



Action Plan for Digitalisation in Higher Education and Research

2019-2021

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1 Introduction

In autumn 2017, the Ministry of Education and Research presented its Digitalisation Strategy for the sector of higher education¹. The strategy describes goals related to digitalisation and structural changes. The establishment of three new administrative agencies is necessary to improve the implementation capacity.

The Digitalisation strategy points out that the greatest returns are expected to result from the collaboration between the institutions and the new Directorate for ICT and shared services in higher education and research - Unit². Unit's responsibility for higher education and research covers the entire sector of knowledge, and the goals also apply to the health sector and the research institutes.

In collaboration with institutions and representatives from the involved sectors, Unit presents an Action Plan for Digitalisation in Higher Education and Research. The plan is created to follow up the intentions and achieve the concrete objectives stated in the Digitalisation Strategy. The Action Plan incorporates guidance from other governance documents. The national goals for research and higher education are the main objectives for digitalisation and ICT:

- High quality in education and research
- Research and education for welfare, value creation and adaptation
- Good access to education
- An efficient, multi-faceted and robust sector of higher education and research system

The Action Plan applies to higher education and research, as well as research institutes and the health care sector, where its relevant.

1.1 The distribution of work and responsibility

To successfully achieve the goals set in the Digitalisation Strategy it is necessary to have a coherent distribution of work. That will enable us to take advantage of the combined capacity of the national actors and the institutions engaged in higher education and research. We must set up standardised shared services at the same time as we take advantage of the user-centric innovation generated in the institutions. Shared services must provide platforms with programmable interfaces that facilitate digital transformation through simple, nimble and effective services. This will lead to a broad collaboration with business and industry in respect of innovation, like several institutions already enjoy today.

The universities and university colleges have academic freedom within education, research and innovation, and they have special administrative and organisational authority. It is essential that we protect this freedom, but in the same time use the innovative power for the common good.

Higher education and research have experience through several decades of cooperating on shared services. Cooperation on all levels, from the users to the management, creates a shared understanding of needs. This yield gains such as lower investment costs, economies of scale, reuse/co-use, a better negotiating position as a large-scale buyer, and knowledge sharing.

¹ Digitalisation Strategy for the higher education sector 2017-2021, the Ministry of Education and Research: <https://www.regjeringen.no/en/dokumenter/digitalisation-strategy-for-the-higher-education-sector-2017-2021/id2571085/>

² Unit's Articles of Association <https://www.unit.no/units-vedtekter>

Unit is responsible for the management of ICT and digitalisation at the sectoral level. Unit will follow up and coordinate digitalisation work and provide services to the institutions. Together with the institutions, Unit bears the responsibility for implementing and further developing the Digitalisation Strategy and the Action Plan.

Diku (Norwegian Agency for International Cooperation and Quality Enhancement in Higher Education), NOKUT (Norwegian Agency for Quality Assurance in Education), the Research Council of Norway, Uninett, NSD (Norwegian Centre for Research Data) and Unit, all play an important part in the digitalisation work. They provide financing, service provisioning, infrastructure, and perform national tasks related to quality development and quality assurance in education and research. Cross-sectoral cooperation is imperative, especially within research. Goal-oriented collaboration is a key factor in the realisation of the Action plan.

1.2 Dependencies and interdisciplinary activities

Several of the initiatives in the Action Plan draft involve dependencies that must be given priority in relation to one another to prove gainful. Several initiatives will also be significant across target areas, e.g. initiatives related to digital skills, data security and data protection, as well as access management and integration architecture. The organisation of joint procurement is an absolute prerequisite for success for the procurements described.

1.3 Digital skills

In order to successfully make genuine advances and promoting development across target areas and initiatives, skills upgrading is a key criterion. The work involved in skills upgrading must address the general needs for competence that are interdisciplinary, in addition to those that are subject-specific. The institutions bear the main responsibility for digital skills at all levels in their undertakings and among their users, and must define their needs clearly.

1.4 Annual revision of the Action Plan

The Action Plan will run for a three-year term and will be revised annually. This document is the first version and covers the period 2019 – 2021. It was drawn up for endorsement by the Digitalisation Board for Higher Education and Research in April 2019. The institutions have participated through the expert committees and the editorial committee. All universities, university colleges, regional health authorities and research institutes were invited to provide input for the draft document. The Action Plan will be revised for the first time by engaging in a similar process in spring 2020.

2 Strategic choices and priorities

The goals set in the Digitalisation Strategy are ambitious and comprehensive. The Action Plan describes the total scope of the initiatives needed to achieve the goals. Achieving all the goals will call for significantly more resources and greater capacity than what is available in the sector at this time. The goal of presenting a comprehensive list, and thus more than what the sector may accomplish during the plan period, is to place the initiatives into a general framework. Several of the initiatives are expected to take significantly longer time to achieve, meaning they will extend beyond this plan period (2019-2021).

Projects and measures priority will be determined in the portfolio management in the Digitalisation Board. Prioritisation will be based on the needs of the sector and the institutions, annual financial parameters, governmental letters of allocation, and guidelines from the Ministry of Education and Research. Some of the measures are outside the Digitalisation Board's authority, at the same time as they are important for bringing the strategy to fruition. This applies *inter alia* to measures whose achievement depends on the institutions, and measures that depend on decisions and priorities in other sectors.

The targets, measures proposed, and priorities are described for each area. Prioritisation is based on current political policies, existing guidelines and the needs of the sectors and the institutions. The political policies refer to the Granavolden Platform³, as well as from governance documents related to digitisation, and from letters of allocation. The introduction of individual initiatives is based on decisions taken by the Digitalisation Board.

