University of Helsinki

IT2030 Plan

University of Helsinki IT Center
5 October 2021

IT2030 PLAN OF THE UNIVERSITY OF HELSINKI

Introduction

At the IT future seminar for university management in autumn 2019, the idea of making a university-wide IT action plan to support the University's strategic goals was launched. Its goal was to ensure success in the University's core missions and respond to changing demands on research, teaching and external regulation such as legislation.

The vision of the seminar was summarised as follows: "*Digitalisation is managed centrally and with strong customer guidance. Development projects will be prioritised and overlaps eliminated. When possible, the University of Helsinki's R&D activities will be utilised in the implementation and links from research to practice will be created.*"

The time frame of the plan is the entire strategy period, 2021–2030. The plan is regularly updated, as global phenomena can change everyday activities very quickly and radically, and in these situations the importance of digital services can be emphasised. The rapid technological development under way also poses a challenge to predictability. The plan identifies ways in which the use of information technology can be made in the best possible way for both the university and the university staff and students. As recent years have shown, global phenomena can change everyday activities very quickly and radically, and in these situations the importance of digital services can be emphasised.

The first three chapters of this plan describe key drivers of change, trends or phenomena that, in addition to the university's strategic goals, should be able to be addressed through information technology and digitalisation. The following three chapters describe suggestions for the continuous development of IT operations and their management. Chapter 7 brings together the main proposals which should be promoted from the beginning of the strategic period. The last chapter describes how to manage, monitor and update the plan.

The plan was discussed at the Board meeting of the IT Center on 8 June 2021 and at the University's management team meeting on 14 June 2021.

Helsinki, 5 October 2021

Plan Steering Group and Preparatory Committee

1. Shifting operational environment

The University of Helsinki's Strategy 2021–30 describes the key choices and the measures to support them. The goals are high, as one of the best universities should have when it comes to solving the great challenges for humanity. Utilising information technology is essential to achieving multiple goals, but the way it is deployed can significantly impact the speed and cost of achieving those goals.

When designing the strategy, it was impossible to predict those global phenomena that could force us to accelerate the pace of change. The COVID-19 pandemic instantly made the university staff and students heavy users of remote working tools and online collaboration. The prolongation of the exceptional situation has also highlighted the downsides of virtual activities: distance from the community or exclusion from the sense of community, as may have happened to new students who have started studying during the exceptional situation. Therefore, the challenges for the coming years are how to create a strong university spirit and inclusion in digital environments as well. Here, too, the university community can also play a leading role for the surrounding society.

Digital communality is also built outside work communities. Social networking services for consumers are constantly being developed. It is difficult to compete with the ease of use of these social and other mobile services. The challenge for the university is to choose the media and the ways in which the university will use them, and which services are recommended to support the basic tasks of the university.

Technologies enabling the provision of applications and services are developing in the same way. The path from technology promises to a cost-effective method is often so unpredictable that this plan does not attempt to make any choices concerning technologies used. In cooperation with research and teaching, emerging technologies must also be monitored, and efforts made to identify when and how new products should be commercialised for wider use.

Digital activities are increasingly subject to regulation, and the fulfilment of the requirements requires significant investment. Compliance with the General Data Protection Regulation is still not entirely straightforward, the requirements of the Directive on Web Accessibility are not met even in all key network services, and the data management model required by the Act on Information Management in Public Administration is in the final stages, but there is still a long way to go concerning providing interfaces to all public information. The Act on the Secondary Use of Health and Social Data opens up significant research opportunities, but its requirements for secure access environments are such that it is very difficult to provide the required environment. Funders' expectations for the infrastructures and services provided by the university are growing, and, for example, the publication of research data in open services is not an exception but rather a rule nowadays.

The university cannot fail to meet these requirements. The challenge, then, is where and how to find resources for these types of common university needs. It would be a waste of resources if each unit and faculty were left to solve the problem alone.

The increase in digitalisation has also led to an increase in the crime that exploits it. Targeted information security attacks and phishing are not uncommon at the university either, and access rights that have fallen into the wrong hands can lead not only to reputational damage but also to financial loss. There are as yet no verified cases of theft of research innovations or collected data, but protection measures must be taken proactively in this respect as well. Prevention is a race

against evolving attack methods, and the key to a sustainable solution is to continuously train users in safer ways of working. Analytics that identify cases of abuse must also be used.

The reform of continuous learning has been introduced into the Government Programme, and these themes are already reflected in the university's strategy. The national higher education network has developed the *Digivision 2030* aiming to position Finland as a model country for flexible learning. The implementation of Digivision 2030 is a joint effort, but putting it into practice also requires the university to do its own work, starting with the implementation of integrations.

2. Changing teaching and learning

The university's strategy has outlined several development measures in which digitalisation related to teaching and learning plays a significant role. Strengthening teaching infrastructures also covers virtual environments. Utilising digitalisation will inevitably change pedagogy as well. The investment in continuous learning brings a lot of new users to IT services. These changes bring new challenges to the well-being of learners and thus new needs to build virtual interaction and community.

2.1 Remote and hybrid teaching increases

The digital leap in remote teaching caused by the COVID-19 pandemic remains partly a permanent practice, despite the fact that contact teaching will continue to be the primary teaching method. As a new form of activity, hybrid teaching is growing, where some learners are present and some study remotely. The most efficient implementation of hybrid teaching will be refined in the coming years so that the end result does not increase the workload of teaching or make it more difficult for students to perform. Also, the needs of this type of teaching for IT services are not yet sufficiently understood, so development work is needed.

