



# Bank of Finland Data Balance Sheet 2023

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# Becoming top experts in data and data analytics through long-term development work

## Kimmo Virolainen

Acting Member of the Board, until 30 January 2024

Changes in our operating environment in recent years have highlighted the importance of crisis management capabilities, and they have compelled us, like all other organisations, to invest more in preparedness and safeguarding critical functions. Alongside this ‘fire department work’, it is also important to take forward longer-term development projects to create the conditions for us to continue to perform our tasks reliably and to a high standard in the future. One important development area is the wider and more efficient utilisation of digital information.

Promoting the data economy is one of the strategic priorities of the Bank of Finland and the Financial Supervisory Authority (FIN-FSA). According to Sitra’s dictionary, the data economy refers to that area of the economy where the collection and use of data are a key part of activities. Today, the data economy may also be considered to be almost everywhere, as it is difficult to find an area of the economy where digital information is not collected and used. This is also true in the public sector, even though the information is not generally used for commercial purposes.

The closer integration of the Bank of Finland and the FIN-FSA into the world of the data economy enables new ways of collecting, analysing and sharing data both within the organisation and as part of wider cooperation between authorities and the central bank. Our goal is ambitious – we want to be a frontrunner in data and data analytics. There are no shortcuts to achieving this goal. It requires continuous development, both as an organisation and as

individuals, and above all cooperation and open dialogue between different functions. We already have excellent examples of cooperation in data across unit boundaries.

We have not had to build the conditions for the data economy from scratch. The groundwork has been under way in several departments for a long time now. Our ICT and Information Management Department has done valuable work in initiating the construction of the cloud capabilities we need to take advantage of the technology opportunities of the future. The Development Programme for Data and Analytics has done pioneering work on the themes of this field, and a number of practical solutions and philosophies have emerged from its work. The Analytics Center of Excellence (ACE), established in early 2023, has set an example for the voluntary implementation of a cross-organisational collaboration network; it is founded on a shared enthusiasm and passion for new technology. The first version of the organisation-wide data catalogue has been published, and at the end of the year the Board confirmed the long-prepared information strategy and related governance framework. These create an excellent foundation on which to set new goals.

An important prerequisite for the successful utilisation of the data economy is also the development of everyone’s own expertise. New technology requires new skills. Increasingly extensive and new types of data require new types of methodological capabilities. The use of artificial intelligence



“ **Our goal is ambitious – we want to be a frontrunner in data and data analytics.** ”

will bring new competence requirements to nearly all of our work tasks. The Bank of Finland and the FIN-FSA provide their staff with excellent opportunities to develop their professional expertise. 2024 is the perfect time for everyone to start future-proofing their skills.

The project to promote the data economy will be a long-term effort and this will be reflected in the operational planning of the various departments in the coming years. The next step is to define concrete measures, and this work is already well under way. When new technology is adopted, the most significant productivity gains are achieved when the technology is not only used to do the same things in the same way more efficiently, but when it is used to do the same things in a completely new way and even to do completely new things. That’s a challenge for us, too, in the coming years!

# Data, datasets and data analytics – the cornerstone of the Fourth Industrial Revolution

## Katja Taipalus

Head of Department, Financial Stability and Statistics

The Fourth Industrial Revolution, namely the huge transformation under way through digitalisation and technology, is profoundly changing the operating environment. In this new environment, there is a strong emphasis on the importance of datasets, data and their use. According to the research company IDC, the creation of data worldwide is accelerating exponentially and will nearly triple by 2027. The World Economic Forum has also estimated that in the labour market of the future, jobs associated with datasets, data analytics and data skills will attain critical status. The availability, ownership and use of datasets will redistribute power relations.

As the number of datasets grows and enables increasingly accurate research and analysis, the complexity of data use and analysis will increase along with the volume of data. A critical success factor will be digital agility – the ability to process and use datasets in order to refine them quickly into value-added information. This will require a completely new kind of competence in data processing and analysis.

” **As the number and structures of data sources increase, it is important to understand better what the datasets tell us and what they do not. It is equally important to identify low-quality and even misleading material.**

The economy and financial markets are pervaded by a network of multiple interactions, characterised by multidimensional and complex interdependent and interactive relationships, and further complicated by the rapid digitalisation of industries. Understanding how such a world functions not only requires comprehensive and diverse datasets, but also the ability to share and combine data. As the volume of data grows, the importance of good data management increases. The rules of data use and the ethics of its use should also be clarified. It is vital to maintain data literacy and high quality data; this will be increasingly challenging, however, as more and larger datasets are used, and the data structures within them become more complex. As the number and structures of data sources increase, it is important to understand better what the datasets tell us and what they do not. It is equally important to identify low-quality and even misleading material. And, in addition to all of the above, the infrastructure supporting the development and use of technology must evolve, not only to create opportunities to promote the development and use of data and analytics, but also to ensure the scalability of these digital functions and operating practices throughout organisations. This is not an easy task.

Central banks and supervisors must keep pace with this development. A joint strategic priority of the Bank of Finland and the Financial Supervisory Authority (FIN-FSA) over the next three years is seizing the opportunities of the data economy, with the aim of ensuring that we have comprehensive access to a wide range of datasets as well as safeguarding their accessibility, usability and efficient management. Our own extensive data resources must be harnessed more efficiently, with the goal of increasing their external use. To increase internal usability, a dedicated data strategy will be applied



to data management, ensuring that the datasets required to perform tasks are easily accessible to everyone. The data strategy and common operating practices will create conditions for more effective cooperation.

The data economy project will increase our capacity, capabilities and expertise to apply modern data analytics to data and datasets and to responsively create solutions applicable to different purposes. To promote these, the expertise and capabilities of our personnel are being purposefully developed to support data work. New technology development projects are promoted together – the Bank of Finland and the FIN-FSA have successfully established an Analytics Center of Excellence (ACE), within whose framework new methodological solutions are jointly developed and best methods and practices already learned are actively shared. Communication plays an important role in increasing awareness of the various projects, as does the organisational culture, which should encourage not only active participation, but also transparency and business-driven joint development. A framework for implementing ideas must also be established and maintained. The development of modern methods of data analytics and the sharing of lessons learned will ensure that the organisation develops sufficiently to respond to the pressures for change exerted by the operating environment.

# To the cloud, to the cloud... and artificial intelligence

## Petteri Vuolasto

Head of Department, ICT and Information Management

A cloud migration goal for 2024–2026 was included in ICT and Information Management’s action plan:

“The Bank of Finland and the Financial Supervisory Authority have access to reliable, modern, cost-effective, secure and ecological **cloud and data centre services** that meet the needs of IT service users, *enabling top-rank expert work* and effectiveness in line with the goals of the strategy of the Bank of Finland and the Financial Supervisory Authority, taking into account the possibility of emergency conditions.”

Many people rubbed their eyes on seeing our goal, but after discussions there was not much left to ask. Large IT vendors focus on developing software, systems and services primarily in the cloud environment, in which case the need for in-house data centre solutions arises at some point – or not at all. New features may not even be available for money. This is even more the case for data analytics and artificial intelligence solutions.

Artificial intelligence (AI) made a breakthrough in early 2023 thanks to ChatGPT. When the stage is reached that truck drivers on their lunch break are talking about ChatGPT, generative AI has really taken off and reached the whole nation. The pace of development is currently very fast and the race between the big IT houses will only accelerate. Hopefully, ordinary consumers will also benefit from this and gain access to affordable services that make their everyday lives easier.

” **When the stage is reached that truck drivers on their lunch break are talking about ChatGPT, generative AI has really taken off and reached the whole nation.**

As the central bank and supervisor, we can use AI in a wide range of tasks. This has also been of concern to workers: Will my job disappear when the machine does it for me? This will not happen; AI will become the servant, not the master. This is the view of the research company Gartner, among others. People’s roles will change in a more interesting direction.

If I may return to cloud services, data processing and analysis will largely take place in various cloud services. Whether the data is structured or not, the best and most cost-effective services are cloud-based. Cloud services have their own challenges, however, both in terms of information security and data protection, and these must be addressed before cloud services can be fully exploited. Solutions to these challenges already exist, and in most cases the decision to use cloud services is based on the company’s risk assessment and the mitigation and acceptance of residual risks.



Cloud services can also be used to safeguard operational continuity. In spring 2022, Ukraine moved its systems to the cloud very quickly with the assistance of large IT suppliers. The cloud migration project of the Bank of Finland’s ICT and Information Management department also includes a contingency aspect. It is clear that certain critical systems will remain in the Bank’s own data centres for quite some time, even if basic systems migrate to cloud solutions. Could one think of cloud services and in-house data centre services as back-up systems for each other? If cloud services are not in place, is it possible for the systems migrated to the cloud to operate from the in-house data centre? And if the in-house data centre is not available for one reason or another, can even critical systems be run from the cloud service?

Cloud computing and artificial intelligence are not new. They have, however, taken a huge leap forward, and that means data analysis and processing now and in the future will be done with the aid of AI in cloud services.



Photo: Jaakko Lukumaa

## Production and utilisation of data

# High-quality knowledge management supports strategic foresight



**Jarno Talvitie**  
Senior Adviser,  
until 18 December 2023

The future is not predictable, nor is it predetermined. Since the future has not happened, there is no factual information about it, as there is about current phenomena or history. Through futures research and foresight methods, however, we can describe, explain and understand wide-ranging social phenomena and related change and development processes.

Strategic foresight is about examining possible future prospects and associated opportunities and challenges. Foresight helps one to act in the present so that future development is shaped in a more favourable direction. Various crises may flare up quickly, and it is not always possible to anticipate them precisely. In these situations, crisis resilience is strengthened by more general business continuity principles, operating models and procedures.

## The Bank of Finland builds a sustainable economy and stability

The Bank of Finland acts in the roles of both the national central bank and a member of the Eurosystem. Our primary mission is to maintain price stability. We are also tasked with promoting the stability of the financial system, ensuring the efficiency and security of the payment system, and supporting sustainable growth and high employment in Finland and the EU.

