ The official definition including all three century

³ “Väestörekisterikeskus on päätyntynyt A-kirjaimeen ‘vähiten huonona’ vaihtoehtona,” kertoo johtaja Hannu Luntiala (Laakso, 1996).

characters was enshrined in the population information regulation 1993/886, which is the latest change made in the form of the henkilötunnus.

4 Current status of the henkilötunnus

In Finnish society today, a universal personal identifier is necessary to ensure the efficiency of many services, both in the public and private sectors. Searching data in any register becomes much simpler when there is an unambiguous, universal identifier which is the same across different registers. Services and processes are designed and built upon the assumption that operators will be able to identify individual identities (Väestörekisterikeskus, 2017, p. 3). Possessing a henkilötunnus is one of the more substantial ways a person is included in society.

The henkilötunnus is meant to allow identifying an individual more efficiently than by using a name. There are people with the exact same name, but every henkilötunnus is unique (Väestörekisterikeskus, 2018b). By default, it stays unchanged for the entire lifetime of an individual, barring certain exceptions which are discussed below. The henkilötunnus is not intended to be used as the sole piece of information required to authenticate an individual, but authentication may involve the henkilötunnus combined with an identification document or other identifying information (Valtiovarainministeriö, 2017b). Registrars are not allowed to build their authentication practices solely upon a request for a person's name and henkilötunnus (Tietosuojavaltuutetun toimisto, 2014).

4.1 Form and logic

The henkilötunnus consists of 11 characters made up of the following parts: an individual's birthdate including the last two digits of the birth year, a character to indicate the century of birth, an individual number to differentiate people born on the same day, and lastly a check character to make sure the code is correct (Väestörekisterikeskus, 2018b). This structure is shown below in figure 4.1. The different forms of identification numbers are discussed in this thesis with the aid of a widely-used letter code. For example, the current form of the henkilötunnus can be stated as DDMMYY-IIIC. D stands for the day, M for the month, and Y for the year of birth, the hyphen is a character indicating the century of birth, I stands for individually determined digits, and C for the check character.

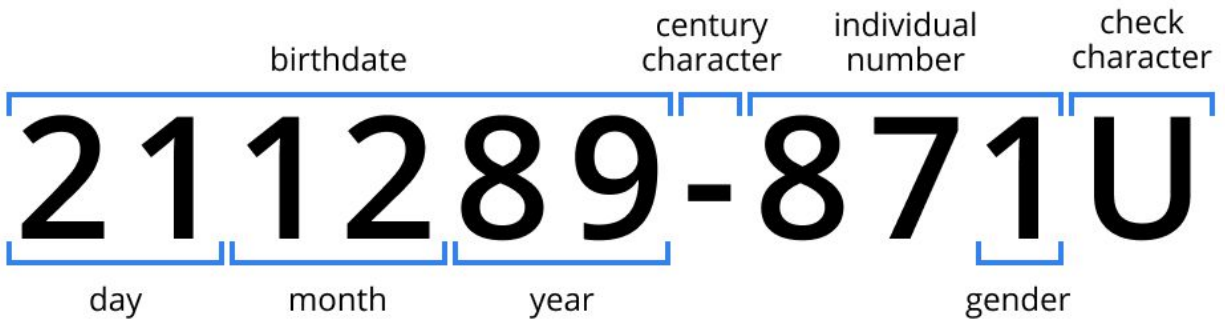


Figure 4.1: The different parts of the henkilötunnus. This particular henkilötunnus is not legitimate, as the check character does not match the nine numbers.

When the sosiaaliturvatunnus was introduced, the pension number had been distributed to at least 1.4 million people, so it made sense to have the successor resemble its predecessor, which in turn was influenced by the Swedish *personnummer*. The design requirements of the henkilötunnus was somewhat different than for the *personnummer*, partly because of the rapid development of computers and information systems. The henkilötunnus had to be unique and permanent for every individual, as well as easy to differentiate from other character combinations. A henkilötunnus had to be possible to generate and manipulate using a computer, and it was beneficial to make the code as short as possible to save costs and make handling it as easy and effortless as possible (Salste, 2018). It also had to be designed in a way allowing its holder to remember it or otherwise produce it easily. The date of birth and gender were the most memorable, the most permanent, and shortest pieces of identity information. Basing the henkilötunnus on a meaningless serial number or purely on identity information were also considered as options, but a hybrid solution was judged to meet the memorability and uniqueness requirements better (Salste, 2018).

The form of the national identification numbers in all the Nordic countries is similar, but not identical or directly translatable. Artificial identification numbers for Finland, Sweden, Norway, Denmark, and Iceland, each encoding the same information, are displayed below in figure 4.2. All of them are correctly formed identifiers for a male person born on 31 May 2002. However, the check characters, colored in blue, are only examples and not correct for these particular numbers.

Finland	310502A12 <u>3</u> B
Sweden	020531-12 <u>3</u> 4
Norway	3105029 <u>8</u> 7 <u>6</u> 5
Denmark	310502-012 <u>3</u>
Iceland	310502-12 <u>3</u> 0

Figure 4.2: Comparison of the Nordic national identification numbers' form. These numbers are not legitimate, as the checksum calculations are not correct. Blue indicates the check characters, red shows how a birthdate in the 21st century is encoded, and the underline shows the encoding of male gender.

As seen in the above figure, the form of the birthdate is the same in all cases except Sweden, which uses the YYMMDD form. The century of birth is encoded in all except the Danish *CPR-nummer*, and the encoding logic varies (Krogness, 2011, p. 105). Finland uses the letter A, Norway uses the number range 500–999, and Iceland uses the number 0 to indicate a person born after 1999, while the Swedish *personnummer* uses a hyphen to denote that the person is under 100 years old. All of them except the Icelandic *kennitala* encode gender information in the number, although Norway is planning to end this practice as well (Frestad, 2017, p. 54). The male gender is indicated with an odd number in a predetermined spot. All of the Nordic countries use check digits, or alphanumeric characters in Finland's case. However, since 2007 Denmark has used the check digit as the fourth digit of the individual number for birthdates that have ran out of unique numbers, meaning the check digit is not reliable anymore (CPR-administrationen, 2018). The Norwegian *fødselsnummer* has had two check digits but will have only one in the future (Frestad, 2017, p. 54). The *henkilötunnus* is the only Nordic national identification number to use alphabetic characters. Denmark and Iceland both use hyphens to separate the birthdate and the rest of the numbers, but these hyphens have no meaning other than visual separation.

4.1.1 Date of birth

The *henkilötunnus* begins with the date of birth in the form DDMMYY. This is the first difference compared to the Swedish *personnummer*, in which the birthdate is in the form YYMMDD. Finland also considered using the YYMMDD form, because it initially made organizing and comparing the birthdates easier in a computerized environment (Salste, 2018). However, with the introduction of more advanced computers, the order of the birthdate elements is programmatically no longer a

matter of much importance. The DDMMYY form was chosen because of its more familiar presentation order, therefore making henkilötunnus easier to recall and understand. As long as a birthdate is part of an identification number, this does seem like the best way to present it. DDMMYYYY would not make as much sense to people and DDMMYYYYY is unnecessarily long. As seen in figure 4.2 above, all the other Nordic countries except for Sweden also use the DDMMYY form for the date of birth.

Including the date of birth makes an identification number easier to remember and builds in a predictable level of exploitation of the number space, which are reasons why the majority of national identification numbers in countries around the world are based on birthdates. This approach instantly provides the user information about an individual's age, just by looking at the number, and therefore allows users some ability to manually sort people by age or birthday. However, a precisely known date of birth has not always been a taken-for-granted aspect of an individual's identity. As Kela was issuing the sosiaaliturvatunnus between 1964–1968 for the entire population of Finland, it was found that in some northern municipalities the birthdates had piled up around the 15th and 30th days of each month (Salste, 2018). This means that still at least in the 1960s, one could not rely on people knowing their exact date of birth. This is still true in some developing countries, and it causes similar spikes in the distribution of assigned numbers, as discussed further below.