Strategic priorities in the Action Plan are:

- Learning processes of the future
- Open Science
- Improved insight and decision-support
- Foundation for mobility and sharing
- Information security and data protection

The greatest potential returns lie in a good cooperation between the institutions and Unit. A distribution of responsibility is needed to achieve the most efficient and effective implementation possible. The greatest potential for implementing measures that call for comprehensive organisational development lies with the institutions. User participation and user orientation can also best be achieved by the institutions.

To provide a framework for prioritising which services will become shared services, the rule will be that the closer the shared services is to the core tasks of the institutions, the easier it should be to facilitate innovation, local management and local options:

- The closer the solutions are to administrative and support processes, the more standardised the shared services should be. The service should be implemented as platforms that may be used by other services. *Examples: Economy and payroll, archiving, identity and access management (IAM), coordinated admissions services*
- The closer the solutions are to teaching and research, the more flexible, enabling platforms and non-mandatory the shared services should be, thus ensuring a high degree of institutional

³ The Granavolden Platform (government declaration):

<https://www.regjeringen.no/no/dokumenter/politisk-plattform/id2626036/>

autonomy. *Examples: Modular and integration-friendly learning platforms, access to data for reuse, e.g. student data from the Common Student System, data storage, an "app store" offering access to cleared and integrated systems for optional use such as, for example, digital exam solutions.*

Several IT-related political parameters for the public sector have been formulated in different governance documents. This refers, *inter alia*, to the White Paper Digital Agenda⁴, the National Strategy on Access to and Sharing of Research Data⁵ and the annual Digitalisation Circulars⁶. While the Action Plan is to be implemented in compliance with these governance documents, importance will be attached to the following principles:

- User-centric approach.
- Think big, start small through flexible development. Prototyping and testing rather than reports. Use interdisciplinary teams if possible.
- Data once-only: Store data just once and make it accessible for reuse.
- Privacy by design and security by design.
- Ensure access management to data and resources.
- Cloud first: Where there are no impediments to adopting cloud services, and such services offer the most practical, cost-efficient solution, the public sector should opt for cloud services.
- Active use of markets which can do better and more efficiently than the public sector.

⁴ Digital Agenda, Report No. 27 (2015–2016) to the Storting: Digital Agenda for Norway in brief — ICT for a simpler everyday life and increased productivity <https://www.regjeringen.no/no/dokumenter/meld.-st.-27-20152016/id2483795/>

⁵ National Strategy on Access to and Sharing of Research Data <https://www.regjeringen.no/no/dokumenter/nasjonal-strategi-for-tilgjengeliggjoring-og-deling-av-forskningsdata/id2582412/>

⁶ Digitalisation Circular: <https://www.regjeringen.no/no/dokumenter/digitaliseringsrundskrivet/id2623277/>

3 Education

3.1 Targets

Students should

- encounter activating and varied forms of learning and assessment, involving the use of digital technology (MU1)
- experience data and technology integrated into subjects to promote digital education, including the limitations and implications of using technology (MU2)
- have access to modern, individual learning environments that facilitate individual learning programmes and cooperative learning, and offers flexibility (MU3)

Teachers should

- have digital and educational competence in a culture of cooperation and sharing (MU4)
- experience a wide range of applications, digital tools and services that support the process of education (MU5)

Administrators at all levels should

- include digitalisation in measures and processes to reach the institution's goals (MU6)
- pave the way for the research communities to support the use of digitalisation to improve the quality of education (MU7)
- have good access to education-related information and decision-making support (MU8)

3.2 Initiatives

#	Description	Target code
U1	Improve and renew learning processes through digitised forms of learning. Facilitate infrastructure for better teaching and learning. Increase production and the sharing of digital learning resources.	MU1 MU2 MU5 MU6 MU7
U2	Further develop the opportunities offered by digital assessment in keeping with the needs of the research communities and as support for active learning, teaching and assessment.	MU1 MU5 MU6
U3	Implement measures to increase digital competence based on the needs of the academic communities and institutions and pave the way for sharing learning materials. Establish common platforms for storing and sharing examples of good practice from universities and colleges.	MU4 MU7
U4	Learning analytics - big data about the teaching and learning processes give insight into activities that provide grounds for continuous improvement of teaching at several levels and enable data-driven educational research.	MU1 MU5 MU8
U5	Optimise the academic administrative processes and solutions for student support and academic planning.	MU1 MU5 MU6 MU8
U6	Streamline and improve the admissions processes and solutions .	MU3 MU6 MU8
U7	Make the next generation national education platform an open ecosystem for services. Define the terms, in university collaborations, for the further development of today's platforms in the short- and mid-term.	MU3 MU5

3.3 Priorities

The following political policies are used as the basis for setting priorities for measures in the field of education:

- The development of digital learning resources and flexible teaching programmes, the introduction of digital assessments and examinations.
- The relevance of work experience in education, e.g. cooperation between workplaces and institutions of higher learning, work experience during studies, more innovation and entrepreneurship in higher education.
- The Competence Reform "Lifelong learning" points to the need to develop flexible offers of further education. Encourage better cooperation on digital competence between working life and educational institutions.
- Greater student mobility calls for simpler administration, for the students as well as for the institutions.
- Service chains across services and sectors will benefit the citizenry and business and industry through goals to achieve more effective public administration, as described in the Norwegian government's emphasis on digital first choices. Annual requirements for efficiency through the ABE bureaucracy and efficiency reform.

**Priority: Learning processes of the future
(initiative U1, U2, U3 and U4)**

The initiative combines important requirements and expectations on the part of students, institutions and authorities through selected parts of the four initiatives.