Central banking policy builds the future. To carry out its tasks, the Bank of Finland collects, analyses, interprets and publishes information on the economy, the financial system and payments. Our expertise is also used to support our stakeholders in their own decision-making. It is therefore important that we base our positions and decisions on reliable knowledge, research and high-quality analysis.

## Strategic foresight and performance measurement identify what is essential

For the Bank of Finland to succeed in its tasks, it needs to continuously take stock of the domestic and international environment. A huge number of different indicators are used in monitoring. An accurate understanding of the dynamics of change enables the identification of appropriate policy actions. On the basis of knowledge, discussion and carefully considered conclusions, the senior management of the Bank selects policy actions that are balanced in their impact and focused on what is essential.

The Bank of Finland also assesses its own operations and success using suitable indicators. The Bank publishes indicator targets and their achievement in its Annual Report. The Bank prepares for changes, disruptions and crisis situations by developing its own operations. This is important from the perspective of national security of supply, as



Photo: Jaakko Lukumaa

the Bank of Finland plays a key role in the Finnish financial market infrastructure and the organisation of the cash supply. In its role as an employer, the Bank of Finland anticipates and leads change by developing expertise, tools and working methods. In addition, there is, for example, a carefully prepared risk management framework for managing financial assets.

Knowledge, expert understanding and constructive cooperation result in the insights and measures by which the Bank of Finland shapes the future for the benefit of citizens. High-quality knowledge management and knowledge-based leadership focus the organisation's attention and actions on the right things.

# BOFIT Weekly Review responds to changing information needs



**Heli Simola**  
Senior Economist

One of the key publications of the Bank of Finland Institute for Emerging Economies (BOFIT) is the BOFIT Weekly Review. As its name suggests, it is published weekly on the BOFIT website in Finnish and English. The Weekly Review includes a general economic overview of Russia and China once a month, while the other issues examine, in a concise format, current issues concerning Russia, China and emerging economies.

## The Weekly Review has long traditions

The BOFIT Weekly Review has been published for over 30 years: the first issues in the Bank of Finland's publication archive date from late 1991, under the name Eastern Economies Weekly (Idäntalouksien viikko). After the dissolution of the Soviet Union, there was a lot of uncertainty about the situation in the region and a great need for information, which was only available from a few sources and often only in Russian. The Bank of Finland had long had an Eastern Trade department, which specialised in the region. This expertise also began to be utilised in the form of a regular publication.

After the Baltic countries joined the European Union in 2004, BOFIT stopped monitoring these economies. China, which had rapidly increased its role in the global economy, became BOFIT's second main monitoring target alongside Russia. At the same time, the Weekly Review also shifted its focus mainly to events related to the Russian and Chinese economies.

## The Weekly Review lives on information needs

Now, perhaps more than ever, information is needed on the development of the Russian and Chinese economies. Russia's brutal war of aggression in Ukraine has been going on for two years. The impact of the war and sanctions on the Russian economy as well as Russia's

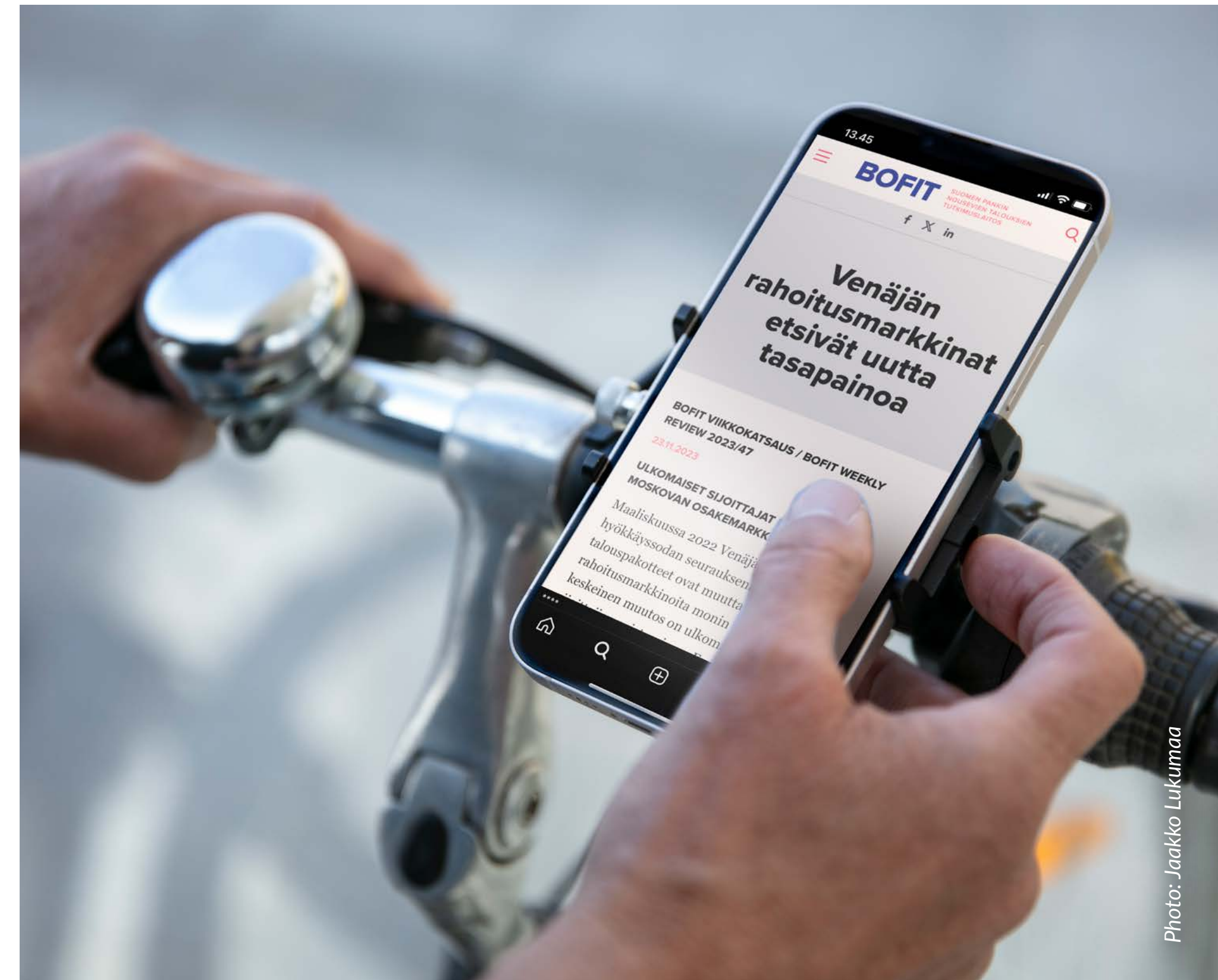
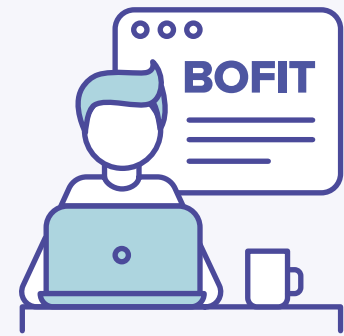


Photo: Jaakko Lukumaa







Up to the end of 2023,

**1,663**

issues of the BOFIT  
Weekly Review (and its  
predecessor Eastern  
Economies Weekly) had  
been published.

economic capacity to continue the war are being closely monitored. China, on the other hand, has become one of the world's largest economies, so fluctuations in its economy and economic policies have a global impact.

The nature of information needs, however, has changed considerably over recent decades. Today, a wide variety of statistical information from both Russia and China is widely available from public sources and also in English. Events concerning the Russian and Chinese economies are widely reported in the Finnish and international media. The social media are also buzzing with headlines related to Russia and China.

Nowadays, the most difficult element in monitoring the economic development of Russia and China is to form as realistic an overall picture as possible and to identify the most important economic phenomena amidst a huge, often fragmented, deluge of information and disinformation. That's why the Weekly Review now focuses on one or two topics, which are covered in more detail. Among the topics selected are current economic events and key questions related to longer-term economic development and economic structures.

In recent decades, the interdependence of different economies has increased considerably. Disruptions to one economy can spread very quickly and widely through international financial markets and production chains. Examining the economies of Russia and China in a broader context has also become more important. The Weekly Review has therefore occasionally started to cover economic developments in other countries as well as the development of the global economy and world trade.

### Many sources and experts are needed in preparing the Weekly Review

The articles in the Weekly Review are compiled from a variety of sources to ensure that the information is as comprehensive and reliable as possible. Background material includes news, press releases and reports published by public authorities, statistical data and various analysis and research publications. The statistical data are mainly derived from national sources, including the statistics institutes and central banks of the target countries. There are deficiencies and uncertainty associated with many statistics, however. Analysis is therefore supplemented whenever possible with other data sources, such as alternative indicators of China's GDP and Russia's foreign trade.

A wide range of experts is needed to produce the Weekly Review. Almost all BOFIT economists contribute to the writing of articles according to their areas of specialisation. The editor-in-chief checks each issue before publication. The publication of the Weekly Review on the website, the sending of the newsletter and social media communications are the responsibility of the BOFIT information specialist. With the assistance of a translator, an English version of the Weekly Review is also produced. Every week, thanks to the cooperation of various experts, a new and concise information package is put together for hundreds of Finnish and foreign readers.

# Visual appearance of statistical data was clarified and content made easier to use



**Harri Kuussaari**  
Head of Division

In spring 2023, the Bank of Finland revamped the statistics section of its website, which contains diverse statistical information on financial markets and payments traffic. The goal of the revamp is to better serve users' needs and facilitate the use of the statistics.