4.1.2 Century character

The oldest individuals to receive a henkilötunnus were born in the late 1850s (Salste, 2018). Currently there are three different characters indicating the century of birth: plus (+) for individuals born during the years 1800–1899, hyphen (-) for people born during 1900–1999, and the letter A for people born in the year 2000 or later. The plus character is falling out of active use as no one with that character is alive anymore. The century character is an entirely exceptional character in the henkilötunnus. It was not originally a part of it but was added later. It is also the only character not taken into account when calculating the check character. With the current checksum calculation logic it is not even possible to include the century character, as it is not a number.

While the introduction of the century characters was chaotic (see section 3.3), in hindsight the addition has been useful and relatively successful. As mentioned earlier, Sweden also added a character to the *personnummer*, but with a different logic. The hyphen in a *personnummer* changes to a plus in the year when an individual turns 100 years old. Therefore the *personnummer* itself changes, which means it needs to be updated in all registers. As a solution to this, there is a separate recording form which includes the whole birth year in the form of YYYYMMDDIIIC, which can be converted to the display form of YYMMDD-IIIC when desired (Salste, 2018). Iceland includes the century number as the last number of the *kennitala*, excluding it from the check digit calculation (Watson, 2010, p. 68). Norway also has a static way to include the century of birth in its *fødselsnummer*

through the use of different number ranges for different centuries, although it has not been entirely consistent (Frestad, 2011, pp. 29–30). Thanks to the static implementation of the birth century indicator, the henkilötunnus only has one form and stays consistent. However, in retrospect the century character could have simply been a number like in the Icelandic *kennitala*.

4.1.3 Individual number

The three-digit individual number differentiates the individuals born on the same day of the same year. In a legitimate henkilötunnus it can be anything in the range from 002 to 899, which means the henkilötunnus supports a maximum of 898 people born on the same exact day (Väestörekisterikeskus, 2018b). This number includes people born on the same day in different centuries, as explained below. Three digits was considered sufficient in 1964, as the Swedish *personnummer* also had three individual digits. The number of babies born each day was the primary factor taken into account, and in Finland's case three digits was plenty (Salste, 2018). The country's typical birth rate has been between 100 and 300 babies a day since the beginning of the 20th century (Salste, 2018; Tilastokeskus, 2007). Another variable to consider is the number of immigrants, which has been rising in the last few years but is still manageable considering the henkilötunnus. Immigration, however, can cause statistical spikes, as immigrants without known birthdates are given a henkilötunnus beginning with 0101 or 0107. If this spike becomes too large, other dates could be used in these immigrants' codes, as Sweden has done (Lindström, 2016).

The last digit of the individual number encodes the holder's gender, in exactly the same way as the Swedish *personnummer* and the Norwegian *fødselsnummer*. This number is even (0, 2, 4, 6, or 8) for female and odd (1, 3, 5, 7, or 9) for male individuals (Väestörekisterikeskus, 2018b). Encoding the gender in the henkilötunnus has been controversial. There do not seem to be many reasons to encode gender information into the henkilötunnus, or at least not ones good enough to outweigh the privacy issues it causes. This issue is discussed also in section 5.2 below.

The sequence in which individual numbers are assigned does not start from 002. Certain numerical ranges, depending on birth dates, have been used since 1964. The individual number space was divided as Eläketurvakeskus was simultaneously issuing pension numbers as Kela started to issue the sosiaaliturvatunnus, and giving out the same number to two different people had to be prevented. For an unknown reason, this practice was resumed even when it was not needed anymore in the 1970s. Currently, since 1 July 1997, newborns are assigned individual numbers between 450–899 in numerical order. If the numbers between 450–899 have run out, any free number starting from 002 can be assigned (Väestörekisterikeskus, 2017, p. 23). Immigrants do not have this numerical range restriction and therefore any available number can be assigned to them (Väestörekisterikeskus, 2017, p. 23). Interestingly, when assigning individual numbers to a given person (born, say, in 2020), an individual number assigned to someone born on the same date a century prior (in 1920) is never

reused. This practice originated at the time when there was no century character in the henkilötunnus, and it still has definite benefit since the check character does not reveal if the century character is erroneous. However, it contributes to the exhaustion of the individual number space, which is currently the most pressing issue with the henkilötunnus.

In theory, it is possible to make some assumptions about a person from the combination of their birthdate and individual numbers. Due to differences in the assignment order of individual numbers between Eläketurvakeskus's pension numbers and Kela's sosiaaliturvatunnus, it is sometimes possible to figure out which entity issued a given henkilötunnus in the 1960s. From that it is possible to deduce whether the person was working during certain years in the 1960s. Additionally, immigrants after 1968 or Finnish citizens who lived abroad between 1962–1971 may be recognizable from their henkilötunnus. Both are likely to have individual numbers higher than others born on the same day, as they were registered later into the Population Information System (Salste, 2018). These assumptions made from the individual numbers are insubstantial, though, as the assignment of individual numbers has not been entirely consistent.

Individual numbers beginning with 9 exist, but only in unofficial identity codes. An unofficial or artificial henkilötunnus is needed if an individual does not have an official one, their henkilötunnus is not known, or they cannot otherwise be identified reliably enough (Salste, 2018; Väestörekisterikeskus, 2017). The number range 900–999 is reserved for these unofficial codes, which can sometimes be found in official registers and documents. Currently they are widely used in health care, where foreign, unconscious, or incoherent patients may be issued an artificial henkilötunnus. The Tax Administration, Kela, and Eläketurvakeskus also give them out, for example to foreign asylum seekers (Väestörekisterikeskus, 2017, p. 23). Some foreigners have multiple artificial identity codes, but it is not known how many numbers from the 900–999 range have been used (Väestörekisterikeskus, 2017, p. 3).

4.1.4 Check character

The check character can be a number or a letter. It is produced by taking the nine-digit number formed by the date of birth and individual number and dividing it by 31. The remainder determines the check character according to the table in figure 4.3 below. This table shows that certain letters are not used: G, I, O, Q, and Z. They were left out to avoid confusion on tabulating machines (the numbers 0, 1, and 2 are easily mistaken for the letters O, I, and Z, while G and Q are marginal letters in writing the Finnish language and are also easy to confuse with other letters) (Salste, 2018). The additional letters Å, Ä, and Ö in the Finnish alphabet were also left out, the tabulating machines and computers of the 1960s typically had a restricted character set (Salste, 2018).

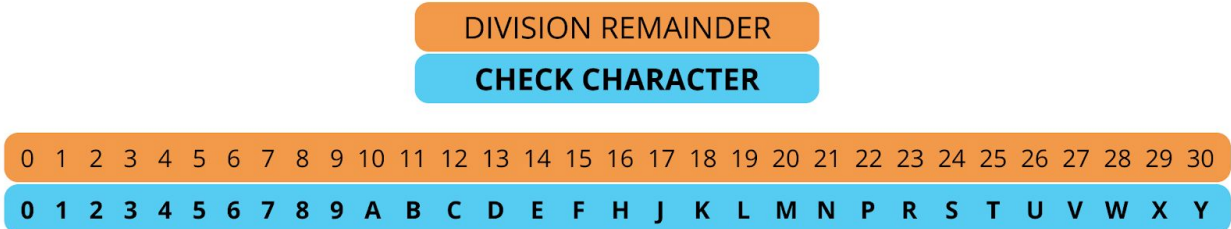


Figure 4.3: The check digit is determined by the remainder following division by 31 (Väestörekisterikeskus, 2018b).