Distance learning – both real-time and self-paced – requires new and more versatile, reliable and easy-to-use IT systems. Their capacity and access support services must be kept adequate. Newer service areas include, for example, electronic evaluation, video and audio recordings prepared by students and augmented reality laboratories. Future needs cannot yet be predicted, so finding and testing new practices is key. The experiments of pioneering teachers need to be supported and their experiences evaluated so that we can choose the approaches to be productised for wider use and the technical solutions that support them. The evaluation criteria are drawn up under the guidance of the Centre for University Teaching and Learning (HYPE) and the teaching and student services.

The university-wide Oppimisen tilat (Learning Spaces) project launched in 2021 combines the management of teaching activities, the development of facilities and IT and AV services into one entity. A significant part of the workstations used by students is located in connection with libraries. They must be designed with good ergonomics and access control in mind.

2.2 Continuous development of new digital capabilities

Teachers' and students' abilities to distance teaching and learning vary considerably. There is a need for training and effective support services in both IT and pedagogical matters. HYPE and pedagogial lecturers participate in the design of the necessary support services.

Clearer rules on how to deal with material containing data protection requirements in teaching are needed. Remote studying brings new use cases where rules are needed.It is also necessary to outline the extent to which students may be required to create a username and accept the terms of use for external network services for which the university has not made a risk assessment and has no agreement for the processing of personal information.

New solutions for the assessment of competence must be established to complement the supervised exam sessions. Services are already in place for plagiarism detection of essays, but in the future, it must also be possible to identify whether the entire writing was produced by a student or by artificial intelligence. Ensuring legal protection for students may also require maintaining an electronic version of learning materials.

The development of digitalisation has a significant impact on the competence requirements of university graduates. Students need to get used to learning and using different tools during their studies.

2.3 Providing continuous learning challenges traditional structures

The University of Helsinki does not operate alone in the field of continuous learning. Learners compile a useful package for themselves from the services offered by different actors. Therefore, it is important that the services the university offers can be easily found on the website and are described in an honest and attractive manner. The systems used to manage studies must support the practices by which the learners describe the accumulation of their skills.

Expanding the supply of continuous learning requires IT services to provide new solutions for managing users' digital identities, storing their data and registering the completed credits. As a first step, solutions are needed for the needs of new MOOC platforms. Solutions are being developed, for example, in the Futurelearn consortium and in the development of platforms at the university's MOOC centre.

The university must outline the objectives for the use of MOOCs, so that sufficient resources can be determined. The target group of MOOCs can be not only customers of continuous learning and degree students, but also high school students (“peek courses”). MOOCs, such as the *Elements of AI*, that bring international visibility to the university in particular, require significant investment in producing high-quality videos, for example.

2.4 Information systems to support learning and teaching

Currently, academic administration's service paths are based on about 50 information systems, which does not create a unified user experience. The different phases of the life cycles of the systems make it difficult to invest in the service path systems as a whole, and the development of services is in danger of fragmentation. Harmonisation could be achieved by keeping the Sisu study information system as the key system, provided and ensuring that its development can adequately meet the needs of the University of Helsinki. This also requires an effort from the university.

Every IT system has a limited life cycle due to both the obsolescence of technology and the changing needs of users. Life-cycle management must be structured, as it takes three to four years to move from one widely used learning environment to another. Therefore, it is necessary to start identifying

in good time what the next generation of “learning experience platform” would be, from the beginning of the learning experience.

In the longer term, the *Digivision 2030* provides interfaces and services with which the University of Helsinki's own systems and services must be compatible and build added value on the teaching and learning of the University of Helsinki. This applies to both degree studies and continuous learning.

3. Digitalisation in support of research

Open science is at the heart of the university's strategy, and it involves several proposals for measures, such as the production, utilisation and service development of research data.

The impact of digitalisation is also visible in the research itself. New technologies, such as artificial intelligence and machine learning, as well as increasing computing power, make it possible to solve new types of research problems. They can also facilitate the routine work phases of research processes. Making full use of these opportunities requires not only infrastructure development but also closer cooperation between IT professionals and the research community, as well as rethinking the content and form of support services.

3.1 Making use of growing amounts of data requires policies and services

The amount of data and opportunities for utilisation will continue to grow throughout this strategy period. It is necessary to produce data through modelling and to analyse it using digital methods in an increasing number of scientific disciplines. Interest in the production and utilisation of data in research cooperation, innovation activities and business cooperation, not forgetting citizen science, has been shown not only at the university level but also at the government level. At the same time, the regulation of the processing of sensitive data in particular and the requirements of funders for the opening of data sets are increasing. Researchers must be provided with services that make it as easy as possible to meet these requirements.

There is therefore a need for services, policies, guidelines and processes to ensure the quality and usability of data throughout its life cycle, from the moment of its creation to its removal after use and storage or long-term storage. The university must appoint a single body responsible for the development of the activities in cooperation with various service units and academic actors within the university or at national or international level.

A financing model must also be developed for the investments required for data management. The needs of the units are so varied that the model must be flexible enough to handle a cause-based cost allocation.

Data management involves issues that are fundamentally not IT-related. Keeping data usable requires repetitive work (e.g. rights management, metadata, technical refreshment of data, data and format migration), but also storage itself is a cost. A procedure must be found for deciding which material is to be stored by the university or unit.

A separate report on research data management services was completed in March 2021, which deals with challenges related to the management and details of services at a more detailed level.

With the development of open science practices, the scope of open sharing includes not only publications and data materials, but also the analysis methods used, software codes, and so on. Publishing practices need to be developed in recognition of ever-changing needs. Success in this requires close cooperation between academic units, specialised services and administrations.