The revamped statistics section has several new features:

- **A filtering tool for browsing tables and charts.** Users can limit the display of tables and charts by selecting more filters, such as subject area, time period or publisher. This allows users to refine their search and find the tables and charts they want more quickly.
- **Dashboards on different subject areas.** Dashboards are extensive datasets, developed with the analysis requirements of each subject area in mind. The loans and deposits dashboard, for example, contains a wide range of data on loans and deposits, collected from credit institutions. Dashboards enable the visualisation and comparison of statistics from different perspectives.
- **Grouping of content by publication type.** Statistical news, tables and charts, dashboards and other information are separated into their own sections to make it easier for users to find the information they need.
- **General statistics information.** The 'Statistics info' section contains up-to-date information on financial statistics, statistical methods and services, facilitating the use of the statistics. The section also contains 'Statistical descriptions and methods', explaining the background, source data and calculation principles.

The Bank of Finland updates its statistical data regularly and by subject area, according to a publication calendar. For example, bank statistics are updated monthly and payments statistics are updated quarterly. Follow the statistics [publication calendar](#), where you can check the publication dates of various statistics.

The Bank of Finland seeks to attend to users' information needs by actively developing statistics and ensuring their up-to-dateness and coverage in a changing operating environment. We are happy to receive feedback and development suggestions by email at [tilastopalaute@bof.fi](mailto:tilastopalaute@bof.fi).

**You are welcome to visit the revamped statistics section on the [Bank of Finland's website!](#)**



Photo: Jaakko Lukumaa

**Did you know that, in the second quarter of 2023, Finnish households owned EUR 28.5 billion worth of listed shares, which was 7.2% less than a year earlier?**

# Data economy dictionary



**Antti Komonen**  
Project Manager

Data and analytics are clearly central to the Bank of Finland's operations. Over time, they have accordingly become an integral part of different functions, which has not facilitated the development of the field of data and analytics. It has been difficult to even identify the field of data and analytics as a separate entity to be developed, and still more difficult to find a common direction for development. In recent years, however, the Bank of Finland has been able to take development forward piece by piece through concrete projects and cooperation groups. In this way, it has already been possible to build, for example, a common system platform for the future and to initiate cross-functional analytics cooperation.

The information strategy approved in 2023 gives direction to the development of information management as a whole and also covers the field of data and analytics. The information strategy now provides an opportunity to begin putting the data and analytics pieces together and start building the necessary collaborative framework around them.

The information strategy is also important for articulating goals in the field of data and analytics and the means to achieve these goals. The goal of promoting the *data economy* is central to the information strategy. The data economy in this case does not refer to the commercialisation of data or the data market economy; it refers more generally to activities that focus on the collection, management and use of data. Promoting the data economy means, particularly in the first phase, the development of the Bank of Finland's internal conditions for the utilisation of data, but in the future also increasingly participating in the national and international data economy.

At the Bank of Finland, one way to improve data utilisation opportunities is to shift to an approach based on *data products*. Key analytics data is provided to users as data products. Here again, the term product does not refer to commerciality, but to the fact that the data and their 'packaging' are designed to meet the needs of data users. In a data product, the data quality, structure, descriptions and all properties are such that the data are ready to be used for the



*Data factory, data product, data shop and data economy are words that have many more meanings than a short article or a dictionary-like definition can reveal.*

purpose required by the user. Built into the data product approach is the idea that the value of data is created when the data are used. The ultimate purpose of data management measures is to make data usable and thereby create value for operations.

The design, production and maintenance of the data product are the responsibility of the *data product owner*. Ownership here means responsibility for the data contained in the data product and its proper management, but at least as important is responsibility for ensuring that the data product meets the needs of its users. At the Bank of Finland, ownership of data products is decentralised to those functions that are closest to the data contained by the data product and thus have the best understanding of the data in question and its potential uses. In such a decentralised structure, good cooperation between data product owners is also required to be able to ensure that the data product range as a whole meets the needs of all users and also allows for the combination of different data products.

The owner of each data product is responsible for the production process of its data product in a *data factory*, which provides a common platform and operating model for all data products. A common platform and operating model help eliminate data silos caused by system boundaries, improve data management and enable cost-effective creation of data products.

A goal for the future is that data products produced in a data factory would be made available to users in a *data shop*. In the Bank of Finland, data shop does not mean that the data products would be sold, but rather that the data products would be available like on the shelves of a shop. In a data shop, it would be easy for users to find data products that meet their needs and to use them.

# Microdata challenges in researchers' analysis work

**Essi Eerola**  
Head of Bank of Finland's  
Domestic Economic Policy Process



The last decade has witnessed an outburst of macroeconomic research using micro (individual- or firm-level) data. This change has been closely related to the growing awareness of and interest in economic heterogeneity, due to its potential impacts on aggregate outcomes. For example, people on low incomes have a higher marginal propensity to consume than those on high incomes and they behave differently on the labour market. Outright homeowners and renters are not subject to the strong leverage mechanism as people with a mortgage. They therefore react differently to economic shocks and, in turn, aggregate economic dynamics depends on these underlying heterogeneities. It is, in fact, impossible to understand these mechanisms without micro data.

Public registries covering the entire population of individuals or businesses are exceptionally developed in the Nordic countries and are increasingly becoming a key source of micro data. Their potential has been recognised among central bank economists, spurring cooperation with world-class scholars and improving policy advice.

Finland has one of the world's best coverages of micro data resources, and their utility has been recognised by economists at the Bank of Finland. For example, data on corporate loans (Luoti/Anacredit) combined with firm-level financial data have been used to study monetary policy transmission and the survival of zombie firms. Finnish Army IQ data combined with survey data on expectations and individual-level register data have been used to study inflation expectations. More broadly, however, the research potential of micro data has been so far underutilised at the Bank of Finland. The latest Research Evaluation Report of the Bank of Finland, from 2022, stresses the need to "capitalise on high-quality registry data".

**Adam Gulan**  
Senior Adviser



Part of this underutilisation has to do with the fact that historically the main data used in research at the Bank have been aggregate economic time series or financial data. As these were largely sufficient for much of monetary policy-related research, the Bank has not accumulated adequate in-house expertise in using micro data. To reap the benefits of these data, a learning-by-doing or learning-by-hiring process is therefore necessary. The second reason for this underutilisation has to do with obstacles to accessing micro data for research purposes. An ongoing administrative effort at the Bank is concentrated on finding the best solutions to widen and facilitate that access. Speed of access is in turn essential if research is to be informative for policymakers in a timely manner in times of large and heterogeneous economic shocks, which the Finnish and global economy have witnessed in recent years. The global financial and European debt crisis, COVID and lockdowns, Russian invasion-related energy crisis and sanctions have all been not only very sudden but also very diverse, playing out very differently in various sectors of the economy. It is impossible to understand their true effects and transmission channels without zooming into highly granular data. All these shocks have also obtrusively shown the need to make monetary and fiscal policy decisions at very short notice in reaction to quickly changing conditions.

Some improvement can be made by taking advantage of new legislation on Statistics Finland. The statistical office now has an explicit mandate to offer access to registry datasets for research purposes. During the COVID pandemic, Statistics Finland developed, in collaboration with VATT and Helsinki GSE, a Situation Room, with the purpose of providing timely analysis to the government. This arrangement granted speedy access to raw registry and other statistical data from Statistics Finland and other authorities, circumventing the standard lengthy procedures of data applications for academics. Thanks to the new law, it is also possible to apply the model at the Bank of Finland.



*Both the non-financial and financial corporate sector collect vast amounts of data on, for example, retail sales and consumption, prices and business-to-business transactions. Tapping into these resources would provide unique new insights into the dynamics of prices and costs in Finland, which is the Bank's core business.*



Photo: Jaakko Lukumaa

Nevertheless, easier access to existing registries does not solve the problem of lack of access to data that is not collected at all or cannot be accessed by law. A case in point is data on household deposits, the lack of which prevents the formation of a good picture of the wealth of Finnish households and its evolution and heterogeneity. More generally, both the non-financial and financial corporate sector collect vast amounts of data on, for example, retail sales and consumption, prices and business-to-business transactions. Tapping into these resources would provide unique new insights into the dynamics of prices and costs in Finland, which is the Bank's core business.

It is, moreover, also necessary to match the globally rising quality level of economic analysis. For example, Norges Bank has developed a broad research agenda using data on personal wealth. The bank has a right to access and store all Norwegian registries as well as to request data

from private businesses for analysis purposes. In Denmark, access to micro data is channelled via Statistics Denmark and facilitated by data-exchange agreements with the central bank. Overall access to register data in these countries is significantly broader than in Finland, yet in line with GDPR requirements. Monetary policy-related research, for example, has been done using full transactions and account records of Danske Bank customers, which covers a third of the country's population. These examples illustrate that access to data that are globally scarce has the largest potential of attracting the brightest minds. Improving that access would not only allow world-class research to be based on Finnish data but would also provide more accurate and timely recommendations for domestic economic policy needs as well as high quality monetary policy-relevant economic evidence from a euro area member state.

# Analytics Center of Excellence promotes data science capabilities



**Ville Voutilainen**  
Senior Data Science Economist

Transforming datasets into information is one of the specialities of the Bank of Finland and the Financial Supervisory Authority (FIN-FSA). The joint organisation collects and processes huge amounts of data, produces a significant amount of financial analysis and communicates the results of analyses to the general public – routinely, through years of experience.

The world is changing fast, however. Datasets are growing ever larger and more complex, and modern analytical tools for analysing them are developing at an astonishing pace. The organisation must keep up with development, because the need for increasingly detailed information about the economy and its actors is only increasing.

## Responding to growing skills requirements

The cross-organisational *Analytics Center of Excellence (ACE)* was established this year by the Bank of Finland and the FIN-FSA. ACE supports better utilisation of data science, offers peer support and disseminates methodological innovations. ACE is also responsible for the organisation's data science culture and its evolution.

The key to successful data-driven operations is the seamless interplay of business and IT skills. The core idea of ACE is to act as the glue between business and IT. ACE is uniquely placed to make this happen: it is organised as a horizontal group of experts, bringing together data-driven elements at an organisational level from the different functions of the central bank and the supervisor.