The check character does not perfectly serve its purpose. As the century character is ignored in the calculation, running a checksum calculation will not pick up an incorrect century character. Also, the decision to use letters in addition to numbers as a check character has advantages and disadvantages. It enables an effective check calculation using only one character, keeping the henkilötunnus as short as possible. The clearest disadvantage relates to the risk of confusing certain characters. Despite having left out five letters to avoid the most obvious confusions, there remain pairs of check characters which are easily mistaken for each other either in handwriting or speech (Salste, 2018). For example, U/V, 4/Y, and 5/S are easily confused in handwriting, whereas B/D/P/V, I/J, and M/N can be confused in speech. There has been debate concerning the check characters, and the suggestion to shift to using only numbers has been made. This debate is discussed further below in section 4.3.1.

However, most errors in the birthdate or individual digits can be detected with the help of the check character calculation. An example of this calculation is shown in figure 4.4 below. The number 31 was chosen as the divider for several reasons. The divider number had to be as large as possible to make detecting errors effective, but also sufficiently small to have enough unique check characters (Salste, 2018). The most common errors needed to be detectable, such as reversing the day and month of birth, or switching the position of two digits. Having an odd divider number makes it possible to detect more different types of errors (Salste, 2018). The number of numerals from 0 to 9 and letters from A to Z is 36. The greatest prime number smaller than 36 is 31.

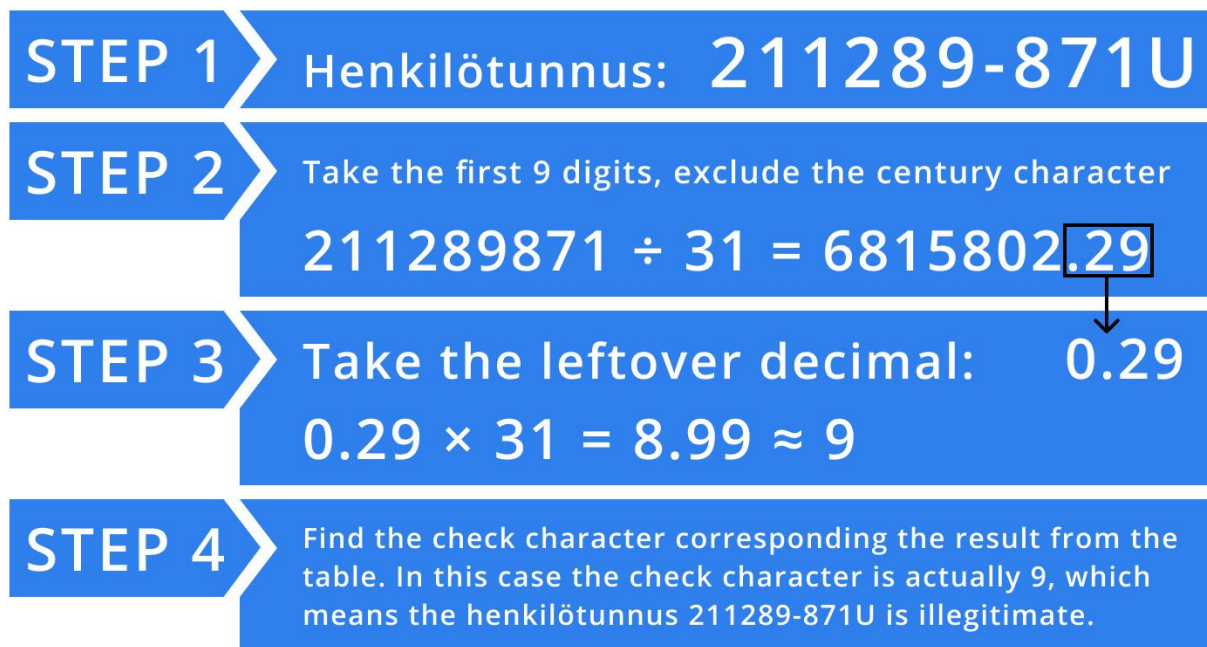


Figure 4.4: This example of a manual check character calculation shows that the henkilötunnus shown in figure 4.1 is illegitimate.

The reason to use any check character at all relates to the use of punch cards before and during the early computer age. Tabulating machines were not very reliable and would sometimes make errors when reading from cards, which would result in mistakes in processing and output (Salste, 2018). A method to minimize these unavoidable errors was needed, and thus a check character was a necessary part of the henkilötunnus. Now that punch cards are not in use anymore, the check character is a product of a bygone era, but it still remains useful. It still adds an extra layer of security against human errors.

4.2 Current use

Dealing with most government services in Finnish society today would be difficult for an individual without a henkilötunnus. It is not possible to acquire identification documents, bank or mobile IDs, or the Citizen Certificate attachment for the ID card without a henkilötunnus (Valtiovarainministeriö, 2017b). An individual with no henkilötunnus cannot use online public services.

4.2.1 Population Information System

The Population Information System is currently maintained by VRK along with the Local Register Offices. The system serves various public functions such as organizing elections, taxation, legal governance, political decision-making, statistics, and research. Also, companies and communities are

able to get access to the system and use the information in it (Väestörekisterikeskus, 2018). The system depends on the obligation of citizens and organizations to notify the authorities about life events and changes to personal information. The Population Information System also includes information about buildings and properties, which are tied to the information about people (Väestörekisterikeskus, 2018). The digitization of public services is one of the main goals of the current government, and in order to support this and meet the needs of users, the Population Information System needs to be reliable and up-to-date (Väestörekisterikeskus, 2017, p. 3; Valtiovarainministeriö, 2018).

The Population Information System is a centralized collection of personal data, but is limited to only certain types of information. Along with the identifying information, the system is focused on data related to birth, personal relations, and addresses or other ways contact. All information in the system is considered “publicly reliable,” which means that only verified information is recorded in it (Väestörekisterikeskus, 2017, p. 3). This also means that an individual must be authenticated before any information is recorded. While this makes the recorded information reliable, it also creates a problem: there are difficulties in verifying some foreigners’ personal information, which prevents recording the information.

The henkilötunnus works as the key which connects all personal data scattered in other registers to individual identities in the Population Information System. The term identity in the system means the entirety of an individual and their personal information. A permanent identity is created when an individual is registered in the system for the first time, and is not created again even if some personal information is changed (Väestörekisterikeskus, 2017, p. 6). Old, changed information is not deleted in most cases, but lives on as historical information. Access to this historical data is restricted to prevent revealing name changes and gender transitions, for example (Väestörekisterikeskus, 2017, p. 24). However, currently it is possible for an individual to have multiple identities in the system, mostly due to the inadequate registration procedures for foreigners (Väestörekisterikeskus, 2017, p. 3). One aim of the reformation project is to find a way of reducing the possibility of multiple identities in the system.

4.2.2 Issuing a henkilötunnus

When an individual’s information is entered into the Population Information System for the first time, a henkilötunnus for them is automatically issued, as law 2009/661 describes.⁴ Therefore it can be assumed that if an individual has a henkilötunnus, their personal information is in the system. There are some exceptions, such as foreign diplomats and employees of the United Nations working in Finland. They may receive a henkilötunnus in some situations, but law 2009/661 exempts them

⁴ 2009/661, 11 §: *“Kun henkilön tiedot talletetaan ensimmäisen kerran väestötietojärjestelmään, hänelle on annettava henkilötunnus. Henkilötunnus annetaan automaattisesti väestötietojärjestelmästä, ja sen antamisesta vastaa Väestörekisterikeskus. Korjattua tai muutettua henkilötunnusta ei saa antaa toiselle henkilölle.”*

from having their information registered in the Population Information System.