- Promote better learning through new, digitalised forms of learning and assessment that also support lifelong learning and digital mobility (U1, U2).
 - Provide processes and shared solutions to increase production and the sharing of digital learning resources (part of U1)
 - Provide processes and shared solutions for summative and formative digital assessments (U2)
 - Establish shared solutions for synchronous video instruction (e.g. webinars and streaming). Collaborate on developing/designing technology-rich teaching arenas for student-active forms of learning.
- Enhance digital competence: Collect research and documentation on good practice, examples and ideas for digitisation, and then establish a platform for sharing courses and examples of good practice:
 - Enhance the digital skills of employees in the sector of education in general (A5, F2)
 - Enhance the digital skills of teachers; provide more details about the use of technology in learning (U3)
 - Acquire a shared solution for documenting educational competence (U3)
- Establish a shared solution for collecting and analysing data on learning that gives teachers, students and administrators better insight into the learning processes, while providing data for further research on the educational processes (U4, contributor to A5)

The individual institution is responsible for implementing subject-centric solutions and innovative projects. To enhance the effect of measures, one should determine what may be a common denominator for several or all the institutions, where possible. Joint initiatives may be managed by one or more institutions, or by a national actor such as Unit.

Digital competence is a component of the educational expertise that the individual institution is responsible for developing. Unit's role is to coordinate what may be shared and to find technical solutions for sharing good practices and examples.

Diku has a system of instruments to promote educational quality that is designed to support the learning processes of the future. The institutions could apply for funds from Diku to develop such learning processes. Diku will also take initiatives for surveys and the sharing of lessons learned of relevance for the development work.

**Priority: Simplified academic administration and student admission
(initiatives U5 and U6)**

This is part of the strategic priority *Foundation for mobility and sharing*:

- Develop standardised interfaces for the reuse of data, making it possible for institutions and the market to develop integrations and applications. This is a prerequisite for several comprehensive user migrations for students across systems (U5 and U6)

- Modernise processes and solutions organised for coordinated general admission, admission to further education and other general admissions (U6)
- Identify opportunities to simplify and enhance the efficiency of processes and solutions for mobility and international student exchanges (U5)
- Continue working on Arbejdslivsportalen (Education to Work life portal) (U5)

In academic administration and student admissions, one should strive to achieve a high degree of shared solutions across institutions.

Initiative U7 is not a priority in this phase (2019-2021), but is included in the measures because the existing platforms are being opened to third parties, and investments are being made in basic infrastructure through initiatives related to infrastructure, middleware and data.

4 Research

4.1 Targets

Researchers in higher education, health, and at research institutes should

- have access to research publications, research data and public data as the basis for their work (MF1).
- make research results (publications, data, etc.) easily retrievable and make them as available for reuse, as possible (MF2).
- have access to a clear, user-friendly set of services that supports both academic and administrative tasks (MF3).
- have access to services that make it possible to effectively interact with other researchers across disciplines and sectors, nationally and internationally (MF4).
- have access to instruction that leads to the expertise needed to exploit the services optimally (MF5). efficiency

Research managers at all levels should

- have good access to information and to the information needed for making decisions (MF6).

4.2 Initiatives

#	Description	Target code
F1	Professionalised research support. Support services that simplify every step of the research process and ensure that registered information can be reused.	MF3
F2	Shared educational programmes. Researchers and administrators shall find the help and guidance they need easily, when they need it.	MF2 MF5
F3	Services to support cooperation. Researchers should be able to collaborate with colleagues nationally and internationally simply and seamlessly, and across disciplines.	MF4
F4	Coordination supporting Open Science. Measures to promote Open Science are coordinated with the institutions in a manner that helps to boost the aggregate effect, and involves all stakeholders.	MF1 MF2 MF3 MF4 MF5 MF6
F5	Open publications. All Norwegian research publications are to be openly accessible by 2024 (Open Access), and Norway shall contribute to the international work to ensure that this also takes place at the international level.	MF1 MF2
F6	Making research data available. Research data from Norwegian research institutes shall comply with the FAIR data principles (findable, accessible, interoperable and reusable).	MF1 MF2
F7	Access to public data. More effective routines for researchers who require access to public data as grounds for their research.	MF1
F8	Shared services for storage and calculations. Ensure researchers and others have access to generic services for storage and calculations.	MF3 MIMD3 MIMD4 MIS6
F9	Good reports and decision-making support. Leaders shall have access to the information they need to be able to make good decisions and strategic choices.	MF6

4.3 Priorities

The following political initiatives are used to rank priorities for measures in the field of research:

- Open Science, i.e. making the research more accessible by stimulating more open reporting on research and more open data⁷.
- Simplify the bureaucracy attached to applications for research funding and generally simplify the administrative burden researchers bear.
- Annual efficiency requirements under the ABE reform will also guide the priorities.

Priority: Simplify research administration (Initiatives F1 and F2)

⁷ National goals and guidelines for Open Access to research articles:

<https://www.regjeringen.no/no/dokumenter/nasjonale-mal-og-retningslinjer-for-apen-tilgang-til-vitenskapelige-artikler/id2567591/>

Ensure the most efficient possible use of researchers' time, provide good supervision and make it easy to choose good practice.

These points are part of the strategic priority *Foundation for mobility and sharing*:

- The general roadmap for developing shared services for researchers across university and university college institutions, sector of health and research institutes for better coordination and good communication.
- Good, continuous support services for both research and administrative tasks through all steps in the research process.
- Greatest possible automated retrieval of information and reuse of information between the services to avoid double registration. Establish authoritative IDs (e.g. for individuals, projects and organisational units) to make this possible. Preparations must be made by the various service providers and in the individual institution to begin using them.
- Efforts to simplify office support (log in, email/calendar, etc.) across organisations, sectors and countries.
- Overview of Norwegian research by combining Cristin and a new national knowledge repository. To reuse information as much as possible to reduce the need for reporting.
- Guidances for researchers and support personnel on how to use the different shared services. Establish a national group for cooperation on learning how to use research services.