## Active communication the key to success

It is important to make people aware of the organisation's wide range of knowledge and the spearhead work that it generates. For this reason, communication plays a particularly important role in ACE's work. Within the organisation, ACE organises presentations and workshops focused on data science. In addition, it offers a 'citizens' square' of data science culture, for example in the form of a Teams channel covering more than 150 members. Externally, ACE appears on the Medium.com platform via the [SPxFiva Data Science blog](#), which publishes articles focused on data science and innovation. ACE also participates in the work of public and private data science networks.

## The data economy is coming – ACE is ready

A joint strategic focus of the Bank of Finland and the FIN-FSA over the next three years is to extensively promote the data economy. The promotion of new technological and operational development projects that are important for the data economy can only succeed through diverse cooperation. ACE will play an important role in facilitating this cooperation.



# Power BI reform of Register of Insurance Intermediaries



**Simo Rininen**  
IT Expert

In relation to the Register of Insurance Intermediaries, the Financial Supervisory Authority (FIN-FSA) ordered from the Bank of Finland's ICT and Information Management department a Power BI implementation to replace the outdated website-based checking of register data. Microsoft Power BI is, alongside Tableau, a widely used BI (business intelligence) visualisation software tool for presenting data at the Bank of Finland and the FIN-FSA.

## The goal: a high-quality data display

Well-organised internal reporting makes data sources more usable and ensures, to some extent, their wider understanding. A Power BI workbook for reporting may contain infor-

mation about the main data sources, the ways to process them, details of the data content, and displays that enable the rapid checking of data quality. In a well-designed implementation, the technical expertise for creating workbooks is also transferred to the user, thereby simultaneously taking a step towards the enduring favourite *self-service BI*.

Zhamak Dehghani's *Data Mesh* (2022) has sparked discussion. Data mesh is a sociotechnical system, one part of which is the data product concept. Data products are made to promote the use of data within an organisation. A Power BI report is delimited in a different way than the data products referred to by Dehghani, but they can be compared with each other. A workbook can be shared between teams and can be modified for different uses.



## Using AI in implementing reporting

At the time of writing, Microsoft is adding to its products Copilot features, including the Power BI Copilot AI assistant. It was not available for the project, but there have been regular discussions with ChatGPT. The way of working has been referred to as pair working, although if the interaction is rather straightforward, such as question-response-further question-response, it is perhaps rather an AI extension of expertise (or the expert!). The new way of working makes developing reports more fun, easier and faster. At best, the experience is simply astonishing, and at worst, one only loses the time spent writing the prompt and testing the idea, for example in the case of hallucinated responses. After a possible setback, one can proceed with a new, more precise prompt with better keywords or with answers obtained from a traditional search engine.

Title	Data_1	Data_2	...	Data_n
Title_1				
Title_2				
:				
Title_m				

*Desired data table presentation. Rows and columns can be filtered using selectors.*

## Stage 1 – API

The implemented reporting reform was divided, in practice, into two parts. Data provisioning and searching were arranged to be callable via an internal HTTP interface (API<sup>1</sup>), after which the interface data were compiled into a Power BI workbook and published to the Power BI Report Server.

The API follows the Bank's typical development practices and is based on C# code. The data are read from the storage location used by the register and provided according to the REST architecture. When the data are available from the interface and the endpoints are ready for DevOps release, it is possible to experiment with API data authorisation, use and usage monitoring.



In addition to a list of API endpoints, nested data structure definitions for API feedback are provided to assist data users. They could, in principle, be programmatically editable into, for example, Python classes and interface-callable functions, although this is not usually done; the data process of products is built stage by stage, typically with the goal being a relational data model suitable for the purpose. In the case of Power BI, the data are edited using Power Query, which is supported by the software.

## Stage 2 – Power BI

The implementation of the second-stage Power BI workbook is not particularly laborious on a project scale, but a clear end result requires thought. Data loading and presentation in Power BI included a raw data source containing data in JSON format, business concept-specific tables derived from this, definition tables explaining some ID values, reportable data in table format, separate filtering tables for those cases where the filtering values are obtained from within a list format, and in the final report table in long EAV format. The latter mode of presentation was needed so that the columns of the matrix displaying the data in the report could be selected by clicking on the filter displaying their list. On the other hand, data tabular representation was utilised in row filtering.

The completed workbook was published on an official report server located in the Bank's own data centre, where it will be available to experts after the report-related access authorisation process. The end result is a concise presentation of the information contained in the Register of Insurance Intermediaries. Compared with the previous webpage, it is easily customisable, while the API also allows for other uses.

<sup>1</sup> API example, the Bank of Finland's open data ExchangeRate endpoint: <https://api.boffaopendata.fi/referencerates/api/ExchangeRate>



# New perspectives on former Finnish President Mauno Koivisto

**Vappu Ikonen**  
Historian



The Bank of Finland archive has served many historians over the decades. Currently, the archive has the pleasure of serving Professor **Tapio Bergholm**, who is preparing a multi-volume biography of former Finnish President Mauno Koivisto. In a couple of years' time, a third volume will be published, covering Koivisto's activities as Governor of the Bank of Finland.

"The Bank of Finland archive material helps clarify the picture of Mauno Koivisto and his major economic policy decisions," emphasises Professor Bergholm, who has been researching Koivisto's societal activities since 2018. The second part of the research, *Kova Koivisto. Pankista pääministeriksi 1960–1970* was published in September 2023.

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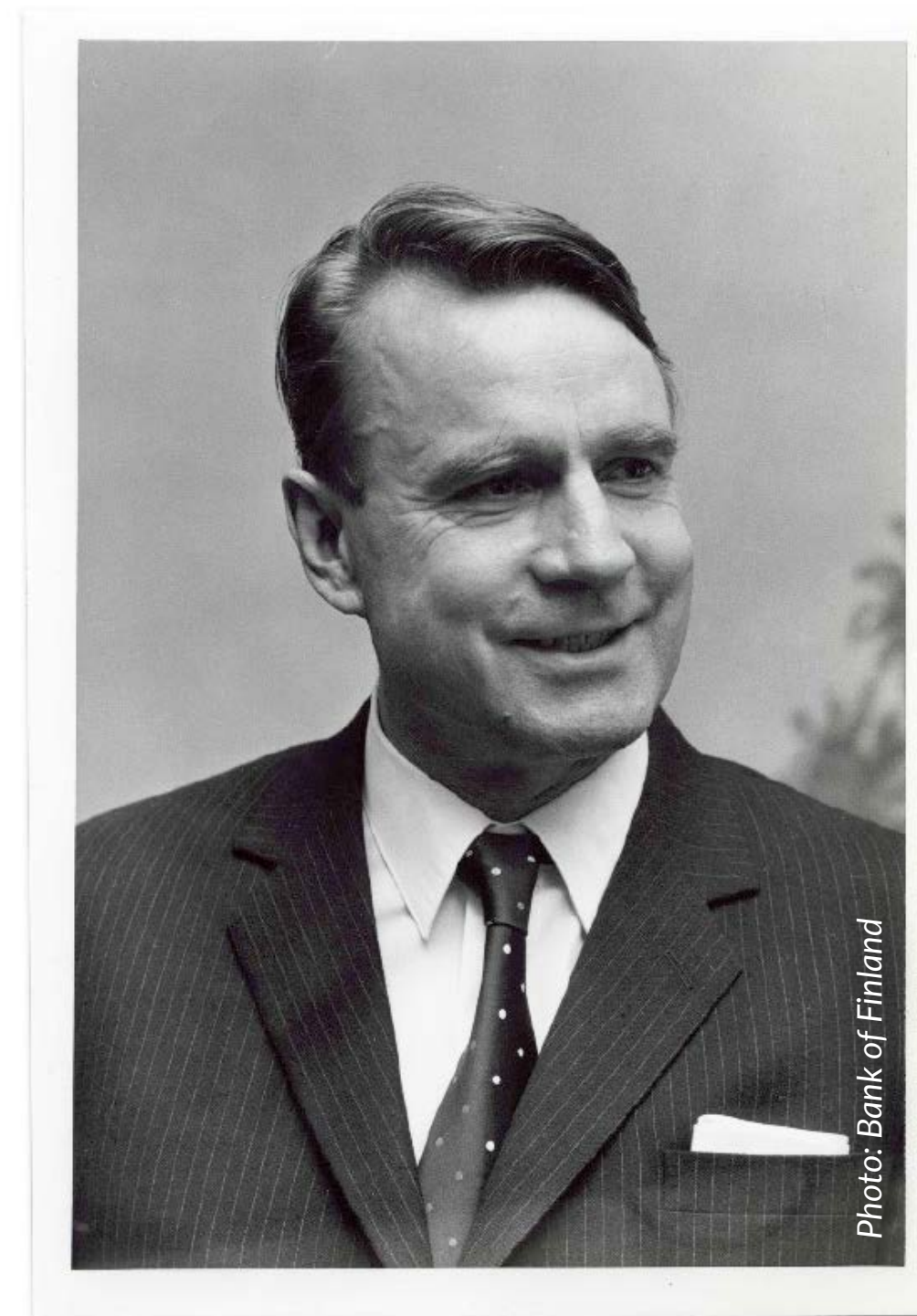
*In your experience, what are the special features of the Bank of Finland archive?*

The Bank of Finland archive is very rewarding, because the minutes of the Supervisory Council are minutes of discussions. The appendices to the minutes of the Board and the Supervisory Council enable the researcher to delve deeply into the issues discussed. For example, my own interpretation of the origin of the first incomes policy settlement was substantially clarified with the help of these materials.