3.2 Machine learning, artificial intelligence and increased computing power open up new opportunities

The IT computing power available to a researcher is constantly increasing. The implementation of and investments in massive high-performance computing environments will continue to be carried out at the national and international levels. A scalable computing environment can also be obtained from commercial cloud services. However, the need for own computing environments does not seem to be decreasing due to, for example, the challenges of data processing. In this context, "own" computing environment refers to both decentralised systems implemented as consortium projects and partly with external infrastructure funding, as well as smaller server solutions. In particular, initial computation or preliminary modelling is often performed close to the location of the data, and experimenting with different analysis procedures and algorithms is in some cases easiest to do in the university's own, limited environments.

In a few years, the capacity available in the workstations will surpass the power that is currently only available in server solutions. It is often perceived to be easier to work with a familiar software used at the workstation, but it remains to be resolved how to make large data or data requiring special security available to these tools.

The increase in computing capacity not only benefits traditional computational sciences but will allow for the analysis of increasingly diverse forms of data. The content of the data varies from well-structured measurement results to diverse modelling results, image and video data.

In the production, analysis and utilisation of data, the importance of machine learning and artificial intelligence grows as tools develop. The need for services facilitating the aggregation and analysis of different types of data is apparent. The selection of suitable platforms for this purpose must be carried out in cooperation with the researchers. The use of artificial intelligence can also raise research ethical questions, for which the pioneering role of the university is needed.

Artificial intelligence can also facilitate the routine work phases. This requires close cooperation between support services and researchers to identify the work phases that benefit from the automation the most. The Lean type of continuous development approach is expected to achieve the best results.

The need to develop competence in the use of new methods is evident both for academic staff and support staff.

3.3 Tightening of the economic situation and increased competition

The tightening of public funding is expected to continue for years to come and competition for external financing will intensify. Already during the application process, reports must be produced on, for example, data management. The application for funding must also be able to show the costs of using digital methods, especially when they deviate from the normal level. It is apparent that the use of digital methods swallows up an increasing amount of research funding. In addition, it is still unresolved, for example, how the storage of the materials produced during the project will be paid for after the end of the funding period.

Success in infrastructure calls will continue to be essential for the continuation of existing infrastructures. Already in the application processes, there is a need for close cooperation between the applicants, IT and other support services experts. IT specialists also need to become more familiar with the different funding mechanisms.

4. IT services to support everyday life at the university

In 2030, the university's IT services will form a unit that is:

- **Flexible in meeting customer needs:** The range consists of purchased services provided by partners and self-produced services, from which it is easy to choose the right service for each purpose.
- **Customer serving:** At the basic service level, the necessary IT needs are met, with additional investments, the customer receives a wider service.
- **Managed:** Legislative requirements and asset management needs are met.
- **Cost-effective:** As the financial situation changes, it is possible to reduce the level of service and cut costs. In addition to costs, cost-efficiency also means operational efficiency.
- **Modern:** New technologies are used appropriately and with security in mind.
- **High-quality:**The services work as smoothly as possible and with minimal disruption, and they meet the needs of the university staff and students.

4.1 The growing number of services and users challenges traditional support services

The majority of users will continue to have a long-term and close relationship with the university (staff and degree students), while some will have a shorter and looser relationship (e.g. MOOC students, visiting foreign researchers or students from partner universities). Therefore, it must be possible to delimit and target services to different user groups for both user experience and cost control. This requires at least the development of identity and licence management and a continuous reassessment of the service portfolio in relation to the needs of different user groups and the resources available

New and new types of IT users are coming into the university's IT services as a result of internationalisation and continuous learning services. The significant growth in remote working and distance learning affects services and support. Demand for 24/7 support is increasing.

The increase in support needs can be met by increasing automation, self-service and AI-based advisory services. We have good experiences with the chat service, and machine learning improves the ability of these solutions to help with basic issues. The same tools can also be used to collect background information related to a service request, so that the problem solving can be faster and

easier. It is also worth experimenting with the systematic use of peer support and the collective sharing of good practices as a complement to IT support and on the platforms it provides.

4.2 Controlled decentralisation, efficient centralisation

In the 2000s, most of the university's IT experts and IT support services have been centralised in the IT Center. The centralisation of user support has already achieved significant cost benefits at the university level, and it is no longer financially viable to decentralise general support to campuses. However, as digitalisation affects all activities, we must assess in which cases support should be provided centrally and in which areas, depending on the field or needs, close to the service user. Requirements for both user and IT support skills are increasing (for example, data analysis, gamification, digital pedagogy). One starting point may be that some IT professionals specialise in specific issues related to the field, discipline or the digitalisation of teaching.

As an alternative solution, experts trained in the above-mentioned fields of digitalisation would provide a support service in networked cooperation with IT professionals. In some cases, it may make sense to set up technology-based centres of excellence composed of different experts to promote the safe and efficient use of automation and robotics to streamline processes, for example.

As services are developed as bigger entities in the future, crossing the silo boundaries of different units, an operating model must also be created for support, so that the user can contact one place in case of a problem without having to know which organisational unit is responsible for resolving the issue.

The Helsinki Institute for Social Sciences and Humanities (HSSH) on the City Centre Campus and the Biodata Analytics Unit in Viikki are units created on the initiative of faculties and partly with external funding. Their tasks also include the development of digital materials and research methods. Specialised service units and University services need to work closely with these units to know how to make use of common services and agreements. Close cooperation between the units set up by the faculties and the special services (Tike, HULib) and the administration benefits all parties.

The IT Center, on the other hand, develops IT for Research activities on campuses. Kumpula has long-standing experience of the IT for Science group, which is part of the IT Center and specialises in scientific computing and the infrastructures that provide it, as well as their use. A similar IT for Life Science activity has been launched in Meilahti. The aim is to make it possible to extend the centralised range of basic services to local needs through local investment. If the faculty or the entire campus needs a service that goes beyond the basic service, it can be implemented in cooperation with the IT Center, funded by the faculty/campus.

