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FS 1993–2026: How Student Administration Became a Digital Collaborative Effort

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Abstract

This article analyses the development of FS, Norway's national student information system. The system is today used by the entire public higher education sector and most private higher education institutions. Through document analysis, the development of the system from its inception in 1993 to 2026 is examined. The analysis shows how sector-based collaboration has led to extensive standardisation of student administrative processes, significant cost savings, and a role in the European digitalisation of higher education. The study further points to how a long-term perspective, user participation, and data modelling have been decisive for the system's viability. At the same time, challenges related to management involvement and continuous technological renewal are highlighted. The analysis places particular emphasis on organisational and technological development trends, digitalisation gains, and international collaboration.

1 Introduction

Student information systems (SIS) constitute a central infrastructure in modern higher education. These systems support critical processes from admissions and student administration to diploma issuance. The choice between in-house development and commercial off-the-shelf software is a strategic decision for educational institutions and national authorities (Pollock & Williams, 2009).

The FS portfolio today includes student information systems, admissions systems, national registers for educational programmes and qualifications, as well as integrations and data infrastructure. FS represents a distinctive model for SIS development through national sector collaboration. The system was put into production in 1996 and has been in continuous development for over three decades. Today there are around 250,000 users who use the system annually. The development history thus provides valuable insights into how the public sector can organise and manage large-scale IT development through collaboration, rather than market-based solutions.

The article examines the following questions:

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- How have organisational structures and development methodology influenced FS's development from 1993 to 2026?
- What digitalisation gains have been realised through the system?
- How should standardisation versus autonomy in system development be assessed?
- Should the data be open or closed?
- How should in-house development versus off-the-shelf software be assessed?

2 Theoretical Framework

The development of information systems in the public sector is characterised by challenges related to complex stakeholder structures, regulatory requirements, and the need for cross-institutional coordination (Cordella & Iannacci, 2010). The choice between in-house development and commercial software involves trade-offs between control, adaptability, and costs (Pollock & Williams, 2009).

Standardisation in the public sector can be realised at several levels: technical, semantic, and organisational (Kubicek & Cimander, 2009). Organisational interoperability, where institutions harmonise processes and routines, represents the most comprehensive form of standardisation, but also the most demanding to achieve (European Commission, 2017).

A long-term perspective in IT development requires balancing technological renewal, functional expansion, and maintenance of existing systems. The concept of "technical debt" illuminates the consequences of postponing necessary modernisation (Kruchten et al., 2012).

3 Organisational Development

Pre-project Phase (1993–1994)

FS emerged from a coordination committee for Norway's four universities at the time and two specialised universities[*] - which in 1993 initiated a pre-project to assess the acquisition of a student system. The primary motivation was twofold: the authorities' need for comparable data and the universities' desire to avoid an imposed solution.

The pre-project, led by the IT department at the University of Oslo, mapped existing systems nationally and internationally. Systems from Sweden, Denmark, Finland, the Netherlands, the United Kingdom, and the United States were assessed. The conclusion in autumn 1993 was that a system adapted to Norwegian higher education would have to be developed.

The decision illustrates the "make or buy" problem in public IT procurement. In-house development was justified by national characteristics regarding laws, regulations, funding models, and reporting requirements.

In 1994, a Work Breakdown Structure was conducted with documentation of all processes the system was to support, and data modelling of the information domain. Approximately 130 people from the four universities participated. The broad user involvement at an early stage laid an important foundation for further development.

Development and Implementation Phase (1995–1999)

In late 1994, the steering group decided that development should be carried out internally within the sector, by the IT department of one university. The University of Oslo was given the assignment,

[*] University of Oslo, University of Bergen, University of Trondheim (now the Norwegian University of Science and Technology), University of Tromsø (now UiT The Arctic University of Norway), Norwegian College of Agriculture and Norwegian School of Economics

with contributions from the other universities - the University of Bergen, the University of Tromsø, and the University of Trondheim.

Development began in January 1995. The first module was delivered in autumn 1995, providing one year of testing before production launch in August 1996 at University of Tromsø as the first institution. All universities were operational by spring 1997, along with three other specialised university colleges[†].

The first version included not only software but also self-registration terminals for students to be deployed on campus, and a grade-by-phone service. This illustrates how the semester registration process was standardised and digitalised already upon the introduction of FS.

In 1997, adaptation to the university college sector began, with Bergen University College as the first college in 1998. In 1999, the larger university colleges[‡] joined the collaboration.

From Project to Collaborative Initiative (1999–2017)

In 1999, FS was transformed from a project to a collaborative initiative under the Universities and University Colleges Act. This organisation, which maintained the FS collaboration until the establishment of the Joint Student Administrative Services (FSAT) in 2016, ensured anchoring in university leadership through annual meetings and a board.

The organisational model reflected a balance between centralised development and distributed decision-making authority. The involvement of university and university college leadership through formal structures contributed to legitimacy and strategic anchoring.

Public Agency (2018–)

In 2018, FSAT was merged with several other bodies under the Ministry of Education and Research, and Unit - the Norwegian Agency for Shared Services in Education and Research - was established as a directorate under the Ministry of Education and Research. The objective of its establishment was to consolidate and coordinate ICT services for universities and university colleges in Norway. Based on a major reorganisation of the central administration of higher education and the competence field, Sikt - the Norwegian Agency for Shared Services in Education and Research - was established in 2022.

User Participation and Governance Structure

FS has been characterised by a high degree of user participation. The model for this has varied over the years. During the first 20 years there were annual meetings, a working group, and expert groups. All new development was supported by expert groups composed of subject experts from universities and university colleges. This model ensured that development was grounded in practical experience and actual needs.