*From your point of view, how has the research gone?*

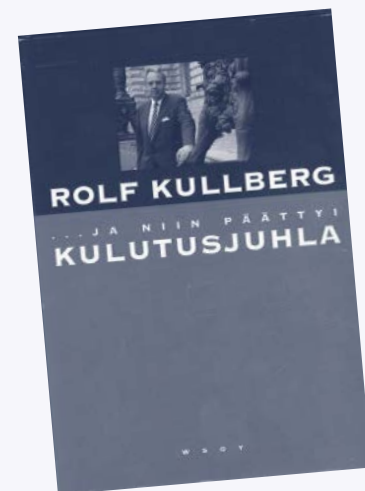
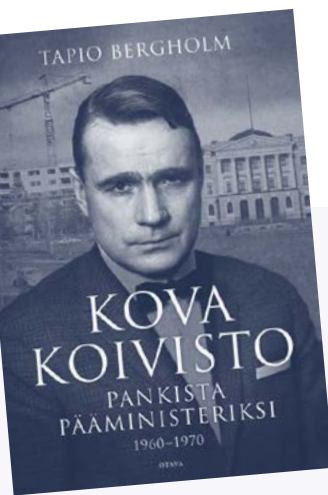
The Bank of Finland archive has professionally and flexibly assisted me in accessing essential material. From the standpoint of Koivisto's biography, it is interesting that the archive materials of both Koivisto and Klaus Waris have been stored in both the National Archives and the Bank of Finland archive.

**Aino Strömberg**  
Information Specialist



*Tapio Bergholm has been researching Koivisto's societal activities since 2018.*





## The Bank of Finland archive has served as a valuable source for biographers and other researchers on a number of occasions.

In addition to the second part of the Koivisto series *Kova Koivisto. Pankista pääministeriksi 1960–1970*, written by Professor Tapio Bergholm, the memoirs of Sirkka Hämäläinen, former Governor of the Bank of Finland, also saw the light of day in autumn 2023 (Ahonen, Vesikansa: *Pakko uskaltaa*). The background material for both the Hämäläinen and the Bergholm books consists, naturally, of document sources in the Bank of Finland archive.

Other publications that have used sources from the Bank of Finland archive include, for example, several works about Risto Ryti: Martti Turtola's *Risto Ryti: Elämä isänmaan puolesta* (1994), Juhani Suomi's *Kohtalona yksinäisyys. Risto Rytin tie Suomen politiikan johtoon* (1989) and, most recently, *Kylmästi laskeva mies* (2022), by Sakari Heikkinen, Antti Kuusterä and Seppo Tiihonen.

In addition to Sirkka Hämäläinen, other Governors have also made use of the Bank's documents in their works: e.g. Rolf Kullberg in his book *Ja niin päättyi kulutusjuhla* (1996) and Klaus Waris in his work *Markkakin on valuutta* (1977).

Finally, a special mention is due to Antti Kuusterä and Juha Tarkka, who undoubtedly used the Bank of Finland archive more extensively than anyone else when preparing their two-volume 200-year history of the Bank of Finland.

## How will you use the Mauno Koivisto archive?

The Koivisto material in the Bank of Finland archive essentially complemented the picture of his activities in international contexts, such as the International Monetary Fund and the World Bank. Addressing international economic policy in the future will require familiarisation with this material.

**The Bank of Finland archive aims to digitise interesting archive materials and make them available to the public. What materials would you recommend be digitised next?**

The minutes of the Board of the Bank of Finland and the Supervisory Council are of interest to researchers in many fields. The material is not unreasonably voluminous to digitise. At the same time, the appendices to the minutes should be digitised, because otherwise the researchers' view of the Bank of Finland's activities and decision-making would remain incomplete.



The Bank of Finland archive may be contacted by email at [arkisto@bof.fi](mailto:arkisto@bof.fi)



Photo: Jaakko Lukumaa

# Information management, information resources and information flows

# Developing an information strategy requires collaboration

**Mia Ristimäki**  
Head of Information Management



The joint information management development programme of the Bank of Finland and the Financial Supervisory Authority (FIN-FSA) was launched in 2020 to respond to changing needs related to information and data in connection with the entry into force of the Information Management Act. The development programme has implemented, among other things, an information management model, a statement on public access to documents and a change impact assessment process, which are now ongoing work.

The final task of the development programme has been to create an information strategy, i.e. to map the current state of information and information management, clarify the target state and specify the necessary measures. What changes are being sought and what benefits they may bring have also been clarified. Moreover, the other side of the coin has been considered. What if we keep information management unchanged?

## Workshops, discussions, comparisons

The work was launched with a joint kick-off, to which all staff were invited. During spring and summer 2023, we worked on the information strategy in workshops, with participants nominated by heads of department. The various departments of both organisations were comprehensively represented in the work, so the information strategy created can truly be described as a joint strategy of the Bank of Finland and the FIN-FSA. In addition to facilitated workshops, various discussions have been held to shape the information strategy, while interviews have been conducted, a maturity level assessment carried out, national and international organisations and companies benchmarked, and background material reviewed.

In the information strategy work, we considered the target state and collected ideas on the measures needed for change, which we discussed extensively. The proposed measures are grouped in the information strategy under five different themes: management model, competence, processes, tools and equipment, and culture. As part of the information strategy, we are not proposing organisational changes, rather a reorganisation to facilitate information management functions and centralisation through a virtual collaboration team and collaboration management.

**Tiina Nokkala**  
Data Advisor



## Steadily forward by working together

As a result of the joint effort, we have created an information strategy whose main themes are cooperation, operations, stability and future. The information strategy was adopted at the end of the year by both the FIN-FSA Management Group and the Bank of Finland Board. We asked the entire organisation to comment on a draft of the information strategy, which was finalised after the comment rounds ended. After the turn of the year, the communication part of the information strategy will begin and the measures given more concrete form. As a strategic document is involved, the recorded descriptions and action plans are top-level visions. The measures and their scheduling have been specified in separate plans, including a strategic mandate for senior management to promote the data economy, with associated descriptions setting out milestones for the development of data and materials, analytics and technical infrastructure.

In addition to internal goals and projects, the information strategy work has been influenced by legislation, ECB data-related projects and, for example, the forthcoming Data Directive. We will also closely monitor how information management is promoted in our stakeholders.

As its name suggests, the joint information strategy applies jointly to both the Bank of Finland and the FIN-FSA and all their departments. Due to the nature of the organisations' operations and operating environment, the information strategy may also be considered to apply to a wider community: the customers and stakeholders of the Bank of Finland and the FIN-FSA, including supervised banks and ultimately the Finnish public.



**Our common goal is to be a recognised frontrunner in the data economy – using collaboratively managed and carefully utilised data in innovative ways.**

# Data factory and lakehouses



**Anthony Baltzar**  
Chief Architect

The Bank of Finland and the Financial Supervisory Authority have long relied on traditional data warehouse solutions that no longer fully serve the needs of modern IT development, data science work and data analytics.

One clear challenge for the future of the current model is the exponential growth in the volume of data and the diversity of data storage formats. Solutions founded on relational databases had come to the end of their road in the organisation.

To address the identified challenges, a number of data-related projects were launched in the organisation. A data factory project was established in early 2021 to design a technical solution.

## Data factory basics

When the data factory project was launched, the starting point was that all, even the slightly more, confidential data would have to be stored in the data warehouses of the Bank's own data centre and that the use of modern cloud services would be a playground for less critical material. The practical consequence of this was that larger architectural changes would have required considerable additional investment in the services and capacity of the data centre. Another option was to keep the changes to a minimum and focus on developing the most effective practices.

Fortunately, a choice did not have to be made between suboptimal options; salvation came from updates to the cloud service policy of the European Central Bank System that enabled the use of public cloud services for more confidential data. By the time of the changed policy, we had, of course, already managed to make several Proof of Concept implementations and write quite a number of architectural plans. When the cloud ports opened, all this was neatly transferred to the archives, and the work started on a new basis at the beginning of 2023.



**Data factory**



**Datalake**



**Data lakehouse**

## Lakehouse architecture

The updated policies meant that we could begin to design in earnest new capabilities in the cloud environment, with no need to carry along the ballast of old solutions. We no longer needed to seek synergy between the technologies of our own data centre and the cloud environment; we could start building synergy through people's expertise. The technologies to be deployed were aimed at serving the application developers and data engineers of the ICT and Information Management department and data scientists in other departments. Beautiful lakehouses began to rise next to the data factory.

The natural choice for the architecture was to design a model based on lakehouse architecture. In a lakehouse, all data from structured to completely unstructured are stored in a centralised datalake. While in the traditional datalake architecture, data processing often requires a modelling layer made with different tools, lakehouse architecture offers a ready-made metadata layer, with which the data stored in the datalake can be modelled and offered to end users as completed data products.

Lakehouse architecture provides all departments with their own lakehouses, and the ICT and Information Management department attends to the wellbeing of the shared lake. Responsibility for the data products themselves remains with the owner department. Around the lake will be built a community facilitating the efficient use of data, where different subareas and experts can effectively support each other's work.

# Statistics in transition



**Aki Ojala**  
Senior Adviser

The financial crisis of 2007–2008 awakened authorities to the realisation that the statistics at that time did not provide enough information on the effects, exposures and progression of the crisis. As a result, reporting requirements, particularly for banks, have increased over the past decade or more. Various authorities have specified their own requirements, which has resulted in banks reporting almost the same information to several authorities. The statistical requirements of the European Central Bank (ECB) have also been stipulated in a number of regulations. All these factors together have given cause for broader reform.

## Integrated Reporting Framework

The ECB has launched an extensive project, the Integrated Reporting Framework (IReF), to reform banks' statistical reporting. Background work has, of course, been going on for much longer, but the project was officially launched in December 2021 and is now moving forward in the design phase, where costs and benefits will be assessed through a consultation with banks, statisticians and users. Based on the assessment, a new regulation will be drafted. One of the goals of the project is to simplify legislation so that all statistical requirements for banks are brought together in a single regulation that takes into account all information needs.

In IReF, data will be collected in such detail that they can be successfully used for new purposes without separate data collection or regulatory changes. For example, data on loans to companies are collected per loan and securities investments per security. When both are collected using universal identifiers, they can be used to further enrich business and securities registers without collecting data from the banks.