Experimentation of different types of activities must continue in order to find the most useful service methods for the basic tasks of the university. For example, workshop-type work has been offered for making material management plans, scientific computation issues have been addressed in a weekly HPC garage meeting (implemented with Zoom), and monthly enterprise architecture KA clinic meetings are available for information system project planners. Information on such service opportunities must be disseminated, experience gathered and widely shared in order to reap the full benefits of the experiments and to implement policies to improve the user experience. It would be

useful to increase the participation of IT professionals in faculty development projects or operational experiments.

IT support for basic issues can be reduced by the means mentioned in chapter 4.1 and those resources can be directed to more specialised support and expert tasks. This is possible if the aim is to make extensive use of AI already during this planning period.

4.3 Increased use of consumer cloud services in university activities

The number of IT services generally available to consumers is constantly growing, and many would like to use the services they have become familiar with in their free time at work as well. The operating logic of consumer services is transferred to services produced and used by organisations. Users' expectations of the basic level of services are changing. The ease of use of consumer services is a reference and default value for the services provided by the university.

Through their functionality, both consumer services and commercially available services aimed at organisations in general can facilitate work or study and, in particular, be attractive in terms of availability. The university's administrative and IT functions must outline when these services can be used and when they should be avoided. The reasons to avoid use may include, for example, the need to control the use of information assets under certain agreements, the need to protect special information, such as confidential personal data or unfinished innovations, or the extent of use required by public tendering.

If there are no such reasons, the party planning to procure a new or renewed service must consider whether a consumer service or a commercially available service would be a sufficiently good and cost-effective alternative to a tailor-made service. One example of alignment needs is the acceptable publishing and recording services of video material produced by the university.

4.4 User interfaces used with different devices

Users expect the services to be available smoothly on a wide variety of terminals and operating systems.

Students are increasingly using their own devices. The same trend may also apply to staff. So far, it has been necessary to provide centralised maintenance for staff equipment, but it cannot be extended to support devices owned by the staff. It is highly likely that the terminal equipment will develop during the period under review in such a way that centralised support is not needed, and the use of own devices increases. This will allow existing support resources to be directed to more university-specific research and teaching needs.

When designing new information systems, it is already possible to take into account the use of mobile devices with touchscreens. Due to the scarcity of resources, upgrading of old systems for smooth use on mobile devices is done only in special cases. In addition to the various devices, accessibility requirements must also be taken into account in the design of the user interfaces.

Voice control and three-dimensional environments (e.g. VR glasses) are likely to become more common during the strategy period. The potential of these technologies in education and research is already being tested. The evaluation of the best solutions and their commercialisation for general use is slower.

4.5 Focus on the user experience and the culture of experimentation

IT services are provided by an even wider range of different actors. Within the university, the responsibility for the development of services lies primarily with the University services and specialised service units, but services based on digitalisation are increasingly also produced in academic units. New types of actors will also be involved through national and international cooperation aimed at synergies. Collaborators need to be considered in the architecture (e.g., system compatibility and interfaces) and service management. In services that concern the whole organisation in particular, the responsibilities of the owner at different stages of the service life cycle and service management work are emphasised, which requires more resources than at present.

Network-based and platform-based activities, in which actors switch from service providers to consumers and vice versa, are increasing. The users of the services are the units and departments of the university, and the university staff and students. The definition of the service needs is done in cooperation with the service provider and the technical implementer.

The units must move from their own separate information system services to services driven by the overall needs of the user. The digitalisation of services must focus on streamlining the targeted processes and adapting information systems to user needs. The aim must be to have the best possible user experience. Although the services include different technologies and parts produced in different ways, it must be visible to the user as one single service. This is aided by a jointly planned service path that describes all the points where the interaction (physical, virtual) between the user and the university takes place in order to implement the service.

The culture of experimentation and continuous improvement supports user-driven development and must be systematically strengthened in all development work. Lean expertise must be increased and used more in service, process and system development. Modern, user-oriented and value-oriented service development is supported by strengthening the activities of different knowledge communities (Digihub, teams, networks).

User-driven methods have been used in the development of network services and this practice needs to be strengthened. The final users of the services must be involved in all the phases in the project groups and their management. The goal in all services must be a smooth and effortless user experience.

4.6 Involvement of users and units in deciding on services and projects

In the development of IT services, various customer parties must be better involved in discussing the content, prioritisation and financing of the service and project portfolio. At the same time, service units are challenged to understand their customers' operations and needs better.

As a solution, the IT Center is developing a model in which the services it provides are divided into three different types of service areas:

1) Basic services for all university staff and students
2) IT background services for the university
3) IT services for campuses and units

Each service area can be viewed, managed, and resourced in the way that best suits them. Within the service area, priority will be given to the development and termination of existing services and the provision of new services for each service area within the budgeted and available resources. When customers need a broader service, it can be implemented with their funding. Those with the greatest interest and resourcing power in the services in question are involved in decision-making and guidance.

5. IT infrastructure as an enabler

During the strategy period, the focus of infrastructures will shift from in-house data centers to external services provided by academic partners such as CSC and commercial cloud service providers. Of course, the need for our own data centers will not disappear, but there will also be no need for expansion.

Models need to be created to determine the carbon footprint of the services produced by the university itself in order to achieve carbon neutrality. It is also necessary to look for partners and suppliers who are committed to a similar goal and are able to demonstrate their success.

There is a need for the development of data management and related services, especially for the needs of research, but also for administration and teaching, as well as for strategy. These needs are only partly investment-oriented: there is also significant development of skills and competences, policy changes and policy guidance in both the academic and service sectors.