Priority: Open science

(Initiatives F4, F5, F6, F7 and F8)

Better access to information for researchers, more reuse of research results and data. Higher quality research, transparency in the assessment of research and researchers. Invite the public to partake in the research process.

- Access to services to collaborate on datasets (with different degrees of sensitivity) during a research project.
- Easier access to use public data as grounds for research, including sensitive public data.
- Ample information to everyone through openaccess.no (and openscience.no). Common website for information from the Research Council, Unit and Universities Norway.
- Establish common solutions for the easiest possible completion of data processing plans and cooperate on learning good practice for data management.
- Access to research data (in compliance with access management and the sensitivity of the data) and publications for researchers, business, industry and public administration to be able to build further on earlier research.
- A new type of publishing agreements under which the copyright to publications is not transferred to the publishers.
- Redirect cash flows so that funding for open publishing is available where it is needed. All researchers shall have the opportunity to publish.
- Simple access for everyone to the storage of publications in the knowledge repository.
- Ensure that national services are aligned with international strategies and services.
- Researchers have access to good services for the storage and management of research data, and data from Norwegian research projects complies with the FAIR data principles (findable, accessible, interactive and reusable). As open as possible and as closed as necessary.

5 Management and support services

5.1 Targets

- A joint system portfolio has been established, resolving interdisciplinary administrative needs (MA1):
 - Administrative work processes and user interfaces are improved and streamlined through standardisation and digitalisation (MA1.1).
 - Exploit automation and self-service to ensure services are simple, effective and user-friendly (MA1.2).
 - All services, information and communications are, insofar as possible, digitally accessible (MA1.3).
- Management has good access to information and decision-making support (MA2).
- Administrative employees have the necessary digital skills to perform their duties efficiently (MA3).

5.2 Initiatives

#	Description	Target code
A1	Provide shared services for finances, payroll and accounting through the Norwegian Government Agency for Financial Management (DFØ). The solution shall support business processes in economy, payroll, budgets, orders for payment, receivables for payment and project economy.	MA1
A2	Provide shared services for administrative processing and documentation management. Platform for digitalisation consisting of an administrative processing platform, a core archive with a service interface, data integrations and functionality for the configuration and automation of work processes.	MA1
A3	Provide shared services for strategic HR. The solution will include staff planning, recruitment, reception and start-up, peer follow-up, wage negotiations, working environment development and HR analyses.	MA1
A4	Survey the need for improving administrative employees' digital skills and propose measures. Establishment of a concept for sharing competence.	MA3
A5	Establish technical solutions that enable decision-making support for leaders at all levels, based on data from research, education and administration in cooperation with infrastructure, middleware and data (IMD).	MA2
A6	Provide shared services for office support, project management and client operations, featuring efficient common ways of working and high common user skills, effective interaction across subject areas and economies of scale.	MA1

5.3 Priorities

To support research and education, measures designed to contribute to economisation and simplification will guide the setting of priorities in the field of administration. Modern technology offers opportunities for improving the quality of the administrative and leadership-oriented tasks that are currently characterised by a great deal of manual labour.

The targets point clearly in the direction of shared services and joint systems. There is a considerable potential for improving quality and making more efficient use of resources through standardising, improving and streamlining of work processes and services. Most initiatives entail a continuation of activities that have already been initiated in the sector of higher education. There is clearly a need for coordination and alignment. A high level of activities to establish identical work processes and shared services are being planned and taking place under the auspices of the BOTT cooperation forms the basis for initiatives to establish the new joint solutions designed to be used by the entire sector of higher education.

The work of alignment and involvement will be coordinated by Unit to ensure that institutions outside of BOTT are involved in ongoing processes. The future administrative regimen will be designed as part of the work with a model for service management.

To take advantage of the opportunities that digitalisation offers for reaching the goals of the institutions and the sector, it is important to make concerted efforts to gain better insight and provide decision-making support. The sector needs good decision-making support. Moreover, there is a need for equal access to authoritative data sources required to analyse and build up qualitative and quantitative decision-support systems for both the owner (the Ministry of Education and Research) and for each individual institution. This will enable continuous follow up of undertakings against defined indicators and enable leadership at every level to be a driving force and catalyst for quality and necessary development processes.

**Priority: Shared services for the sector of higher education
(Initiatives A1-A3)**

Shared systems for finances and payroll, administrative procedures and documentation management, as well as strategic HR, will be established for universities and university colleges.

In finances and payroll, the Norwegian Government Agency for Financial Management (DFØ) was chosen as a supplier to the BOTT project. The general rule is that these services will be shared and standardised. There may be local adaptations, e.g. strategic HR and administrative solutions based on significant differences in strategy, needs and the size of the institutions.

To achieve the anticipated gains and use the services effectively, good processes must be implemented to develop the digital skills of the users.

**Priority: Establishing technical solutions to enable decision-making support
(Initiative A5)**

Academic and administrative leadership at all levels needs a forward-looking service for decision-making support, which, as simply as possible, reuses the data. The service must ensure that leaders at all levels have a holistic view across central disciplines (studies, research, leadership and general administration) cf. target MA2. During the current plan period, common data definitions, master data in selected fields and common central parameters will be established based on the needs of the Ministry of Education and Research.

This initiative assumes close collaboration with the area of infrastructure, middleware and data (IMD). It is also related to the measure *“Good reports and decision-making support (F9)”* and to *“Learning Analysis*

(U4)". A shared solution will be established as the basis, offering opportunities for undertakings to develop/adopt solutions at the top according to their own needs, e.g. presentation layers or their own local management parameters.