IReF will also specify more precisely how data are collected and how various indicators are calculated from them. Under current regulations, the national central bank has been able to determine itself how it collects the required data, as long as it submits to the ECB the data it requires and in the required manner. In Finland, for example, [RATI reporting](#) differs greatly in structure from the tables of the ECB's regulations, but the Bank of Finland has used it to produce the data required by the ECB. IReF, on the other hand, will in the future specify directly the format in which data common to all countries will be collected and how the final statistics will be produced from them. In this way, the comparability of even detailed information will be improved between different countries.

Different countries have their own specific characteristics, however, and therefore their own specific information needs. In Finland, for example, employment pensions are largely statutory and part of general social security, which makes it necessary to monitor them as a separate economic sector ([S.13141](#)). This and other national information needs will be met in IReF in as consistent a way as possible.

## Broader cooperation between authorities

Although IReF is a major reform, it is seen, however, as only the first step towards a solution in which supervision and resolution reporting are also combined into the same framework and data model. With this goal in mind, conceptual consistency with the supervisory reporting of financial standing and risks (FINREP) is already being ensured in IReF. Also being established between these authorities is an advisory committee, the Joint Bank Reporting Committee<sup>1</sup>, whose various expert groups will ensure a common direction. The authorities will also discuss requirements with banks in the working group on the Banks' Integrated Reporting Dictionary ([BIRD](#)).

<sup>1</sup> This committee cannot make actual statutes, however, as each authority has its own legislative powers.

# From information management model towards enterprise architecture



**Mia Ristimäki**  
Head of Information Management

During 2020, we implemented the first version of the Bank of Finland's information management model, as required by the Information Management Act. The result was an information management model that described our operations very comprehensively and in great detail. In terms of scope, the description was more than an information management model, i.e. it already had features of an enterprise architecture. The work was new, and it was done on a broad front; all IT Business Partners were trained to work on the model. For this reason, the personal touch of the various contributors could be seen on the final result.

The information management model must be maintained. The detailed model was starting to 'crumble at the edges', which meant that the descriptions needed harmonisation between different sections and less detail. We initiated more extensive development of the information management model at the end of 2022, to make maintenance easier and the content more user-friendly. We brought in Anna Aaltonen (Coala), a specialist in large-scale clean-up of enterprise architectures. I asked Anna about her experiences in assessing the model.

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**Anna, what did this next step mean in practice?**

First, of course, I had to familiarise myself with the current content and at the same time update the way the work should be approached. The foundation for the work, i.e. the modelling content in the tool, was exceptionally comprehensive and of high accuracy, so I could see that a lot of work had been done. There were differences in the individual styles of different contributors, and far too much content to maintain. The amount of content has now been reduced from around 7,000 elements to 2,000 elements.

Enterprise architecture is my speciality. It also covers the information management model but is more versatile. An enterprise architecture helps an organisation to improve its operations, and project success is improved. The potential benefits are therefore greater than with an information management model alone.



Photo: Anna Aaltonen's album

*Anna Aaltonen is a Senior Consultant at Coala Oy, a company specialised in enterprise architecture, IT architecture and process development consulting.*

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**The content must be utilised in order to sustain the motivation to maintain it. If maintenance becomes solely a yearly chore, it typically takes a back seat to other priorities.**

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Photo: Jaakko Lukumaa

### Lessons learned:

- The content starts to crumble right away. In a few months, a number of processes, IT systems or data storages have been changed throughout the organisation.
- Create a clear governance model for maintenance, specifying who has overall responsibility for the model and who maintains it.
- There should not be too many contributors, in order to keep the model consistent. Preferably one person should be accountable for consistency and guiding others.
- It is worth creating a common modelling handbook that everyone involved in modelling follows.

This next step towards enterprise architecture was very close but had not yet been taken.

### ***What have been the challenges in developing the information management model?***

The content had been created by division and department, so each unit knew their own field, but an overall picture was missing. A challenge for me was that I was not familiar with central banking operations. For the general public, the most visible part is the key interest rate, but what else do central banks do? This was revealed in the course of the work.

It has been a unique experience to see how things fall into place and the overall picture begins to take shape. The interviewed experts have played a significant role in this.

### ***What are your best tips for us regarding the maintenance and development of the content in the future?***

The content must be utilised in order to sustain the motivation to maintain it. If maintenance becomes solely a yearly chore, it typically takes a back seat to other priorities. Utilisation means using the content as a basis for strategy work, as starting material for projects, in the orientation of new staff, etc. Accountability for further development is another challenge. To maintain integrity, someone must be assigned primary responsibility. Content ownership must remain close to operations, responsibility for accuracy cannot and must not be delegated to an anonymous "someone".



# Inventory of Numismatic Collection revealed piece of Finnish history



**Ilari Korpikoski**  
Intern at the Bank of  
Finland Museum

I joined the Bank of Finland on 8 March 2023 as a university intern at the Bank of Finland Museum. My task was to go through numismatic material received from Setec Oy. There were around 50 removal boxes and three roller cages worth of material, and more material arrived during the spring, summer and autumn. The original plan was to complete the work in around three months. Due to the importance and extent of the project, however, I ended up handling my collection duties alongside my summer work at the Registry and my work as a Bank of Finland Museum intern, which started in the autumn. The cataloguing of the material was finally completed on 16 November 2023, after which the work was checked.

Why is the Numismatic Collection significant? Old banknotes and coins are still important historical items, even though they are no longer legal tender. The art displayed on the money alone and the complex and skilful processes involved in its production give us an opportunity to look into the history of domestic money, culture and art, and into the past



of the Bank of Finland and the Bank of Finland Security Printing House. Banknotes have been designed by a wide group of Finland's finest artists. The most prolific of them, in terms of the amount of material, was Eliel Saarinen, who was commissioned to design two series of banknotes for the Bank of Finland, in 1909 and 1922. The latter series remained in use until after the Second World War. It is also fascinating to see what and who was selected to be remembered and highlighted in banknotes from Finland's past, and how.

<sup>1</sup> The material also includes earlier material, such as roubles and thalers.

<sup>2</sup> There are approximately 3,000–12,000 items, depending on whether one wishes to count, for example, each banknote sheet, banknote, model sheet or draft model separately. There may be more than a hundred pieces of the same item in the collection. For example, the 100 markka banknote sheet from 1987, of which there are 186 sheets with the same identifier.

The items of the Numismatic Collection are invaluable. They often represent different stages of design, clearly exhibiting the various skilful steps that the production of the banknotes required, as well as alternative ideas and solutions that could have been used in the production of the markka banknotes.

The items ranged in size from small shreds of paper to large banknote sheets and model sheets. The design period of the items roughly runs from 1860 to 1993.<sup>1</sup> Most of the material relates to post-war market reforms, culminating in the design of the final markka banknotes and coins. However, the items also highlight various episodes that Finland experienced during the autonomous and republican periods. The material also included various commissioned works, which the Security Printing House produced for a wide range of customers both at home and abroad.

The variety and volume of the material<sup>2</sup> makes it easy to understand how long the work took to complete. I have been fortunate to be able leave my mark on the catalogue and to have had a privileged opportunity to learn about the history of Finnish money.



# Bank of Finland art collection book reflects Finland's history and social values

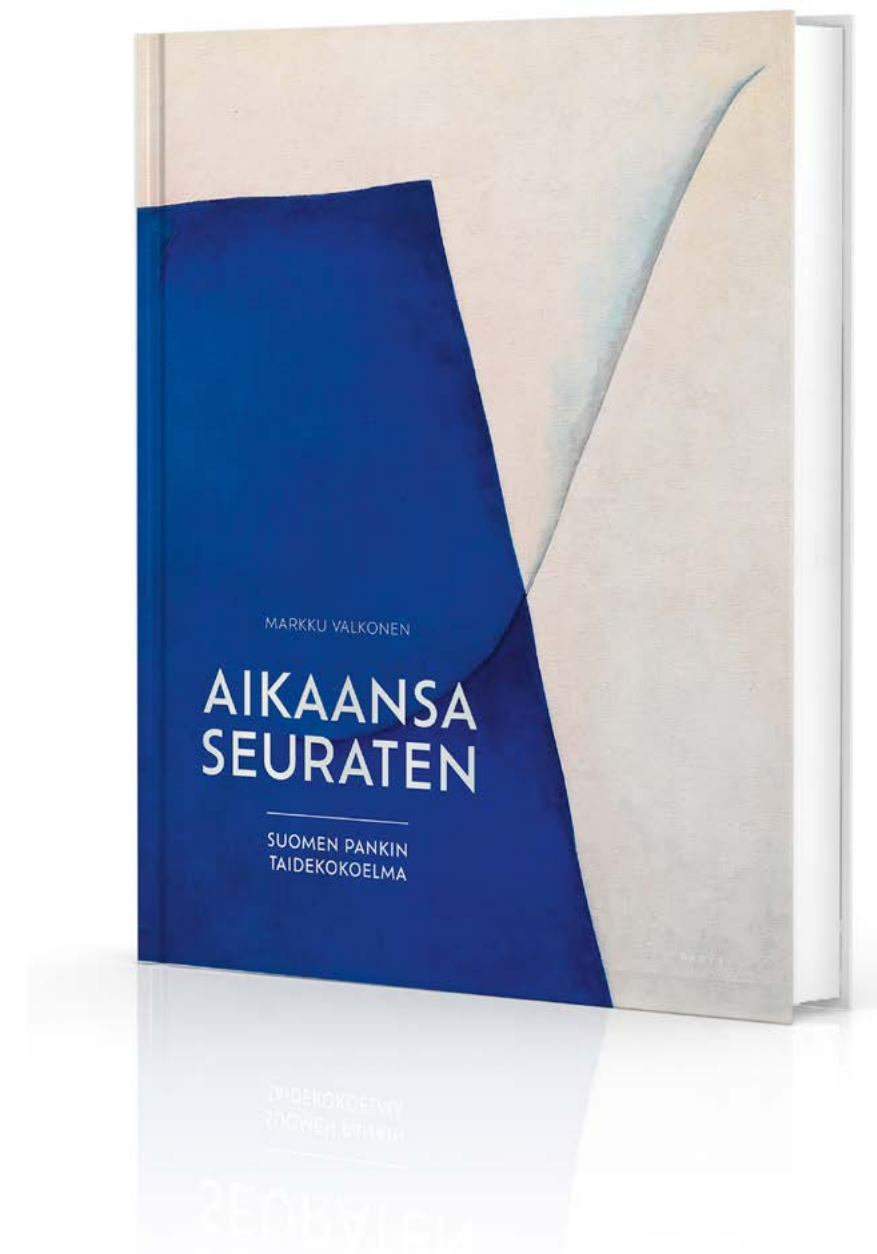


**Julietta Huttu**  
Communications Specialist

*Art of Our Times – The Bank of Finland Art Collection*, presenting highlights from the Bank of Finland art collection of around 1,200 artworks, was published in June 2023. The collection includes paintings, graphic art and sculptures. While reflecting the artistic aspirations of their time, the works also hold a mirror up to Finland's history and social values. The pages of the book provide a broad sample of Finnish art from different decades.