For a child born in a hospital in Finland, receiving a henkilötunnus does not require any action by the parents (Väestörekisterikeskus, 2018b). The hospital will report the birth of a child directly into the Population Information System. When the birth information is registered, the child will receive a henkilötunnus in the system. After the registration, the henkilötunnus of the child is noted on a form that also contains other information about the child and is sent to the mother (Väestörekisterikeskus, 2018b). Finnish citizens living abroad are obligated to inform the Local Register Office in the last place of residence about life events such as the birth of children, marriages, divorces, name changes, and address changes (Maistraatit, 2018). A Finnish citizen born abroad is issued a henkilötunnus once the parents have reported the birth, and a register office has added the child into the Population Information System.

Foreigners are eligible to receive a henkilötunnus in certain circumstances. When a foreign citizen moves permanently or indefinitely to a Finnish municipality, they qualify for a henkilötunnus. Temporary residents such as short-term workers and students staying in Finland can receive a henkilötunnus if they need it to exercise rights and fulfill obligations as described in law 2009/661. They must fill out a form requesting registration of their personal data in the Population Information System and bring it to their Local Register Office along with a personal identification document (Maistraatit, 2015). Along with Local Register Offices, Finnish embassies and consulates, the Finnish Immigration Service, and the local tax offices are able to issue a henkilötunnus to a foreigner.

In Sweden and Norway only immigrants planning to stay over 12 or 6 months are assigned a *personnummer* and *födelsnummer*, respectively (Ludvigsson et al, 2016, p. 131; Skatteetaten, 2018). There are no clear-cut time requirements to be eligible for a henkilötunnus. As the eligibility requirements are stricter in Sweden and Norway, both of the countries have alternative identification numbers which can be given to residents not meeting the requirements. Both of these alternative numbers are similar in structure to the national ID numbers, but alter the encoding of the birthdate (Ludvigsson et al, 2016, p. 131; Frestad, 2017, p. 33). Finland does not have this kind of alternate numbering system, but rather for information recording purposes gives out an artificial henkilötunnus to anyone not eligible for a legitimate one.

4.2.3 Changing a henkilötunnus

By default, the henkilötunnus is unique and fixed for an individual's life. But there are some exceptions, which allow an individual's henkilötunnus to be changed (Väestörekisterikeskus, 2018b). If a henkilötunnus stored in the Population Information System is technically erroneous, or the birthdate or gender information tied to it is incorrect, the code must be corrected. It can also be

changed if a transgender individual has been confirmed to belong to the opposite gender, in accordance with law 2002/563. In both of these cases the final decision concerning the change is made by a Local Register Office. Over 100 personal identity codes are changed every year in Finland, the majority of them due to gender transitions (Verkkouutiset, 2017). Between 1 March 2010 and 9 January 2017, 568 personal identity codes in Finland were changed due to a gender transition (Väestörekisterikeskus, 2017). There has been some debate concerning such identity code changes, as they can be regarded as a data privacy risk. Old certificates from schools and work placements might show that a job applicant previously had a different henkilötunnus. This can reveal a gender transition, a piece of information which the applicant might want to keep private.

Another reason for changing a henkilötunnus is if it is absolutely necessary to protect its holder in situations that threaten their safety or health in an obvious and lasting way, or if a henkilötunnus has repeatedly been abused by someone else. To change a henkilötunnus due to abuse, the abuse must have caused significant economic or other harm to the rightful owner, and the change must be able to prevent further harmful consequences. The most common cases of abuse of a henkilötunnus involve online shopping or quick loans, but isolated economic abuse cases are usually not a sufficient reason to change a henkilötunnus (Verkkouutiset, 2017). A threat assessment by the police can also be used to evaluate the need for changing a henkilötunnus in situations like witness protection (Väestörekisterikeskus, 2018b). The final decision in this matter is made by VRK.

Old, changed identity codes are kept as reference points in the Population Information System, and are not recycled and reused for new holders as stated in law 2009/661. This is different than, for example, the Swedish system, where in some instances a *personnummer* has been reused for a new owner (Ludvigsson et al., 2009, p. 663). Although certain precautions have been taken in Sweden to minimize confusion with reused *personnummers*, there is some potential for mix-ups (Ludvigsson et al., 2009, p. 663). This strict no-reuse policy is one of the main reasons why the henkilötunnus is such a strong identifier. The possibility to mix up two individuals with a henkilötunnus is negligible. However, it should be noted that in Finland the changes of codes brought by gender transitions in combination with the no-reuse policy contributes slightly to the depletion of unique individual numbers.

4.2.4 Identity documents and certificates

Identity documents are closely connected to national identification numbering systems, as documents need a unique identifier to be effective. There are two types of official physical identity documents in Finland: passports and identity cards.⁵ Finns apply for both of them from the police. Driving licences are accepted for authentication in most situations but are not considered official

⁵ 2006/707, 1 §: "Poliisin myöntämiä henkilöllisyyttä osoittavia asiakirjoja, jotka hyväksytään tunnistamisasiakirjana henkilökorttia ja passia haettaessa, ovat henkilökorttilain (829/1999) 1 §:n 1 ja 3 momentissa tarkoitettu voimassa oleva henkilökortti ja passilain (671/2006) 3 §:ssä tarkoitettu voimassa oleva passi."

identity or travel documents, and are issued by the Finnish Transport Safety Agency (Poliisi, 2018c). Each of these three documents includes the henkilötunnus, other identifying information, and a picture of the holder. An example of each is displayed in figure 4.5, and the henkilötunnus is circled in red. It can be seen that Finnish passports and identity cards currently have a very similar design.



Figure 4.5: A Finnish passport (top), identity card (bottom left) and driving licence (bottom right) (Poliisi, 2018a; Poliisi, 2018b; Trafi, 2018).

Finland also has an electronic identity and certificate system called FINEID, which is formed from the words “FINnish electronic IDentity.” The most common type of FINEID is the Citizen Certificate, which is an optional integrated attachment to the national identity card used for remote authentication and electronic signatures (Väestörekisterikeskus, 2018c). FINEID contains an individual’s identifying information accompanied by an electronic client identifier. This identifier is a unique personal identity code, which could be thought of as a purely electronic counterpart to the henkilötunnus. Unlike the henkilötunnus, it does not include any additional personal information such as the birthdate or gender. The electronic client identifier consists of eight random numbers and a check character which is calculated with the same logic as the check character in the

henkilötunnus (Väestörekisterikeskus, 2018c). Not every Finn has an electronic client identifier and it is not necessary either, as other electronic authentication methods such as bank and mobile IDs can be used for the same purposes.

4.3 Debates and issues

There are some unresolved issues with the henkilötunnus and the way it is used. Some of them relate to the Population Information System as well. Some of the most severe and long-lasting problems are explored in this section. Most of these issues have been recognized and debated since the 1970s, but their severity has risen with increasing globalization and digitalization. These issues are among the most important challenges for the reformation project to solve, and possible solutions to them are discussed further in chapter 5.

Most of the concerns regarding future development relate to privacy. The appropriate balance of surveillance and practicality is imperative and has turned into a more and more concerning topic during the last decade. Public opinion on recording personal information seems contradictory. Finns' trust in their government is relatively low (OECD, 2017, pp. 214–215). Therefore, people do not necessarily want to increase the amount of information recorded by the authorities. On the other hand, corporate loyalty cards are very widely used, which makes companies seem generally trusted, even though the potential amount of data gathered by these cards or web services is immense.

The debates around the henkilötunnus and the use of personal information are difficult due to the fact that information laws are relatively new and incomplete in Finland (Jauhojärvi, 2016, p. 7). Not everything has been completely regulated, which leaves some room for ambiguity and debate.