Initiative A6 "*Shared services for office support, project management and client operations*" will be postponed until the next period.

6 Infrastructure, middleware and data (IMD)

6.1 Targets

- The user has convenient, secure and appropriate access to the necessary digital resources (MIMD1).
- ICT solutions communicate (MIMD2).
- Data is securely collected, processed, shared and archived. Good processing of data throughout its entire life cycle contributes to simplification, improvement and innovation (MIMD3).
- The infrastructure is flexible, accessible and secure. It paves the way for mobility and development and has enough capacity (MIMD4).

6.2 Initiatives

#	Description	Target code
IMD1	Establish a shared solution for identity and access management (IAM). Shared IAM is an important prerequisite for other shared initiatives to boost digitization.	MIMD1 MIMD2 MIMD3
IMD2	Establish reference architecture and align solutions for integration services. A common approach to exchanging and accessing data is to ensure good interaction between ICT solutions. Includes interaction with data sources and IAM, testing and technical implementations (IntArk).	MIMD2 MIMD3
IMD3	Consistent data for process support, analysis, reporting and innovation. Clarify responsibility for master data and make data accessible and easy to use.	MIMD1 MIMD2 MIMD3
IMD4	Bring the next generation research network to fruition. Ensure enough distribution, availability, performance, capacity and flexibility in the research network, also after the expiry of the current fibre agreement in 2023.	MIMD4
IMD5	Alignment of ICT infrastructure on campus. A common approach to the operation and management of ICT infrastructure on campus facilitates quality improvement, efficiency and security.	MIMD1 MIMD2 MIMD4

6.3 Priorities

The following political policies are used as the basis for setting priorities for measures within IMD:

- Enabling joint capabilities in infrastructure, middleware and master data will be given priority, as many of them will be prerequisite for achieving new digital services.
- Paving the way for economic development, innovation and light-weight IT by offering open data and platforms.

Consistent and coherent IMD are prerequisites for efficient and effective digitalisation in higher education and research. The initiatives in the field of IMD are part of a necessary foundation on which other parts of the Action Plan depend: a shared digital foundation upon which a platform approach rest. Interaction with other sectors is necessary. The use and exchange of services across the sector of higher education, the sector of health and institutions in other sectors should be facilitated.

**Priority: Infrastructure for identity, access and data
(initiatives IMD1, IMD2 and IMD3)**

The field of education, the field of research and the field of administrative depend on work with common user identities and access management (IMD1), integration architecture (IMD2), master data and open data (IMD3). These three high-priority initiatives support standardisation and common solutions, increased mobility, lifelong learning, interaction and sharing across institutions and national borders. Further, they support the need for access to information and decision-making support and built-in data security. The initiatives address the user's need for access to digital resources, the need for ICT solutions to communicate with each other and the need for good processing of data that contributes to simplification, improvement and innovation.

High-priority measures include

- establishing common solutions for identity and access management (IAM) that also cover the need for interaction between higher education, the sector of health and institutes,
- clarifying responsibility for master data and for making data accessible and easy to use,
- establishing common reference architecture and technical solutions for integration services.

Beyond a technical foundation, there is also a need for:

- A shared understanding of some terms in the data sources,
- Accessibility mechanisms based on a shared understanding of roles,
- The ability to compare data from different sources using shared data models and consistent terminology.

Future work processes in learning, research and administration will change over time. We must define terms and design data models that are general and support the updated processes.

Several other measures are necessary, in IMD, to bring the Digitalisation Strategy to fruition:

**Infrastructure for networks, storage and calculations
(initiatives IMD4, IMD5 and F8)**

The digital foundation for higher education and research also includes networks and services for storage and calculation. Initiatives are described for the next generation of research network (IMD4), coordination of ICT infrastructure on campus (IMD5) and storage and calculation services for researchers and others (F8). The initiatives address the need for access to digital resources, the need for flexible, accessible and secure infrastructure that facilitates mobility for students, researchers and teachers, as well as for development where the infrastructure does not set limits. It is necessary to take an overall view of the shared and local infrastructure.

The National Research and Education network (NREN) has been a success and the Action Plan assumes that this will continue. Bringing the next generation research network (IMD4) to fruition is handled by Uninett as part of the ongoing infrastructure work.

Uninett and the institutions cooperate in making assessments and testing related to the coordination of operations and management of ICT infrastructure on campus (IMD5). The IT communities at the major universities have significant expertise in this area and must play a central part in the work. Better integration of ICT infrastructure and research infrastructure must be handled in a manner that takes account of the institutions' academic autonomy in research.

Bringing to fruition services for storage and calculations (F8) is part of the strategic focus on open science. Work with national e-infrastructure for research is not part of this action plan. This involves important shared services, but with separate administration and funding. In spring 2019, a proposal will be presented for a separate strategy in this area (*E-infra 2030*)⁸.

⁸ E-infra 2030: <https://www.sigma2.no/e-infra-2030>

7 Information security and data protection

7.1 Targets

- Overall management of data security and data protection offers a foundation for digitalisation and strategic efforts (MIS1).
- The institutions raise the requirements for data security and data protection, making them higher than the national minimum requirements based on their information value (MIS2).
- Management protects the institutions' information values and complies with national guidelines through systematic efforts for satisfactory data security and data protection (MIS3).
- Researchers handle the security of the data, including research data, and the research participants' data protection, in a satisfactory manner (MIS4).
- Students and employees process data so data security and data protection are safeguarded (MIS5).
- All use of data and ICT safeguards consideration for data security and data protection throughout the entire life cycle (built-in data security and data protection) (MIS6).