5.1 Services are built on stable basic infrastructure

Well-functioning digital services require a sustainable IT infrastructure. The infrastructure referred to here consists of server and storage services, communication, workstation services and systems that enable technical information security, user administration, messaging, data transfer between systems or serve as developing platforms for content production, cooperation and services.

It includes a significant number of hardware, software, suppliers and contracts the management of which ensures the smoothest possible operation, manages assets and reduces risks. The administration and development of basic infrastructure is the operational work of the IT Center, so this chapter does not go into the details of the technology, but outlines the main principles and priorities of infrastructure development.

The university's IT infrastructure is developed on the basis of the following basic principles:

- Information security solutions ensure the ability to meet regulatory requirements and reduce the risks of security breaches and the financial and operational damage they cause.
- The adequacy and reliability of the capacity of basic services are taken care of proactively and thus enable the most trouble-free operating environment possible.
- Stable functionality is sought in the services, e.g. ensuring that investments are implemented on schedule, using up-to-date and secure applications and software, and investing in staff skills.

- The integrity of the data, including storage and backup solutions, is ensured in accordance with the guidelines of the party responsible for the data, taking into account the requirements of the legislation. The same party must be prepared for the costs of these.
- Equipment and service choices take carbon neutrality into account in accordance with the university's strategy.
- Investments will be made primarily in common or technology-based infrastructures, so that their core capabilities (equipment, experts) are centrally funded and users pay for the additional capacity they need for their own use.
- The technology architecture and its principles, as well as the recommended components, are maintained and developed as needs change. In solutions that deviate from these, the system owner must be prepared to procure a maintenance service from outside the university.
- A sufficient number of external contractors ensures the flexibility of services, the ability to meet current needs and competitive pricing.

5.2 The importance of cloud services is growing

The University continues its previously adopted policy by acquiring cloud services from more than one supplier, i.e. the so-called multi-cloud strategy is in use. This ensures a competitive level of costs, the possibility of choosing the most suitable platform service for the user's needs, and improves operational reliability. The downside is the need for wider expertise and contract management. It is essential to keep the service package described so that it is easy for the user to choose the option that suits them best.

The use of cloud services must be directed to selected contractors to ensure visibility of the university's assets and data. In this way, even in exceptional circumstances, the potential problem situation can be brought under control by agreement.

Particularly in the case of the renewal of administrative systems, the primary option must be the purchase of a service as a cloud service, especially when this is not a system tailored to the needs of the university and the costs do not increase significantly. This will contribute to shifting the focus of expertise to the specific needs of research and teaching.

The cloud services needed for research and teaching are partly produced by the units themselves, but as far as possible strongly utilising the services offered to academic organisations at national level (e.g. CSC, Finnish Social Science Data Archive) and at EU level (e.g. EOSC, numerous research data repositories). The range of services is complemented by commercial cloud services. The University of Helsinki will continue to play an active role in the development of national services. The services of several different providers must be assembled into an easy-to-find package for university staff and students.

It is worth noting that switching to cloud services will not reduce the overall cost of IT as such. The use of cloud services, and in particular the growth of use, should always be considered as a strategic choice. Based on the chosen strategy, it can be decided which needs and why are covered by self-produced services, and when to use external cloud services.

As the need to use technology increases, there will be more situations in which the user, when choosing the infrastructure, will have to consider how the choice will affect their work in the future. In addition to user needs, the selection is guided and regulated by the requirements of the funders,

legislation (the Act on Public Procurement and Concession Contracts, General Data Protection Regulation, Act on Information Management in Public Administration) and the university's decisions related to the enterprise architecture and management of digital assets.

5.3 Local computing infrastructures supporting research and teaching

For as long as research and teaching needs require, a local computing infrastructure will also be produced, where software and methods related to scientific computing and data processing can be developed and tested. Funding for such a common, possibly campus-specific core component will be provided centrally, both in terms of equipment investment and labour input.

The centralised IT infrastructure will be implemented in such a way that it can be expanded by the units and research groups, using the selected technologies and competitive purchase contracts. Centralised management of the common IT infrastructure will lead to a more efficient use of resources and a more even distribution of investments on an annual basis.

The common IT infrastructure and the services based on it are developed in cooperation between the units that use them and the IT Center, ensuring that the infrastructure is sufficiently managed and in accordance with the architectural principles.

The use of the centralised IT infrastructure is guided by a common university-level usage policy and based on the Fair Share principle. Those units that have made their own efforts to expand the common infrastructure will, whenever necessary, have access to the capacity for which they originally paid.

The IT Center provides support and training related to the utilisation of centralised environments and tools for scientific computing, but support for the use of methods and data management is most sensible to organise within the discipline (cf. Helsinki Institute for Social Sciences and Humanities HSSH).

5.4 Data management and utilisation

Research data management

One strategic goal of the university is to make research data openly available to researchers, education, and society. Achieving this goal requires services and guidelines throughout the data life cycle to make the publication of data materials easy enough for researchers. Work on data policy reform began in spring 2021, with the aim of completing it by the end of 2021. The guidelines for the new data policy will be considered in more detail in the next update of this document.

The university has significant gaps in services covering the entire life cycle of data, especially in the processing of sensitive or otherwise protected data and in long-term data storage solutions. Initiating even the most necessary development activities requires resourcing decisions so that research in certain disciplines is not hindered. Here, too, there is a need to seek a funding model in which the enabling part of the common infrastructure is paid centrally and the expansions are paid for by the user. When using external services, the invoice is directed to the party using them.

A national solution is primarily sought for long-term storage, but if there is no service that meets the needs, at least provision must be made for the implementation of temporary solutions so that valuable data is not lost.