4.3.1 Issues with the check character

The implementation of the check character has caused some debate, mainly because of the use of letters. It was noted in 1971 that the mixed use of numbers and letters led to more errors compared to the national identification numbers of other Nordic countries (Helsingin Sanomat, 1973a). However, checksums are more valuable when they have more contrasting values. Norway increased the effectiveness of the checksum by using two check numbers in the *fødselsnummer* rather than a single alphanumeric character, although this approach looks likely to be abandoned (Frestad, 2017, pp. 31–32).

Despite the criticism, the check character has proved practical. Some of the confusion was related to the use of punch cards and old optical readers and printers (Salste, 2018). Modern equipment has eliminated some of these issues, and having only one check character has also made it easier to use the henkilötunnus in some information systems. The author sees reason to doubt whether using

check numbers would have been a better solution.

4.3.2 Unique codes are running out

A problem in the design of the henkilötunnus is that Finland will eventually run out of unique individual numbers. This issue originates with the century character, which was added to the henkilötunnus without integrating it into the checksum calculation. It follows that an erroneous century character cannot be detected by the check calculation. This, in turn, means that an individual born, for example, on 15 May 2017 cannot receive the same three-digit individual number as another person born on the same day in 1917 (Salste, 2018). Otherwise, their henkilötunnus would be exactly the same except for the century character, and this level of similarity was felt to be a potential source of confusion or error. This design flaw has been understood since 1964, but there has been no particular attempt to fix it until now (Salste, 2018).

Although it has been understood for decades that the individual number space would eventually become exhausted, the need for a reform is still not extremely pressing. VRK researched the issue in 1996 and estimated that unique codes would last until the year 2100 (Sipilä, 1996). The capacity of the henkilötunnus was studied again in 2007 and 2017 to see how many unique numbers were left. In 2007, 27 birthdates were found to have 40 or fewer unique individual numbers left for females in the number range 450–898 (Väestörekisterikeskus, 2017, p. 24). Therefore the lower number range was released to be assigned if a certain birthdate ran out of higher numbers. This solved the problem temporarily. In 2017, as the entire number range was at disposal, every birthdate had at least 90 unused individual numbers left (Väestörekisterikeskus, 2017, p. 24).

However, rising immigration has caused the Swedish *personnummer* to run out of unique numbers for certain birthdates, such as those associated with the statistical spikes mentioned earlier in section 4.1.3. It is worth noting Sweden's population is almost twice the size of Finland's, while the individual number space of the *personnummer* is not considerably larger compared to the henkilötunnus, but a similar issue would arise eventually in Finland as well. As mentioned earlier, the issue has been solved in Sweden by either recycling old numbers from deceased individuals to new holders, or by encoding an adjacent birthdate in the *personnummer* instead of the actual one. While similar solutions could work in Finland's case too, both of them conflict with the basic principles of uniqueness, memorability, and consistent derivation. There are other solutions available for the henkilötunnus though, including some that might have not worked in Sweden's case. These solutions are discussed further below in section 5.2.

Because of this limited supply of unique numbers and insufficient authentication of some foreigners, not every foreigner temporarily living or doing business in Finland gets a henkilötunnus. This causes difficulties identifying individuals who appear in different registers with different registration

numbers. Their lives in Finland would be easier if they too were able to use a henkilötunnus when dealing with public and private sector services (Valtiovarainministeriö, 2017b). There has also been discussion about a possibility to introduce a new national ID number, something that could be issued more universally to anyone needing it.

4.3.3 Openness debate

After its introduction, the henkilötunnus was quickly embraced in different situations ranging from social security to health, military conscription, and taxation. From there its use began to expand to statistics, employment, education, and public transportation, becoming more and more open and widespread in the early 1970s. The information in the various registers was not widely available back in the 1970s, which was used as an argument to defend against criticisms based on information security concerns. On the other hand, due to the very limited access back then, a very limited number of people had exclusive power to abuse the registers, choosing what kind of information gets recorded and how the information is used (Helsingin Sanomat, 1973a). Eventually, though, certain patient information regarding issues such as sterilization, abortion, and dangerous contagious diseases like HIV/AIDS and meningitis were tied to the henkilötunnus, which raised even more worries about the security of patient information (Helsingin Sanomat, 1986). However, these medical registers were and still are very restricted and bound by medical confidentiality rules, and leaking such information would be a criminal offence (Helsingin Sanomat, 1986).

Additionally, with the rapid development of information technology since the early 1970s, there has been concern about the potential of the henkilötunnus as a key to connect information between different registers. Private companies such as banks and insurance companies began to use computer-based customer registers, using the henkilötunnus as an identifier. Several experts, such as Sirkka Uskali, were worried that the laws concerning the usage limits of the henkilötunnus were inadequate and had not kept pace with technological developments (Helsingin Sanomat, 1973a). Responding to these worries, R. J. Lumento (1973) from Kela's IT department pointed out that there were laws to protect the confidentiality of certain sensitive types of information, and those laws also covered the information in the computer registers. He also highlighted that Kela did not and would not sell any confidential data to outsiders. Some argued that the wide use of the henkilötunnus can result in discrimination when applying for jobs or education programs (Helsingin Sanomat, 1973b). People were hoping they could opt out of using the henkilötunnus in some situations. Today, though, the henkilötunnus continues to be used in many information systems even though separate customer numbers would be a more suitable solution in many situations (Väestörekisterikeskus, 2017, p. 4). As a result of the widespread use, people are not generally aware when the henkilötunnus is required to be disclosed, which might lead them to giving it out too easily when asked (Helsingin Sanomat, 1995).

A new personal information register law (1987/471) came into force in 1988 and improved personal information security (Luntiala, 1989). The law forbid most cases of combining registers containing personal information belonging to different registrars, and allowed registered people to forbid registrars from giving out any of their information for marketing purposes. Additionally, the population information law 1993/507 brought more information security measures, such as a way for individuals to forbid VRK from giving their address information to anyone except the authorities.⁶ This, however, did not prevent the sharing of information in other registers such as the business or vehicle registers. Further decisions by the Finnish Supreme Court in the 1990s further limited the use of the henkilötunnus, and it seems that its use is now less open compared to the 1990s (Ojansivu, 1995). These laws and their implementation relieved some worries about the henkilötunnus being used as a connecting key, but they did not offer any protection in the event of a leak of information from a register.

4.3.4 Use in authentication enables identity theft

Even though the henkilötunnus was meant to be an identifier, not an authenticator, it is nonetheless used for authentication in some unofficial situations (Väestörekisterikeskus, 2017, p. 4). Many telephone services still ask for the caller's henkilötunnus or the last four characters of it to authenticate that the caller is who they claim to be. Then it is only a matter of acting convincingly in order to get access to personal medical information, for example. It has been possible, at least in the past, for Finns to authenticate themselves on the phone as the owner of a credit card, simply provided they know the henkilötunnus of the owner and are in possession of the card (Väestörekisterikeskus, 2017, p. 4).

However, the henkilötunnus or its last four digits are weak authenticators due to its widespread use. Even though they are not publicly available, just one glance at an ID document is enough to find one. It is common to see the last four digits of the henkilötunnus used as something akin to a PIN code, for example as a code that must be punched in after swiping a key card (Salste, 2018). The last four digits of a henkilötunnus is a relatively weak PIN code even when the henkilötunnus is not available. A proficient guesser could deduce the last four characters, provided they have some information about the person in question. Knowing the gender cuts the number of possible combinations in half, and knowing the birthdate too limits the number of combinations to 449. Understanding the assignment logic of the three individual numbers limits the possibilities even further. If the check character is somehow known, only several possible combinations are left. Therefore, a random four-digit number is likely a more secure password than the last characters of the henkilötunnus (Salste, 2018).