7.2 Initiatives

#	Description	Target code
IS1	Strengthen the follow-up of data security in the sector of higher education. Data security and data protection constitute a foundation for digitisation. This leads The Ministry of Education and Research to introduce a new governance model for data security to ensure goal achievement.	MIS1
IS2	Coordinate data protection work in the sector of higher education. Establish a forum for data protection officers in the sector, for the sharing of competence, lessons learned and best practice.	MIS1 MIS3
IS3	Establish overall and joint detection and analysis capacity, as well as improve the general handling of events throughout the entire sector. Strengthen the ability to prevent, detect and deal with security events in the research network. Strengthen the handling of events in compliance with the National Security Authority's framework.	MIS1 MIS2 MIS3 MIS6
IS4	Consider tools for additional systematics and structure in conducting risk assessments. Shared methodology and systematics in the implementation and follow up of measures after risk assessments. Make it easier to share risk assessments in the sector.	MIS1 MIS3
IS5	Advisory services for data security and data protection. Establish an advisory service that meets the institutions' needs.	MIS1 MIS3
IS6	Upgrade skills relating to data security and data protection. Good skills for employees and students are a prerequisite for achieving satisfactory data security and data protection.	MIS3 MIS4 MIS5

7.3 Priorities

Data security and data protection are a clear political priority⁹ ¹⁰, and a foundation for successful digitisation. All the initiatives mentioned earlier are high priority. The Ministry of Education and Research has already allocated MNOK 17.5 per year for a four-year joint programme beginning in 2019.

The initiatives of digitalisation must be based on competence in data security and data protection to ensure that the solutions protect data and personal data in a satisfactory manner. It is also decisive that the individual user has a security culture and an awareness of security that will reduce the risk for breaches of data security and data protection.

⁹ National strategy for cyber security <https://www.regjeringen.no/no/dokumenter/nasjonal-strategi-for-digital-sikkerhet/id2627177/>

¹⁰ National strategy for cyber security competence <https://www.regjeringen.no/no/dokumenter/nasjonal-strategi-for-digital-sikkerhet/id2627189/>

8 Governance, organisation and financing

The Action Plan is intended to result in better services for higher education and research. The expert committees draw up initiatives and measures within their purviews, and the Digitalisation Board sets priorities through portfolio management. The expert committees provide support among users as well as professional expertise. To ensure user-centric solutions, end-users participation is mandatory for individual projects. The governance model ensures participation on the part of the institutions at every level.

The descriptions are focused on shared services and enabling platforms. Local initiatives will vary in order to take advantage of the local user-centric force of innovation at the institutions. The ranking of priorities will adhere to the principles:

- The closer the solutions are to administrative and support processes, the more the architecture and the solutions should be standardised and shared. These should be implemented as platforms that may in turn be used by other services.
- The closer the solutions are to teaching and research, the more the architecture and solutions should be flexible, enabling platforms and nonmandatory shared services with a high degree of institutional autonomy.

All those involved in higher education and research should be able to use the services being developed through joint investments. The Digitalisation Board will assign responsibility for implementation to institutions or national actors. Responsibility for the implementation (and piloting) of shared services will ensure good user involvement, contribute to building skills, ensure local influence on the solutions, and allow institutions to resolve their own challenges early on.

8.1 Governance model

The governance model¹¹ is intended to ensure genuine user participation by drawing up the terms for national cooperation, strategic development, and the development of services and administrative models. It will include the institutions of higher education and research, as well as other users of the services, e.g. in the sector of health.

Strategic management rests with the Digitalisation Board¹², which is comprised of representatives of institutions of higher education and research. The Digitalisation Board shall promote digitalisation through national management and coordination. The board manages shared service development through portfolio management, and has an advisory role associated with respect to Unit's regulatory role.

¹¹ The governance model for digitalisation in higher education and research:

<https://www.unit.no/sites/default/files/media/filer/2019/01/Styringsmodell-for-digitaliseringen-i-h%C3%B8yere-utdanning-og-forskning.pdf>

¹² Mandate for the Digitalisation Board: <https://www.unit.no/mandat-digitaliseringsstyret>