Enabling data management

In discussions on opening and sharing data, research data has been a primary area of interest. Still, there is also a need to develop services for data generated in management, especially the data used in reporting. The Act on Information Management in Public Administration also requires the provision of interfaces to public administration data. This aspect should be taken into account when developing the data warehouse service.

In order to ensure data-driven decision-making, the integrity and quality of the datasets to be utilised must be ensured. The related processes and practices still require the development of architectural level and practical work.

The data is utilised in the automation of university services and service processes, creating smooth and easy-to-use service paths for service end-users. Automation and software robotics reduce the amount of manual work, and artificial intelligence methods are also utilised in monitoring and maintaining infrastructures.

Facilitating data analysis

To facilitate data analysis, platform solutions (data science platform) will be introduced, with which data modeling and, for example, utilisation of machine learning algorithms is possible with less workload. There would be obvious use for this type of platform within the university in terms of teaching, research and administration. The assessment of the platform options together with the research units and the piloting to the wider university community must start at the beginning of the strategy period.

There is also a strong demand for data analytics expertise outside universities and research institutes, so it is important to continuously strengthen the relevant capabilities.

5.5 Automation in infrastructure management improves efficiency

Infrastructure virtualisation enables the programmatic management of physical infrastructure components and capacities. Virtualisation enables more efficient and comprehensive utilisation of infrastructure. It creates the conditions to automate the processes by which resources are provisioned, managed, and used. As the degree of automation increases, an increasing number of capacities and a larger number of services can be more easily managed with the same – or even smaller – number of maintenance staff. Increasing the degree of automation requires the standardisation of services and new expertise in the development of automation.

Infrastructure choices must favour systems managed by programming. This will reduce the amount of manual work, enable full use of cloud services, improve information security, and bring flexibility to the delivery of new technological services. The transition phase is long, due to the long life cycle of previous investments, for example, and because it takes time to develop the skills required for the transition.

5.6 Virtual desktops complement workstation services

In spring 2021, there were more than 17,000 devices in the centralised maintenance of the workstation service. Continuous evaluation, optimisation, and automation of maintenance-related methods are necessary to achieve cost savings or prevent cost increases. During the strategy period, a cloud-based terminal management and maintenance model will be introduced in the workstation environment.

In addition to the traditional terminal environment (workstations, tablets, telephones), the university utilises virtual solutions. These seek to increase the efficiency and flexibility of the use of resources and enable secure ways to utilise university resources in remote working, special research needs, to enable teaching and learning independent of time and place, and in the secure use of administrative information systems. The virtual desktop solution also enables the analysis of larger amounts of data from workstations with familiar applications, without taking time to transfer data over a communications network or to perform the analysis of sensitive data in a secure manner. In order to avoid wasted investment in the utilisation of virtual desktops, small experiments are made and only those services for which there is a clear demand are commercialised.

In addition to personal terminals, maintenance requires a growing number of facilities related to facility control, which must identify users and have a close connection to the university's key infrastructures. When purchasing these devices, a complete service must be obtained from the supplier, which also includes taking care of information security updates for the devices.

6. The multifaceted role of IT governance

IT guidance is needed throughout the strategy period for both regulatory and operational benefits. The monitoring and implementation of increasing legislation – such as the General Data Protection Regulation, the Act on Information Management in Public Administration, the Act on the Secondary Use of Health and Social Data and the Act on the Provision of Digital Services – as cross-unit

cooperation requires knowledge and resources. The implementation of the obligations of the Act on Information Management in Public Administration will be implemented gradually by 2024, starting with the implementation of the information management model and the creation of a data governance model. We have to choose in which situations we want to be the best, and when it is enough that only the necessary requirements are met.

As the number of digital services increases and they are scattered globally to different cloud services, the importance of the enterprise architecture will also increase. In order to avoid cost increases and uncontrolled fragmentation, an objective must be planned and updated for all components of the enterprise architecture (EA).

The enterprise architectural work must include a user experience assessment and development approach that not only recommends but also guides. EA and quality reviews must be performed already during the project and the findings must be corrected before the project is completed. One common and jointly managed service development portfolio must be compiled for the university.

The asset and risk management perspective will be emphasised more in the future. Information security and protection are taken care of in order to comply with strict legislation as well as because the shortcomings in them can significantly damage the university's reputation and research conditions. Information security principles and responsibilities may not be well known at the unit level, and awareness needs to be raised in this regard as well. A mandatory information security course for all university staff and students improves individual-level awareness and competence.

Nearly 600 existing information systems have been described in the university's application portfolio, of which more than a hundred have been described as being of great importance for the university's operations. In addition to the previously mentioned Sisu study information system, these include, for example, library systems, SAP, the research information system, the university's public website and the Flamma intranet. The life cycle of these systems is typically long, often more than ten years.

In addition to operational requirements, the choice of renewal time is affected by costs. A model for cost monitoring of existing key information systems needs to be developed. It must be regularly assessed when cost benefits will be achieved either by changing the system or its maintenance model to a cloud-based, for example.