⁶ 1993/507, 25 §: *"Henkilöllä on sen lisäksi, mitä henkilörekisterilain 23 §:ssä säädetään, oikeus kieltää osoitetietonsa luovuttaminen puhelimitse muuhun kuin viranomaisen käyttöön."*

Conversely, if the last four characters of someone's henkilötunnus are leaked, finding out their complete henkilötunnus is even easier. The check character limits the possible combinations, so that if the age of the person in question can be estimated even within ten years, the possibilities are limited to approximately 120 birthdays. If the birth year is known, only 12 possibilities are left to guess among (Salste, 2018). Birthdays are often quite public information. If the date of birth can be found from Facebook or a newspaper, even without the birth year, guessing is not needed. The missing birth year can be calculated with the existing information. These examples above show that the henkilötunnus is not very effective for authentication (Salste, 2018).

The use of the henkilötunnus in authentication relate closely to the issue of identity theft. Identity theft is a common term used to describe criminal acts where identification data is gathered and abused. Identity theft was classified as a criminal offence in Finland relatively recently, by an amendment to the criminal law (2015/368).⁷ There were other ways to prosecute the abuse of personal information before the identity theft classification was created, but the classification helped in compiling crime statistics. After the law came into force, the police recorded 518 cases of identity theft during the remainder of 2015 and 3.300 cases in 2016 (Tilastokeskus, 2017). According to an Yle (2014) broadcast, the police estimated that identity thefts at varying levels of seriousness occur approximately 10.000 times a year, which seems plausible if several thousand of them reach the police. As there are no subclassifications in the statistics, detailed conclusions cannot be made. Most of these cases are likely related to stolen credit/debit card information, but a significant part presumably relates to abuse of the henkilötunnus (Jauhojärvi, 2016, p. 22).

An identity theft can happen as a result or side effect of a wallet or mail theft. It is sometimes enough to know the name and the henkilötunnus of a person to abuse their identity. The consequences of an identity theft can be far-reaching. Aapo Mentula (2016) wrote a news article about a woman who got her wallet stolen in 2012, and as a consequence became the victim of identity theft only in 2015. The perpetrators accomplished several things with her stolen identity: they changed her address multiple times, bought several new phones and SIM cards along with other devices, marked her as responsible for tax payments on a car, and checked into a hospital under her name which resulted in a child being born "to her" (Mentula, 2016). The case eventually went to court and she was compensated for her losses, and the last four characters of her henkilötunnus were changed (Mentula, 2016). Identity abuse on such a scale is rare, but definitely possible.

It is not always fully understood that the henkilötunnus is juridically public information. It is, for example, included in court rulings. In 2004, the Finnish Supreme Court ruled in the precedent KKO:2004:15 that the henkilötunnus is indeed public and there is no legal obligation to suppress it

⁷ 2015/368, 9 b 5: "Joka erehdyttääkseen kolmatta osapuolta oikeudettomasti käyttää toisen henkilötietoja, tunnistamistietoja tai muuta vastaavaa yksilöivää tietoa ja siten aiheuttaa taloudellista vahinkoa tai vähäistä suurempaa haittaa sille, jota tieto koskee, on tuomittava identiteettivarkaudesta sakkoon."

when rendering a verdict. This issue became a topic of debate after an identity was stolen using the documents of a court case (Jauhojärvi, 2016, p. 2). It is probably fair to say that the general opinion in Finland is that although a henkilötunnus is not considered confidential, withholding it from public view is still preferable, as it can be abused quite easily. The system and processes related to the henkilötunnus are not intended to work in a way that allows identity theft to happen, but its use for authentication makes them possible. Some services are overly dependent on the henkilötunnus, even if they might not need it even as an identifier. And it is hard to find a fast way to eliminate the practice of using the henkilötunnus for remote authentication. It will remain an avenue of abuse until better remote authentication methods, such as mobile authentication or other electronic certificates, are implemented more widely.

5 Reforming the system

The henkilötunnus currently has several design flaws and is misused by some private-sector services, as described in section 4.3. The most pressing matter is that unique codes are slowly but surely running out as discussed in section 4.3.2, and due to this, a legitimate henkilötunnus cannot be issued to all foreigners who might have a need for it. Another flaw has surfaced with the increasing digitalization of society: it is too easy to access information tied to the identity code by using it as a key to combine databases, at least in theory. Additionally, the number plainly shows the birthdate and gender of an individual. This can be seen as a personal privacy issue, especially with the rising attention to transgender issues. The use of the henkilötunnus as an authenticator creates an information security risk and invites abuse of the henkilötunnus. Supplementing the henkilötunnus with biometric identifiers has also been under consideration. For all these reasons, a government work group was assembled to reform the number and the administrative structures around it (Valtiovarainministeriö, 2017a).

The European Union regulation 2016/679 on personal data protection, also known as the General Data Protection Regulation (GDPR), also brought certain new obligations, especially for register administrators. This regulation aims to make the flow of personal information more reliable and secure, and thereby improve trust in online public services (Valtiovarainministeriö, 2017b). The regulation also aims to minimize the gathering of personal information, so that merely the sufficient information for each purpose is gathered. Various operators handling personal information can be subject to sanctions if the data is not handled in a way commensurate with the associated risks (Väestörekisterikeskus, 2017, p. 4). The GDPR does not, however, seek to directly influence national identification numbering systems, and leaves most of the power to define these systems to the member states (Väestörekisterikeskus, 2017, p. 11).

5.1 Reformation project

Finnish and global society has changed in many ways since the introduction of the sosiaaliturvatunnus in 1964. The reformation work group was assembled because the henkilötunnus and the way it is handled do not meet the long-term needs of society. VRK carried out a preliminary study about the current situation of the henkilötunnus and its use, and the work group can now use this study as background material. Work on the reformation project started in September 2017, and a reform proposal is scheduled to be ready by the end of 2019.

A significant part of the reformation project's work responds to the challenges brought by digitalization and globalization. The reformation project's ultimate goal is to propose an improved operating model for personal identification, taking the effects and possibilities of technological and

international progress into account (Valtiovarainministeriö, 2017a). Every individual dealing with public and private services in Finland should have an unambiguous national register identity which is compatible with and supported by official procedures (Väestörekisterikeskus, 2017, p. 10).

More specifically, among the issues under study by the project are:

- Is a new identifier needed, or could the current ones be adapted?
- Issuing an universal identity code to immigrants and visiting foreigners
- Authentication of people when issuing an identity code
- Jurisdiction around issuing of the henkilötunnus
- Biometric supplements to the henkilötunnus
- Neutral form for the henkilötunnus, without birthdate or gender information
- Use of the henkilötunnus as a personal identifier across different systems
- The administrative processes connected to personal information

The reformation project has several subgoals. One of the first things to be decided is whether a new identifier is needed to replace or supplement the henkilötunnus (Väestörekisterikeskus, 2017). The other option is to adapt the current identifiers (the henkilötunnus, the electronic client identifier, and specialized identifiers used by some authorities), eliminating some of their problems and making them work more seamlessly together. If the henkilötunnus stays in use, there are some issues in it to be solved. It has to be reformed in a way that eliminates the problem of exhaustion. The information content of the henkilötunnus is controversial and not necessary for most situations. These are discussed below in section 5.2.