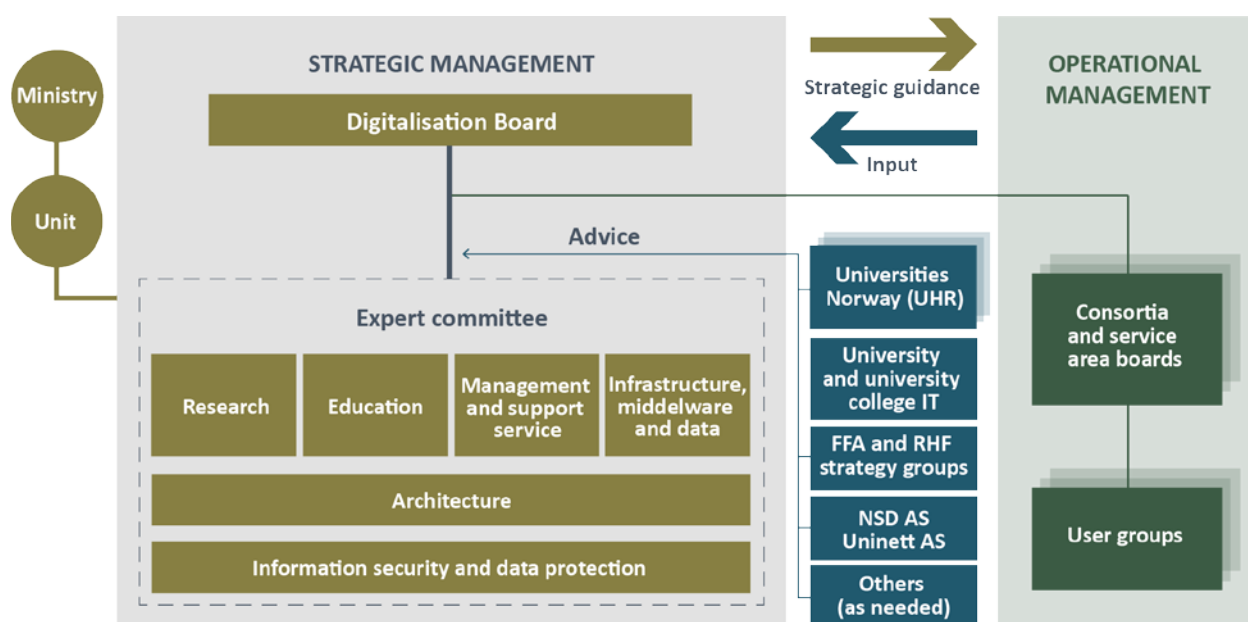


Figure 1: The governance model

The Digitalisation Board is chartered to:

- contribute to the sector having relevant, entrenched, binding and realistic digitalisation strategies and objectives.
- contribute to better achievement of goals and rapid achievement of gains through rapid development and introduction of new shared services, as well as rapid achievement of changes in existing shared services.
- contribute to improved utilisation of resources and new technology.

The Digitalisation Board appoints expert committees¹³ for different areas. The expert committees are advisory and are intended to help the Digitalisation Board to ensure a concerted, effective achievement of the Digitalisation Strategy. The expert committees ensure user participation and that common needs and interests are considered.

The Digitalisation Board will play a key role in the follow up of the Action Plan. The Digitalisation Board determines which projects will be implemented under the Action Plan, the annual financial parameters and guidelines provided in governance documents from the ministries. The Digitalisation Board shall endorse projects and prioritise how joint investment funds will be spent.

The Digitalisation Board may recommend standardisation or amendments to legislation/regulations, organisation or other measures related to Unit's overall administrative responsibility in the ICT area.

Today, there are several different governance models for development and administration of shared services. In the further efforts and by the end of 2019, a common governance model will be established to further develop and manage shared services. The governance model will be decided by the Digitalisation Board.

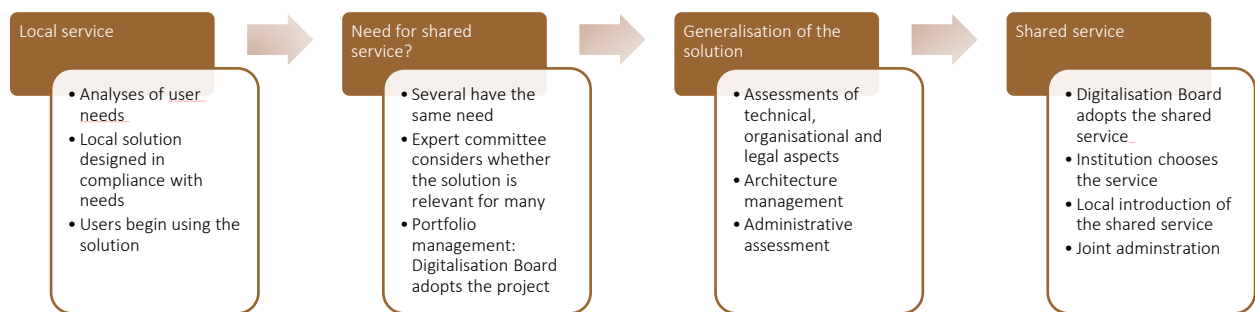
¹³The mandate for the expert committee for digitalisation in higher education and research: <https://www.unit.no/mandat-fagutvalg-digitalisering-i-hoyere-utdanning-og-forskning>

8.2 Organisation and the delineation of roles for the implementation of joint measures

The Digitalisation Strategy decides the distribution of work among the institutions, national actors and the Ministry of Education and Research. Users' needs are to guide the solutions, as discussed in Chapter 2.

The institutions are responsible for the provision of services and value creation, which digitalisation is intended to support, and have each been delegated responsibility for their ICT systems and the initiation of digitalisation measures. Unit will be responsible for the tactical and operational management of ICT and digitalisation at the sectoral level.

On the one hand, Unit will be responsible for initiating and following up strategies and policies established by the Ministry of Education and Research, while on the other hand, it will implement and follow up initiatives originating with the sector. In actual practice, this will take place through strategies and proposals being developed through cooperation between the sector and Unit. Innovative solutions from an institution may be generalised into shared services as illustrated in the figure below.



It will require a collection of development activities and resources to achieve the prioritised initiatives. Some of the initiatives are outside the Digitalisation Board's authority, at the same time as they are important for providing direction and bringing the strategy to fruition. This applies *inter alia* to initiatives where the responsibility for achievement rests with the institutions, and to initiatives where achievement depends on decisions and priorities in other sectors.

To ensure the implementation capacity of many parallel shared projects and initiatives, a general division of tasks and roles has been made:

- Portfolio management will determine which projects will be carried out: The Digitalisation Board is responsible for portfolio management, where individual projects and shared services are adopted.
- Reuse of solutions: Innovative solutions developed at an institution may become shared services. If an institution has solved a specific need that it shares with others, the solution ought to be considered for being designated as a new shared service.
- Responsibility for implementation: An institution may be assigned project responsibility and/or to be a pilot institution. The national actors may be assigned project responsibility for establishing new shared services or common platforms and must cooperate with the institutions on user involvement.