“The Bank of Finland art collection reflects the artistic interpretation of Finland's key stages, particularly due to significant monumental works, from Juho Rissanen's glass paintings and Lennart Segerstråle's frescoes to Eva Anttila's and Dora Jung's textile works. The collection includes a broad spectrum of Finnish art from the second half of the 19th century to the present day. Keeping up with the times, the Bank acquires works by living artists and thus supports contemporary art culture,” says **Markku Valkonen**, art expert and writer.

Along with the works of art, the book provides an overview of the vibrant history and architectural significance of the main building of the Bank of Finland, which last year turned 140 years. The main building was the result of the first architectural competition held in Finland and was designed specifically for the central bank's use. A design by the German architect Ludwig Bohnstedt won the competition in 1876. The



Neo-Renaissance-style building was completed in 1883 at a cost of 1.1 million markka. Bohnstedt's characteristic style is not only visible in the impressive and renowned façade, but also in the many interior details.

## Idea for art collection book arose in Bank of Finland's Art Committee

The idea for the art collection book arose a few years ago in the Art Committee of the Bank of Finland, which is responsible for the inventory and maintenance of the Bank's art collection and new art acquisitions. The Art Committee's guiding philosophy is that the Bank of Finland art collection is the property of the whole nation. It is therefore important that the magnificent works of the collection have been brought together for the first time between the covers of the book.

From the beginning, the goal was for the art book to be a high-quality work in terms of content and appearance as well as a pleasure to read. At under 180 pages, the work is compact, light and accessible. The work was published in Finnish and English editions.

The book was published by Parvs, a company specialising in books on art and architecture. The book was written by the Bank of Finland's long-time art expert Markku Valkonen, who also produced the artwork descriptions for the online gallery published on the taide.art website in 2017. The descriptions were used extensively in the manuscript of the art book. The foreword is written by **Olli Rehn**, Governor of the Bank of Finland.

The Communications unit coordinated the project in cooperation with the Arts Committee in 2022–2023.



*The Bank of Finland art collection includes paintings, graphic art and sculptures.*

# Risto Ryti's appointment as Governor of the Bank of Finland



**Vappu Ikonen**  
Historian

**Risto Ryti** (1889–1956), National Progressive Party politician and Minister of Finance, was appointed Governor of the Bank of Finland in January 1923. Due to his ministerial duties, Ryti did not, however, take up the post of Governor until one year later. At the time of his appointment, Ryti was the youngest ever Governor, 35 years old. Ultimately, he also became the longest serving Governor.

As Governor of the Bank of Finland and economic policymaker, Risto Ryti was first and foremost an economic liberal who believed in the functioning of markets and minimal state intervention.

Ryti was also an advocate of monetary stability. Early in Ryti's term as Governor, in 1925, Finland returned along with other Western countries to the gold standard. Efforts to stabilise the value of money meant a strict economic policy also during the Great Depression of the 1930s. In Finland, the depression actually started in 1928 with difficulties in forestry. Ryti and the Bank of Finland maintained the markka's link to gold until autumn 1931. The deflationary policy received strong criticism, particularly from the Depression Movement, among whose leading thinkers was **Yrjö Jahansson**.

Ryti's time as Governor was also marked by complex efforts to settle post-World War I war debts and repa-

rations. On Ryti's initiative, Finland continued to pay interest on its debts to the United States even after the Hoover Moratorium of 1931. This attracted huge attention in the US press. Finland is still known as "the country that paid its debts".

As is well known, on the outbreak of the Winter War, a reluctant Ryti was appointed to the post of Prime Minister in December 1939. Due to the illness of President Kyösti Kallio, Ryti also had to carry out many of the President's duties. After President Kallio announced that he was unable to perform the duties of President, a still reluctant Ryti was persuaded to become a presidential candidate in autumn 1940, and he was elected to the post in December 1940. Ryti became Governor of the Bank of Finland once again in 1944–1945, but was forced to resign. In the war-responsibility trials, Ryti received a 10-year sentence, but was released on health grounds in 1949.

Ryti later stated that his tenure as the Governor of the Bank of Finland was the happiest time of his career.

In the Bank of Finland's archives, [the Risto Ryti archive](#) is just over one shelf metre in size, from the period 1924–1945. The archive is therefore quite limited considering Ryti's long and distinguished career. When studying Ryti's tenure as Governor of the Bank of Finland, it is therefore worth looking at the minutes of the Board and the Supervisory Council from the period in question. The archives of the later stages of Ryti's career can be found in the National Archives.

*Risto Ryti served as the Governor of the Bank of Finland 1923–1939 and 1944–1945.*



# Over one hundred years of information resources and statistics



**Vappu Ikonen**  
Historian

The Bank of Finland has been producing information resources and statistics since its establishment. Initially, however, the information resources were created alongside actual other banking activities and included lending statistics, interest rate statistics and the development of the Bank's balance sheet items. Currency exchange rates began to be collected as early as the 1840s.

The systematic collection of new statistical data began in 1919, when the Board of the Bank of Finland made the decision to create a new post of Statistics Secretary. After a modest beginning, activities expanded to form the Statistics Department, which from 1925 was led by A. E. Tudeer. In 1930, Bank's research activities were again expanded by the new Conjunctural Research Department under the leadership of Bruno Suviranta. During the war years, the work of both departments increased, and from the beginning of 1944, the departments were merged to form the Bank of Finland Institute of Economic Research. The objectives set for the institute were to prepare reports illuminating the work of the Bank of Finland as well as the general economic development of Finland, and to conduct economic research and carry out any tasks assigned to it by the Board.

A fourth task, which emerged later, was the training of economists. Indeed, many of the Finnish economists of that era spent shorter or longer periods researching at the research institute. During the period of the so-called old research institute, 1919–1971, 14 doctoral dissertations were completed in the Bank of Finland's publication series B. Other, shorter publications, or publications aimed at a more general readership, appeared in the Bank of Finland's publication series A, C and D. The research institute also published the Bank of Finland Monthly Bulletin from the early 1920s. The Bank of Finland's research publications have been digitised and can be found in the Bank of Finland's [institutional repository](#).

At its height, in 1968, the research institute had 48 employees. The old research institute ceased operating in 1971 following an organisational restructuring. Its work was divided



*The Bank of Finland's Economic Research Institute in the early 1960s. From the left Heikki Valvanne, Erkki Laatto, Lauri Korpelainen. Photographed in 1961.*

between the Economics Department and the Research Department. The research and statistical activities of the Bank of Finland continued vigorously, both in these departments and in the many other departments established later.

The archive of the old Economic Research Institute from 1919 to 1971 takes up around 14 metres of shelving. The archive is divided into administrative papers, correspondence and original statistics and research materials. Most of the administrative material has been digitised in the enclosed package. It provides a picture of the research institute's objectives, its actions in emergency conditions, its everyday activities and even festive occasions.

[The archives of the old Bank of Finland research institute 1919–1971](#)



Photo: Jaakko Lukumaa

## Information security and data protection

# Secure cloud environments



**Ville-Pekka Altti**  
Senior Information  
Security Expert

## Information security features of cloud environments

In cloud environments, the key to information security is understanding the risk shared with the service provider and making choices appropriate to your level of risk. The information security level and options also vary within the same service provider, making service-specific planning and risk assessment necessary.

The expanding adoption and accessibility of cloud environments make them tempting data breach targets for threat actors. In addition to traditional reactive information security monitoring based on log events, cloud environments offer extensive options for implementing preventive information security. Active protection is achieved through architectural choices and by reacting to perceived vulnerabilities before they can be exploited.

Service providers have effective tools for monitoring the status and recommended settings of the entire cloud environment, from software development to production systems. This is particularly highlighted in modern information systems, where changes are ongoing and, for example, new regulations and services affecting information security are constantly being developed.

## Secure deployment requires cooperation

The secure deployment of the cloud services to be used in the information systems of the Bank of Finland and the Financial Supervisory Authority will be preceded by a planning process to verify conformance with requirements of the services to be introduced and assess the related risks.

This process involves an assessment of the information security status of services to be deployed as well as the design of a secure information system architecture and information security monitoring. The work will be done in close

cooperation with software developers, platform architects and information security experts, taking into account operational requirements. Good information security planning maximises security and minimises risks and their impact.

In the secure deployment of cloud environments, as with traditional IT systems, the importance of the planning security choices from the early stages of projects is underlined. Cloud services are built using automation, which allows solutions once designed and approved to be replicated and their level of security between projects to be ensured.