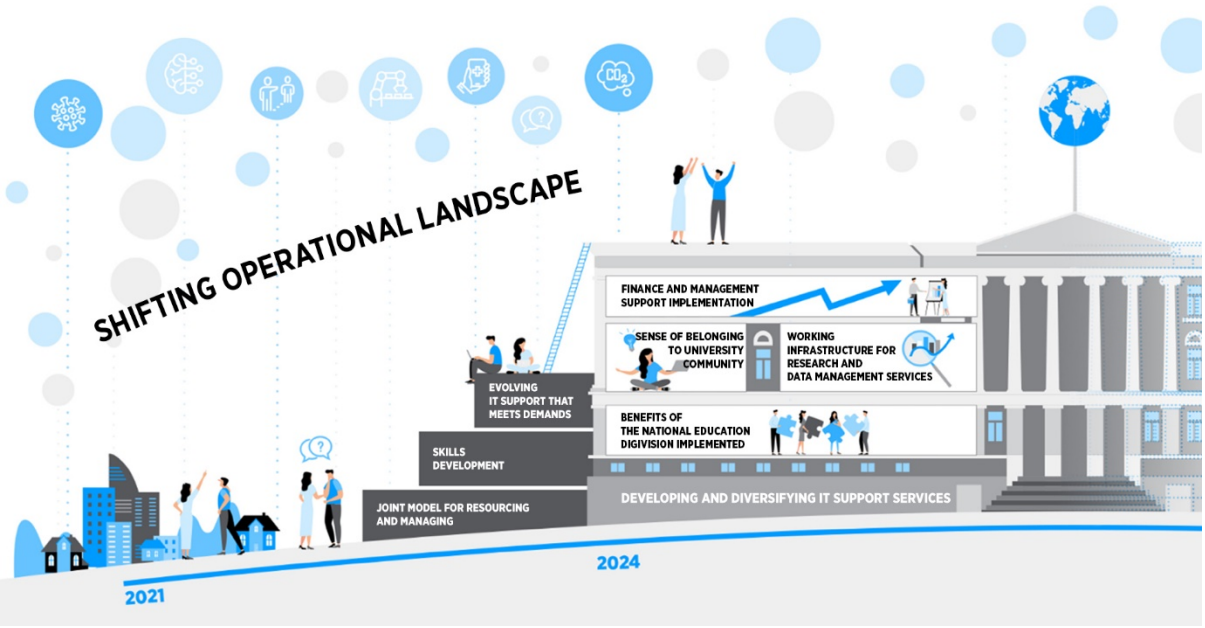
Continuous monitoring is also required for the management of the university's licence assets. Software licences that are widely used in different units are often worth bundling and acquiring together reducing the total cost at the university level. However, in the future, a clear mechanism is needed for which licences are purchased for the whole university as so-called campus licences, as the purchases of campus licenses are paid centrally.

Cost calculation and evaluation must also be performed for self-produced services. These are compared with other academic actors in collaboration with around 50 European universities according to BencHEIT ("Benchmarking higher education IT”) each year.

The importance of active cooperation with the information technology units of other academic institutions will continue to be important. Key networks include FUCIO (IT managers of Finnish universities) and similar supranational organisations such as NUAS (Nordic), EUNIS (Europe-wide) and EDUCAUSE (USA). In addition to the exchange of information, cooperation also involves advocacy work, the development of common services and guidance (e.g. CSC, FUNET) and, where appropriate, purchase cooperation.

7. Where will we be in 2024?

As stated above, the ten-year timeframe for information technology development is so long that the plan needs to be updated several times during the strategy period. Proposals have been selected for this chapter, the implementation of which should start immediately at the beginning of the strategy period, in order not to slow down and complicate the achievement of the objectives.



7.1 University digital services as part of the university community

The exceptional situation caused by the COVID-19 pandemic transferred almost all teaching and working to online services. A balance between attendance-based and remote cooperation will continue to be refined in 2024. The digitalisation and automation of service processes will continue, and self-service will deliver both cost savings and a positive service experience. Smooth digital services also leave more time for genuine presence and collaboration, promoting community spirit. The challenge, however, is how the students and employees of the university find the same sense of continuity of academic tradition in digital operating environments that previous generations have felt as they walk through university buildings.

The emergence of a “digital” sense of being part of the university requires:

- Even stronger user involvement in all digitalisation projects and system upgrades. Improving the user experience is considered as a single service, which, in addition to the system's user interface, includes improving the processes across unit boundaries. The best user experience is created when the system does as much as possible on behalf of the user.
- The number of user interfaces, systems and services is growing and the related changes are continuous. The resulting cognitive burden should be minimised by streamlining user interfaces and simplifying processes. Evaluation and development of the user experience is part of every system project and there are common indicators for its continuous monitoring and evaluation.

- When developing digital tools and processes, their necessity and total cost are assessed, taking into account the additional workload that they may cause to users.
- In particular, the systems of cooperation shall be subject to continuous monitoring and evaluation of their suitability. Recommended and popular environments may vary from unit to unit, but the need for an environment perceived as common by the whole university is also constant. In the next wider reform project of Intranet Flamma, the aspect of community support will be raised, as will other related network service reforms.

7.2. Working research infrastructures and data management services

In 2024, research and teaching will have a clear set of services from which to choose the local, partner or commercial service provider capacity as required. The researcher will receive the support they need for both methods and the use of technologies in way required by their discipline. This is made possible by the following measures:

- The university's own research IT infrastructures and related management are centrally funded at the core, and the units can acquire the additional capacity they need by expanding these infrastructures. Confidence in the creation of common infrastructures is achieved through commonly agreed operating policies and by ensuring the amount of use corresponding to the contribution. IT infrastructure investments or similar service purchases are part of the units' investment and purchase plans.
- The utilisation of machine learning and artificial intelligence in both research activities and support services is developed in cooperation with academic actors and service units. The experiments help to refine the overall picture of the required services and platforms.
- Establish campus and/or discipline-based units to assist researchers, at least as part of their job description, in data analysis and management issues. The support service units (IT Center, Helsinki University Library, TUTTO) work closely with these units, ensuring the transfer of information and good practice.
- The reform of the research data policy and its implementation plan will be completed, and the owner party will be assigned to data management and its services and development.