Unit is responsible for following up the Action Plan and facilitating the Digitalisation Board's work through expert committees and other forms of user participation. The national providers of shared services administrate and develop established shared services. This takes place within the parameters laid down in the Articles of Association and letters of allocation from their respective government owners, as well as through national strategies and action plans, and through service agreements with user institutions/customers. Management responsibility for shared services is clarified in the work with a governance model for shared services. Institutions with larger in-house ICT organisations may be assigned administrative or operative responsibility for shared services in keeping with said institutions' strategy, and following approval by the Digitalisation Board.

8.3 Funding model for joint investments

The purpose of joint investment funding is to finance high-priority projects and initiatives in the Action Plan. The funding model for joint investments is illustrated in Figure 2.

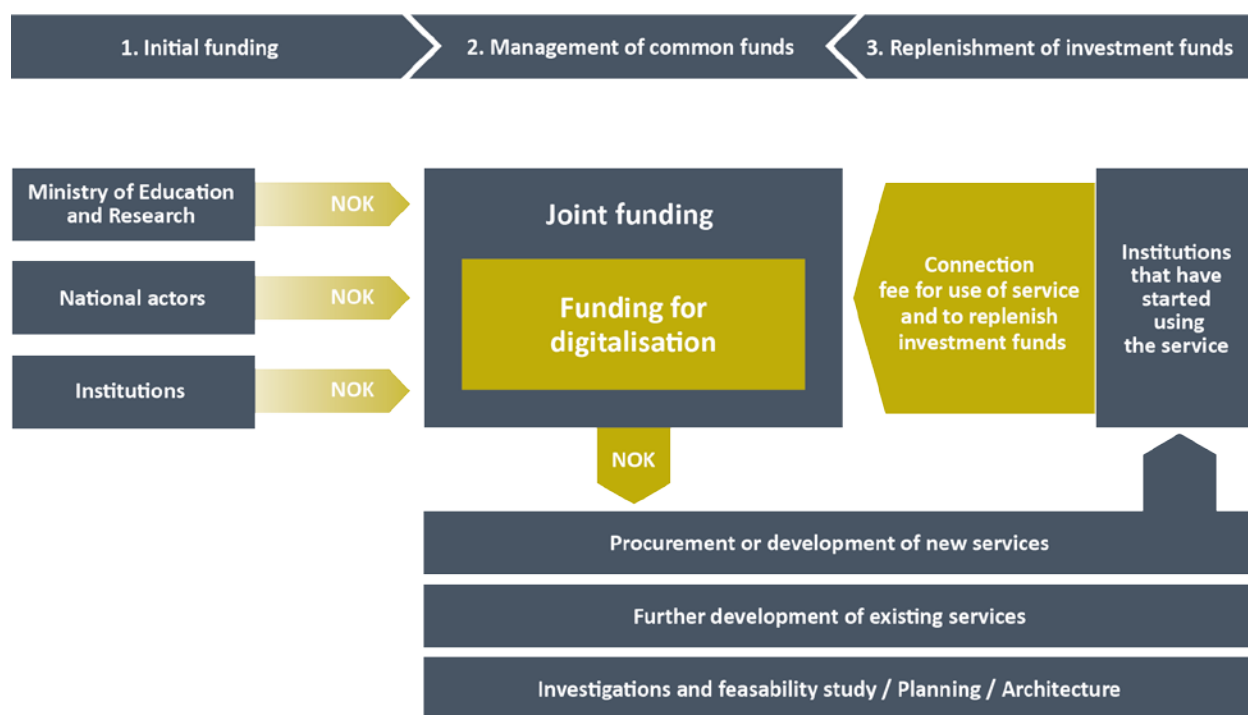


Figure 2 Funding model for joint investments

The model takes advantage of established funding schemes and grants, as well as an initial one-time payment distributed over two years. The one-time payment is to ensure joint investment funding for those projects that are given priority by the Digitalisation Board.

A connection fee is paid when a new shared service is adopted, thereby ensuring replenishment of investment funding. The connection fee is carried back to the investment funding which may, in turn, be used to fund subsequent the joint investments. All actors in higher education and research should be able to use the services developed through joint investments. Users may also be private institutions of higher

education, research institutes, etc. The connection fee will be lower for state university and university college institutions that have contributed to the accrual of the investment funding.

Reference is otherwise made to the detailed description of the funding model¹⁴. Ongoing prioritisation is made by the Digitalisation Board through portfolio management.

8.4 Other sources of funding and sources of funding exposed to competition

By channelling resources through Diku's system of instruments for educational quality, one may effectively mobilise innovative power in the sector. Using such a funding model, one may accomplish locally initiated development, in which digitalisation is a policy instrument for improving quality. The sector's aggregate capacity is effectively utilised through cooperation on services and platforms.

In addition to the funding model for joint investments, some initiatives will be wholly or partially funded through other mechanisms. Examples include e-infrastructure for research under the auspices of the Research Council of Norway, Difi's co-funding scheme for digitalisation, or other sector-specific sources.

9 References and definitions

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9.2 Definitions

- IAM: Identity and Access Management
- DFØ: the Norwegian Government Agency for Financial Management, facilitates good financial management on the part of State agencies, administrates the Instructions for Official Studies of Central Government Measures and the financial rules, and provides payroll and accounting services.
- NVA: National Knowledge Repository
- FS: Student Registry, the Common Student System – used for academic administration
- SO: national coordinated admissions services <https://www.samordnaopptak.no/info/english/>
- NSD: the Norwegian Centre for Research Data
- The ABE Reform: The Bureaucracy and Efficiency Reform in the State Sector
- BOTT: cooperation between the University of Bergen, the University of Oslo, the Norwegian University of Science and Technology, and the University of Tromsø. It is intended to strengthen the participating organisations' ability to supply administrative and technical services that support the organisations' primary activities. Read more about it here: <https://www.bott-samarbeidet.no/>