## Focus on risk management and skills

Understanding and assessing the risks of cloud environments also requires new skills and knowledge sharing about constantly evolving threats. The active migration to the cloud is also reflected in the security and risk management working groups of the European System of Central Banks (ESCB), which share information on risks and develop best practices for cloud environments. In addition to the risk assessment and the information security testing of the projects under construction, the risk level of cloud environments can be continuously and proactively verified, for example through automated attack path analysis.

Operating rapidly changing services requires new skills and continuous learning. It is also necessary to ensure that the existing information security processes, for example in contingency planning and incident management, also work in a cloud environment. Holding exercises for potential incidents through practical examples is key to ensuring staff competence and training in new technical features. Protecting data and the identities that use it, in all its forms, also provides a more efficient way to utilise entirely new services, such as the rapidly evolving large language models.



# Email and data protection



**Mari Rusi**  
Data Protection Officer

Emails almost always contain personal information, as most email addresses are personal addresses and even an email address in the form `firstname.lastname@organization.fi` is personal information. In addition, emails often contain a signature containing personal information. It is very common that the message itself also contains personal information other than what the sender of the message has written, and to whom and when.

As a lot of personal data is processed in emails, in 2023 the Bank of Finland focused attention on data protection in email communications.

## Email messages between the Bank of Finland and other parties are documents of the authority

Emails are confidential communications and the employer cannot freely look at employees' emails. When a member of the staff of the Bank of Finland sends or receives an email for the processing of a case or otherwise in a matter that falls within the Bank of Finland's sphere of authority or tasks, the email is, however, a document of the authority, and access to it is determined on the basis of the Act on the Openness of Government Activities. Thus, the starting point is that emails related to the handling of work tasks are public, and the messages can only be kept secret if there are special grounds for secrecy.

This does not mean, however, that the Bank of Finland can freely monitor staff emails; but emails that are documents of the authority must be stored in another system where they can be accessed, if necessary. Messages are stored manually, so instructions regarding storage are important for the implementation of data protection and data management.



## Application of retention periods to emails

Personal data contained in emails may have very different retention periods. Messages in individual mailboxes cannot, however, be automatically deleted applying different retention periods. It is therefore important that the emails to be retained are stored in another system where destruction/archiving of data can be carried out in a more coordinated way.

In 2023, a discussion was also initiated on whether it would be possible to automatically delete from all email boxes messages older than a certain date, so that email boxes could not contain personal data that should have already been destroyed in accordance with the file plan. For the time being, messages older than a certain date are regularly deleted from certain shared email boxes, and deletion of data from these is done manually.

## The goal is to reduce the processing of personal data in email

Human errors easily occur when sending emails. Email can easily end up being delivered to a wrong recipient with almost the same name, the wrong attachment can be accidentally attached to email, the sender may forget to send a message by secure email, even if it contains confidential personal data, or the sender may inadvertently use the 'cc' field for the recipients, even though the intention was to use the 'bcc' field.

Efforts are made to reduce human errors by technical means; for example, the email software verifies whether the intention is really to send the message outside the organisation. Not all human errors can be prevented by technical means, however. The goal is to reduce the processing of personal data in email and to use other services for exchanging data. In internal Bank of Finland communications, one method that has proved its worth is not to attach a document containing personal data to an email message, but to simply include a link to a document that is available in the electronic workspace. Even if the message accidentally goes to the wrong person, the recipient would not have access to the personal data.



Photo: Jaakko Lukumaa

# Monitoring and key figures



# Data Balance Sheet key figures 2023

	2023	2022
<b>Case management and documents</b>		
Matters entered in case management system	507	566
Documents stored in case management system	2,515	2,447
Documents transferred to digital archive <sup>1</sup>	20,606	6,505
Extent of historical archive in shelf-kilometres	7	7
Documents in digital archive, total	453,427	432,831
Number of visitors to historical archive	12	29
Duration of visits, total	63	116
<b>Data and statistics assets</b>		
Statistical data collections performed	12	12
Regular reporters of statistics	1,645	1,675
Statistical data collection reports received	26,046	24,771
Statistical data storage capacity	> 1 TB	> 1 TB
Time series entries in the time series database	12,047,416	10,265,341
Statistics dashboards in external network	57	37

## Communication channels

### Social media

	2023	2022
BoF Facebook followers	950	746
BoF Museum Facebook followers	1,271	1,166
BoF Twitter/X followers	13,294	12,858
BoF Instagram followers	2,293	1,921
BoF Museum Instagram followers	849	771
BoF LinkedIn followers	22,369	19,796
BoF experts on Twitter	85	85
YouTube subscribers	1,070	903

### Digital services

	2023	2022
<b>Visits 2021</b>		
Suomenpankki.fi	6,394,278	3,838,286
Eurojatalous.fi	153,666	182,240
Rahamuseo.fi	15,186	24,320
BOFIT	50,020	77,813
Helda/Kaisu digital repository <sup>2</sup>	267,969	49,705
	around	around
API calls in open data service	12 million	2.5 million

<sup>1</sup> The electronic workspace archiving function was introduced in June 2023.

<sup>2</sup> New digital repository Kaisu was introduced in November 2022.

	2023	2022
<b>Publications</b>		
Publication files and archive files loaded into Helda/Kaisu during year	959	732
Digitised material for archiving and publication (estimated in pages)		
External digitisation	9,300 <sup>3</sup>	610,000
Own digitisation	42,200	111,000
Total	51,500	721,000
Blog posts published in Bank of Finland Bulletin (fi + en)	42	55
Articles and analyses published in Bank of Finland Bulletin (fi + en)	96	53
Peer-reviewed research published	20	18
<b>Requests for experts, statements and information</b>		
Requests for experts	17	52
Requests for statements	47	38
Requests for information	40	42
<b>Emails<sup>4</sup></b>		
Emails received	5,615,426	6,380,643
Emails blocked	7,596,429	6,434,747
Spam emails and emails with attachments quarantined or links removed	150,211	85,834
Blocked viruses	3,415	3,903
Total	13,365,481	18,386,776

<sup>3</sup> Rytin archive

<sup>4</sup> The email figures include Bank of Finland and Financial Supervisory Authority emails.

## Capabilities and expertise

In the Bank of Finland's ICT and information Management department, we invested in Microsoft's learning pathways (Enterprise Skills Initiative) in 2023. It has been possible to choose learning pathways from a range of options relevant to our work, while supporting the cloud migration we have launched. In addition to learning pathways, certifications have also been facilitated.

In early 2023, we organised for our experts two one-day data training sessions with the same content, entitled the Data Management Capability Assessment Model. The goal was to increase perspectives on data management topics.

Case management training generally covers the case management system, document handling and processes. Document management training focuses on the handling of official documents in electronic workspaces. In addition, training includes content management forums and training for content managers, which covers electronic workspace functions and user rights administration. The forums present new developments and discuss future development needs. Contract management training focuses on the use of the new contract management module, which has been introduced as part of the case management system. General training in information management includes topics of current interest in information management, but also a review of, for example, document classification and processing rules, data protection or systems use.

### System or tools training (no. of events held):

Training in the new Astra case management system	12
Document management training	56
Contract management training	4

Departments can decide for themselves who will participate in external information management training, which includes, for example, training in data and analytical tools and software. Most internal training is jointly arranged for Bank of Finland and Financial Supervisory Authority staff. In 2023, several SQL and Tableau training events were arranged.

The data science community (r.kiosk) has evolved into the Analytics Center of Excellence (ACE). ACE organises presentations and workshops focused on data science and offers its own “citizens’ forum” on the organisation’s Teams channel. You can read more about ACE in Ville Voutilainen’s article [page 14](#).

#### Examples of themed lectures or training events:

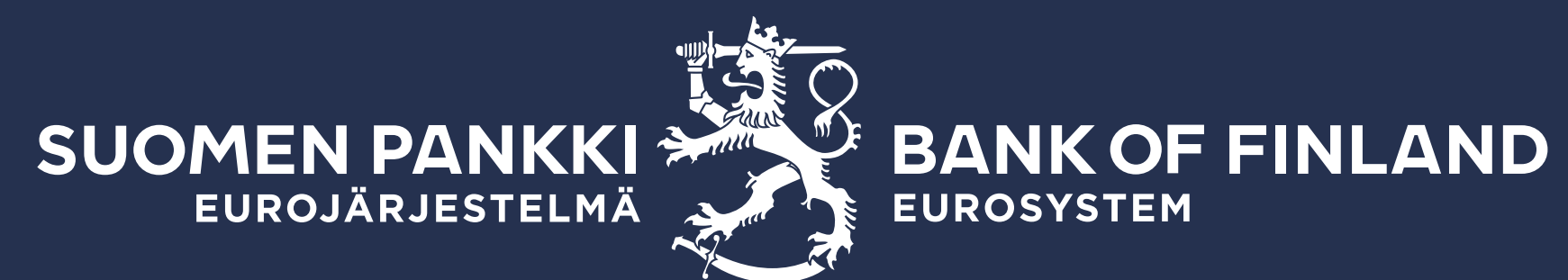
Presentation of enterprise architecture and data management model	1.5 hr
ACE: LLM POC – Generative Language Models Technology Test	1.5 hr
ACE: Introduction to Polars	1 hr
Data protection at the Bank of Finland and the Financial Supervisory Authority	2 x 1.5 hr

#### Other events related to data, data use or information management:

In October 2023, we organised a half-day TechDay seminar, coordinated by the ICT and Information Management department, which addressed topics such as cloud services, the data economy dictionary, data factory architecture, data products, data science and the data economy. Antti Komonen, Ville-Pekka Altti and Anthony Baltzar write about these themes in this publication. The introductory articles also review the data economy promotion project, which will be launched in early 2024.

As part of information strategy work, we organised an open kick-off event for the whole organisation as well as a total of eight workshops for people nominated by heads of department. You can read more about information strategy work in the article by Mia Ristimäki and Tiina Nokkala [page 20](#).

- » [Statement on public access to documents \(in Finnish\)](#)
- » [Data protection and privacy statements](#)



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