One of the reasons why a whole new identifier has been considered is that registering foreigners in Finland is more complex than registering people born in the country. A greater percentage of the people living in Finland need to have a universal identifying code. But not all foreigners temporarily staying in Finland can currently receive a henkilötunnus, partly in order to prevent exhausting the number space, and partly due to the difficulty of verifying some foreigners' identities. Some foreigners, depending on their needs, are assigned an artificial henkilötunnus, as explained earlier in section 4.1.3. As this is often a temporary solution, some foreigners end up having multiple parallel identities across different registers (Väestörekisterikeskus, 2017, p. 3). For example, the Finnish Immigration Service records all immigrants in its own register and gives them a customer number for identification. However, immigrants cannot use this customer number when dealing with other authorities. A different authority may have to assign an artificial henkilötunnus to an immigrant in order to be able to deal with them and store their data.

Providing a means to prevent identity theft is one of the project goals. One way to prevent identity theft is to improve information security, and decentralizing personal information could improve security. Decentralization is discussed below in section 5.3. If well executed, it would reduce the

need to save the same pieces of information in multiple registers, strengthening the government principle “information is asked for only once” (Valtiovarainministeriö, 2016).⁸ Additionally, the project aims to promote personal identification and authentication practices which protect information, as well as provide people with better abilities to control and take advantage of their own registered personal information. Under consideration has been some kind of notification and blacklist system to limit the harm done by identity theft (Väestörekisterikeskus, 2017, p. 10).

At the time of writing, the reformation project is still in an early study phase which will end with a progress report at the end of July 2018. This early phase focuses on mapping different possible ways of reaching the main project goals, as well as surveying the viewpoints and opinions of different stakeholders. No decisions or even direct proposals have been made yet, and the first public seminar of the project was about listening to different viewpoints with an open mind.

The seminar was held on 23 March 2018 and was open to anyone who registered in advance. The author took part in it to learn about the current status of the project and the different viewpoints being considered. The speakers at the seminar represented different government entities such as the Ministry of Finance, VRK, Local Register Offices, the Tax Administration and the Immigration Service. An even wider array of representatives from different companies and authorities attended as guests. The presentations covered the current status of the project, its focus points and objectives, and the processes and current issues of the different stakeholders and how they relate to the reform.

After the presentations, four workshops facilitated discussion on several pre-selected themes. The author took part in the workshop related to prospects for the future. An interesting thought that came up in the workshop was whether the reformation is actually necessary right now. Would it be beneficial to wait before rushing into changes? The general consensus seemed to be that if the henkilötunnus remains to be used the same way, exhaustion of unique numbers is not an immediate issue. However, as the henkilötunnus should be issued more efficiently to anyone needing it, the exhaustion issue becomes more immediate. Biometrics was also a popular theme in the workshop. It was noted that biometrics could work well as an authenticator under limited circumstances but not as a sole identifier. The use of biometrics in the future is discussed further in section 5.4.

5.2 Reforming the form of the henkilötunnus

If it is decided that the henkilötunnus should be kept as the primary national identification number, it needs to be reformed. This is essential to ensure that unique numbers will not be exhausted in the foreseeable future, but also the confusing century and check characters along with the privacy issue concerning gender encoding are worth looking into. Removing the gender encoding seems quite

⁸ *Periaate että tietoa kysytään vain kerran, osa hallituksen “Digitalisoidaan julkiset palvelut” -hanketta* (Valtiovarainministeriö, 2018).

straightforward and should not raise any significant issues. The birthdate in the henkilötunnus has been found useful and practical in some health-related situations according to a speaker in the reformation project seminar, meaning that if birthdate information is removed, the processes around the henkilötunnus would need to be modified to accommodate that. Removing the birthdate would make the henkilötunnus much less memorable, but it can be argued that memorability would not be an issue if the henkilötunnus transitions into something akin to the electronic client identifier mentioned in section 4.2.4; an identifier used purely digitally through a certificate. It should be remembered that while it would be desirable to solve all these issues, the government wants to find a reformation solution that is as simple and inexpensive as possible (Valtionvarainministeriö, 2017, p. 10).

There are multiple different ways the henkilötunnus could be reformed. The technically least complicated and thus cheapest options would involve preserving the visual form of the henkilötunnus, which would also allow keeping old codes unchanged. Only the underlying logic and encoding of information would change. There are some solutions which would keep the form visually similar and 11 characters long. Tuomas Salste (2018) listed some in his article, and these seem the most plausible to implement:

- A.** Release individual numbers 000, 001, and 900 through 999 into public use. This might cause existing artificial codes to be confused with new codes, and it would only be a temporary solution to the problem of exhaustion (Salste, 2018).
- B.** Issue the same codes to people born in different centuries, as the century character would still separate the individuals (Salste, 2018). As explained earlier, the check character would not detect an erroneous century character. The exhaustion issue would likely be solved, depending on how many foreigners would need the henkilötunnus.
- C.** Abandon the check character altogether and extend the individual number to four digits instead. Denmark has opted for this solution, but it would mean that errors would not be detected as easily and increases the risk of personal information being registered to the wrong individual (Salste, 2018).
- D.** Reform the century character and include it in the check character calculation. This would mean that two different check calculation methods would be used: the old one for any henkilötunnus issued before the change, and the new one for those issued after the change (Salste, 2018). New century characters would be needed to avoid changing existing codes, so it might be wise to start using century numbers instead.
- E.** Allow letters in the individual number, which would now become a set of “individual characters” to increase capacity (Salste, 2018). The check calculation and the Population Information System itself would need significant changes as well, and would likely cause

more mistakes as some letters are easy to confuse with each other.

- F.** Add 20 to the month number, making January 21, February 22, and so on. This would double the available individual numbers for each birth date, and could be extended further by adding 40, 60, and 80 to the month as well (Salste, 2018). This would affect memorability only slightly.
- G.** Remove meaningful numbers from the henkilötunnus. Gender encoding already seems likely to be removed, but it does not significantly ease the exhaustion issue. Removing the birthdate would turn the henkilötunnus into more of a serial code, which would eliminate the exhaustion issue. Remembering the henkilötunnus would, however, become more difficult as a result.

Some of these solutions are not mutually exclusive. All of them have some drawbacks, some more significant than others. However, introducing an entirely new identifier to replace the henkilötunnus would likely end up being very costly compared to merely modifying how new codes are issued. Solution G ensures that even if all the other aforementioned options are deemed insufficient, a complete replacement for the henkilötunnus will not really be needed to solve the problem of exhaustion. In this case, the henkilötunnus would end up resembling the electronic client identifier. This would raise a new question though: why have a two similar, but separate identifiers for physical and digital use, especially when the electronic identifier is shorter and therefore slightly easier to remember?

5.3 Decentralization and information credibility

One much talked about trend in technology is decentralization, which specifically relates to digital data. Often decentralization is associated with blockchain technology, but one does not necessarily need a blockchain for it. The reformation project has considered implementing a more decentralized system for personal information. As of now, a large part of the most commonly used personal information of people residing in Finland is centralized in VRK's Population Information System. Operationally this could, for example, mean that personal information of an individual is scattered in different registers, depending on who asked for the information first. The henkilötunnus combined with strong authentication (certificates or biometrics) would allow connecting information in different registers. The main benefit of decentralizing this information is the improved information security it brings. It would allow administering the henkilötunnus separately from the personal information. However, to make decentralization useful and reliable, the Population Information System needs a technical reform, especially regarding the credibility of information.

Currently all the information registered into the central system is regarded as fully credible. This is a problem, as information that is not absolutely credible will not be registered at all, and issuing a

henkilötunnus requires a certain minimum amount of authenticated personal information. It has been suggested that introducing a more dynamic scale of credibility could solve this problem, and would certainly be needed when different types of personal data is decentralized in different registers. This kind of system could also solve some of the problems with registering foreigners, as all immigrants could instantly be given an universal identity code, and any of their unauthenticated personal information could be classified as less than credible. An example of a dynamic credibility system is displayed below in figure 5.1.