7.3. Benefits of the digivision of the national education implemented

All Finnish universities and universities of applied sciences have produced a common digital vision for teaching, the purpose of which is to “support learners' learning throughout their lives and enable the development of pedagogy and the renewal of higher education institutions. In 2030, Finland has an open and recognised learning ecosystem that also provides a platform for research and innovation activities, benefiting society and working life extensively.” The realisation of the vision requires strong cooperation between different actors, and in addition, the university must-consider how the results of the work will be utilised and used in the university's own activities. In 2024, the implementation of the digivision is still at a fairly early stage, but in order to use the benefits, it is necessary:

- Adequate resources must be allocated to support changing teaching.
- Active participation in the digivision project has an impact on the implementation of the key goals and needs of the university and the implementation of the benefits.

7.4. Developing and diversifying IT support services

Making full use of digitalisation requires knowledge and learning from both service providers and service users. The increase in the number of systems and users will lead to an increased need for support, which must be met by means other than increasing the number of staff. The applicable measures are:

- utilisation of artificial intelligence in various service channels (e.g. multilingual chatbots)
- easy-to-find and understandable instructions, videos, and so on.
- added self-service tools combined with automation
- experiments with different forms of support on campuses and extending good practice to more general use.

7.5 Finances and management in support of implementation

The university's current funding model does not have the kind of centralised funding that could launch large-scale joint development projects. This has been an obstacle to many joint development projects (such as confidential data services) that could not be promoted in the absence of resourcing decisions. The situation needs to be rectified. Funding decisions must be accompanied by a prioritisation process involving the various stakeholders, thus ensuring that funding is used for the most appropriate projects for the university. Options for resolving the situation include:

- Reducing the unit framework and allocating co-financing to development projects. The financing of the production phase is agreed in accordance with the ‘user pays’ principle.
- Proposals for development are dealt with in the units, and each unit will decide on a case-by-case basis to what extent they wish to contribute to the costs of the project and the exploitation of the final result.
- Each unit decides and finances its own projects and their production phase, rather than pursuing more common services.

In addition, it would be necessary for Operations Management to take IT issues into account more broadly than just as a data protection risk, as is currently the case. It is important for the units to identify the investment needs of their own systems and equipment. IT development should be separate issue to be considered, much like facilities plans, for example.

7.6. Reducing risks and improving compliance

Both increasing regulation and the growing threat to information security and data protection require efforts to protect digital services and data. The key measures already at the beginning of the strategic period are:

- Monitoring and influencing legislation, and making implementation plans.
- Making the necessary investments: common requirements of many Acts are the validation of user authentication (MFA), verification of changes to systems (log services) and ensuring data integrity and preservation, among others.
- Raising the level of competence of the users through the use of the information security course.
- Communicating information security responsibilities to unit management and system owners.
- Design of infrastructure solutions minimising information security risks.
- Establishment of an intrusion detection monitoring system, in particular for key systems.

7.7. Prioritising and managing projects together

As the university's financial situation looks tight in the years to come, it seems that IT projects in different fields and independent institutes will end up competing for declining funding.

- A new model for project prioritisation and funding decisions is needed, in which funding and prioritisation decisions for large projects are taken together. The decision-makers are representatives of the administration, specialised service units and academic management. This is the only way to achieve the needed better customer guidance for projects.
- At the same time, the overall financial perspective in project preparation needs to be strengthened.
- Once completed, the projects must also be subject to post-project assessments, particularly post-project financial calculations, stating whether or not the intended benefits have been achieved.

8. Plan management, monitoring, and updating

This plan has been prepared for the entire strategic period of the university. **However, the most concrete development proposals are for the next years, 2021–2022. The plan will be regularly updated throughout the strategy period so that new development proposals reflect the current situation regarding the strategy's progress and the response to external changes.** The update cycle includes monitoring the plan and reacting if a pace of progress is not desired or possible.

As part of the implementation of the plan, **impact analyses** on the effectiveness of the measures in research and teaching can be carried out, if necessary. In addition, **indicators** can be defined at a later stage to show how the objectives have been achieved.

The plan is monitored and updated in the following cycle:

Annual evaluation round from 2022 onwards

- The IT Center evaluates the progress of the plan's proposals and reports to the IT Center Board, the University services management team and the digital steering groups (research and teaching groups).
- If obstacles to progress are identified, the IT Center will raise them in the evaluation round and decide on the necessary measures to remedy the situation.

Every two years, in addition to the previous one, the plan will be revised from 2023 onwards

- Communicating the progress to the university community, opportunity for comments by the university community.
- Slight specifications to the contents of the plan, if necessary, and possible new proposals to support the objectives of the strategy.
- Updates with the same decision chain as the original plan (IT Center board, university management team).
- The refinement round will take place in the autumn when comments and areas for development on the plan can be taken into account in the implementation plans.

Years 2024 and 2028 preceding the change in the action plan period

- More extensive updates regarding the content and suggestions of the plan.
- Evaluation and reporting as well as plan updates with the same decision chain as the original plan (IT Center board, university management team).
- The update will take place in the autumn when comments and areas for development on the plan can be taken into account in the implementation plans.

Responsibilities/roles:

The IT Center is responsible for promoting the plan for its own operations and cooperating with other responsible parties. The key is to identify and develop the necessary capabilities and to provide adequate resources.

University services and other service units are responsible for promoting development targets for their own operations.

The board of the IT Center shall receive annual reports on the implementation of the plan.

The university management team approves proposals for refining and updating the plan.

Academic units are responsible for the systematic prioritisation and resourcing of development work and special services necessary for their own activities in cooperation with other units of the university in accordance with the guidelines of this plan. They provide feedback and development suggestions in the context of plan update rounds.