PERSONAL INFORMATION

1. PERSON

2. RELATIONS

3. PLACE OF BIRTH

4. CONTACT

5. HISTORICAL

6. DISCLOSURE

COLOR LEGEND

Verified

Supported

Declared

Your information recorded in various authoritative registers: 18.05.2018 at 19:26

1. PERSON

Last name	<input type="text" value="Sangala"/>	8		
Given name(s)	<input type="text" value="Mike"/>	8		
Alias	<input type="text"/>			
Henkilötunnus	<input type="text" value="050691-782T"/>	1		
Electronic client identifier	<input type="text" value="72391125N"/>	1		
Nationality	<input type="text" value="Malawi"/>	3	Immigration Service	VERIFIED ID
Native language	<input type="text" value="Nyanja"/>	5	Tax Administration	VERIFIED ID
Marital status	<input type="text" value="married"/>	5	Kela	SELF-DECLARED
Profession	<input type="text" value="engineer"/>	1		

2. RELATIONS

Parent 1:	Name	Date of birth		
	<input type="text" value="Kachikho, Mesi"/>	<input type="text" value="27/11/1970"/>	1	
Parent 2:	Name	Date of birth		
	<input type="text" value="Sangala, Dulani"/>	<input type="text" value="01/01/1966"/>	1	
Partner:	Name	Date of birth		
	<input type="text" value="Aaltonen, Laura"/>	<input type="text" value="12/12/1994"/>	7	

3. PLACE OF BIRTH

Municipality of birth	<input type="text" value="Lilongwe"/>	3		
Country of birth	<input type="text" value="Malawi"/>	9		
Foreign place of birth	<input type="text" value="Lilongwe, Malawi"/>	3		

4. CONTACT

Home municipality in Finland:	Name	Date of move-in		
	<input type="text" value="Helsinki"/>	<input type="text" value="29/10/2002"/>	4	
Home municipality:	Name	Date of move-in		
	<input type="text" value="Foreign"/>	<input type="text" value="11/01/2018"/>	1	
Current address:	Street	Place		
	<input type="text" value="Trondheimsvegen 32"/>	<input type="text" value="2853 Oppdal, Norway"/>	1	

Figure 5.1: An example of how dynamic scale of credibility could be implemented, from the perspective of a resident checking their own information. The individual described in the figure is not a real person.

The figure above displays the author’s design of a webpage where a citizen or resident can check

their own saved personal information and inform about changes. It is only an early wireframe design, which explains some of the information architecture of a decentralized system with dynamic scale of credibility. This design is partially based on a service offered by VRK, where people can check their information saved in the Population Information System. In the design in figure 5.1, personal data is divided into categories. Some of the information is modifiable through this service, while some can only be changed via other channels. All pieces of data include information about the credibility of each piece. In this example, the same information is saved in several different registers, and the number next to each piece of data tells how many registers have this information. Clicking the number shows which registers have the data and how the information was verified in each case.

5.4 Supplementing with biometrics

Biometrics has become a bit of a buzzword in the field of individual identification and authentication. A part of it has to do with the widespread emergence of consumer devices capable of biometric authentication, most noticeably smartphones with fingerprint or face scanners. Biometric data has proven to be a sufficiently efficient method of authentication, and more reliable than photos. As a result, some have speculated whether identification numbering systems could be supplemented with or even replaced by biometrics. However, biometrics are more suitable for authentication, and allowing a biometric identifier to replace a numbering system is problematic. One of the goals of the Finnish reformation project is to consider whether some type of biometric data could be included in the Population Information System. Bringing biometrics into wider use raises questions about who would have access to this data and in which situations. Information security requirements would have to become stricter (Väestörekisterikeskus, 2017, pp. 10).

In the past, biometric data such as fingerprints and DNA samples has for the most part been found in criminal databases. In the 20th century, most nations adopted the practice of fingerprinting all arrestees (Cole, 2013, p. 82). This practice resulted in a two-tier system where one group of individuals (criminals) had their data permanently saved while others (those with a clean record) did not appear in the register (Cole, 2013, p. 83). The situation has changed during the last couple of decades, as more people such as travelers and immigrants have been included in various biometric databases.

The issue of multiple parallel identities among certain groups of foreigners in Finland has been tackled partly with the use of biometrics. Since the beginning of 2012, the Immigration Service has recorded the fingerprints of all residence permit applicants and asylum seekers (Maahanmuuttovirasto, 2011). The fingerprints are included in the information stored on the chips in Finnish residence permits and they are recorded in the foreigner register (Maahanmuuttovirasto, 2011). In addition, European Council regulation 2004/2252 had already ruled that all official travel documents issued by EU member states are required to have an integrated storage medium with a

facial image and the fingerprints of the document holder saved on it. Finland adopted biometric passports in 2006, with a RFID chip for digital facial images, and added fingerprints to them starting in 2009 (Ulkoministeriö, 2009). These biomarkers were recorded in the passport register but are mainly used for authentication of the travel documents themselves, as well as their owners (Kansan Uutiset, 2014). The police do not have access to them for criminal investigations (Kansan Uutiset, 2014). This is the official situation with biometrics in Finland currently.

Identification and identity are separate notions but in most cases connected on some level. Identification can uncover different parts and amounts of an identity, depending on the identification method and tool used. A neutral identifier in itself does not reveal any additional information about the person. The current henkilötunnus is not a completely neutral identifier, as it reveals the birthdate and gender of its holder. Most biomarkers are not neutral either, and therefore not suitable as identifiers (Cole, 2013, p. 81). Biometric data is an unnecessarily complex and impractical way to identify individuals in most common interactions. However it does show promise in situations where people need to both identify and authenticate themselves in an impersonal interaction, such as gaining access to a building or a computer. It is also useful in cases where people are not able to state their identity in any way, such as some foreigners or patients without identification documents. The proper role of biometric data in society is a fascinating and important question but somewhat beyond the scope of this thesis. Biometric identifiers are unlikely to make the use of name-like alphanumeric identifiers obsolete.

Instead of identification, biometric data could be used as an authenticator. It could be especially useful as a remote authentication method, alleviating the issue discussed in section 4.3.4. A major factor making authentication with biometric data efficient is that it can be automated. Airports have already embraced this after the adoption of biometric passports. Before any widespread implementation of biometrics, the most difficult questions to be answered relate to data protection and privacy. Countrywide implementation is not going to be cheap, as it needs to be done right, but its long-term benefits might surpass its risks. The Finnish legislation would also need some changes to accommodate it.

6 Conclusion

In his book *Suspect Identities*, Simon Cole (2001, pp. 8–9) reminds us that changes in society have historically brought new personal and criminal identification needs. In pre-industrial societies many people spent their lives in the village where they were born or its vicinity, amidst a network of personal acquaintances. As everyone knew each other or at least someone who knew someone, there was generally no need to verify identities in any other way. Then cities grew, and networks of acquaintances grew until they were no longer an effective or reliable means of identification (Cole, 2001, p. 9). While urbanization took place slowly in Finland, it eventually did shape the country's need for population registration and identification.

Today, Finland has had a stable and effective Population Information System for several decades, but once again changes in society have created a need for changes in identification practices. Digitalization, immigration, European Union membership, and the rise of completely anonymous interactions over the Internet mean that issues of privacy, control over one's identity, speedy electronic authentication, and ways of ensuring the credibility of personal data have become more important than they were fifty years ago when the henkilötunnus was introduced. Societal attitudes towards gender classification have also changed. Awareness of these new issues coincides with a recognition that the number space of the henkilötunnus will eventually become exhausted if nothing is done, and that the widespread, if officially unsanctioned use of the henkilötunnus is problematic. All these issues pose challenges for the work of the current reform process. It should become clear in the next year or two how Finnish society will respond.

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