There has been a slight cultural shift over time from initial scepticism and a desire for autonomy towards a more positive approach, indicating growing trust in centralised standardisation and recognition of the benefits of joint solutions. Universities and university colleges have changed from many smaller institutions in the 1990s to today's larger, merged institutions with university ambitions, making effective user participation more demanding because representatives now require extensive internal anchoring rather than sharing their own professional assessments directly.

Over time there was a greater need for user participation at a more strategic level. The current model for governance of shared services is structured as multilevel governance with three distinct levels.

[†] Norwegian College of Agriculture, Norwegian School of Economics, and The Oslo School of Architecture.

[‡] Oslo University college, Østfold University college, Stavanger University college, Agder University college and Tromsø University college

At the strategic level we find the Ministry of Education and Research at the top, followed by the Digitalisation Board for Higher Education, of which rectors and university directors are members. Below this sits the Portfolio Board for Higher Education and Administration, composed of directors of studies and deans.

The operational level consists of the Product Council for Student Administration, register committees and specialised groups, as well as expert groups for various subject areas. These bodies advise Sikt on prioritisation and assist with subject expertise in development work.

At the user level, user participation is a core principle, through active involvement. Good communication channels between the institutions ensure information flow, and the entire system is founded on a trust-based governance culture built up over several decades. Sikt also facilitates networks between institutions.

This structure was intended to ensure communication between institutions and Sikt, that common needs are identified and prioritised collectively, while institutional autonomy is respected. Within FS we have experienced that it has not functioned satisfactorily as institutions have grown larger and more complex, while not all institutions are represented. The model was introduced in 2018 and is currently under revision.

Costs

Development and management costs is shown in the table below. The figures sourced from the accounts of the organisations FS has been part of.

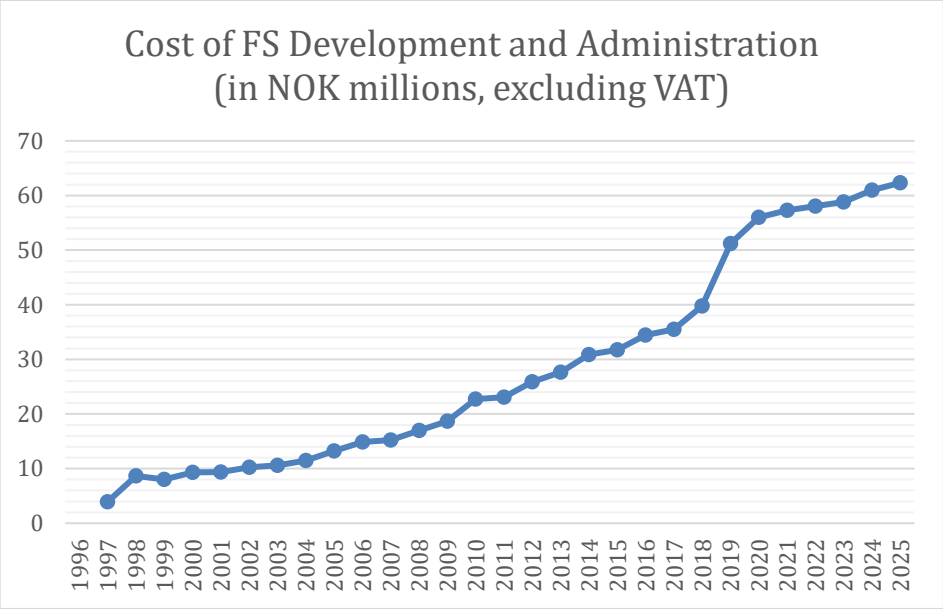

Figure 1 Cost of FS development and administration

The development and operational costs of FS have remained relatively low compared to similar systems. This cost-efficiency is largely due to long-term in-house development, shared financing across institutions, and minimal reliance on external consultants. Consultants has primarily been uses when specific qualifications or the introduction of new technology was required.

4 Technological Development

4.1 Data Model Foundation

The foundation of FS is a thoroughly developed and consistent data model. This model, developed in collaboration with domain experts from universities and university colleges, is regularly modernised with automatic conversion of data to new structures.

The modelling work includes the development of a new domain language for defining student administrative concepts more precisely. Many of these terms have been integrated into the general professional vocabulary at Norwegian universities and university colleges - an example of how technical standardisation can influence organisational practice.

Control over the data model and its evolution is identified as decisive for the ability to deliver services quickly and cost-effectively. This contrasts with situations where institutions are dependent on external vendors for structural changes.

4.2 Technological Evolution

FS's technology history shows continuous modernisation:

- **1996–1999:** PowerBuilder-based Windows client with Oracle database, self-registration terminals
- **1999:** First web application (Studentweb) with 24/7 availability
- **2000–2010:** Introduction of Feide[§] (2004), REST interfaces, LMS integrations based on IMS standards, and several web applications
- **2010–2018:** Transition to agile methods (Scrum), modern web technology (React), microservice architecture
- **2018–2022:** Continuous work on improvements and bug fixes across FS
- **2022–:** Launch of FS modernisation with a focus on API first and GraphQL, and reduction in the number of web interfaces

4.3 Architecture Development: From SOAP to GraphQL via REST

Technology has evolved over the 30 years, and FS has along the way made several changes and adaptations.

FS's architecture development in recent years represents a fundamental transformation from a monolithic database-centred architecture to a modern API-based platform. This transition, which accelerated from 2018 to the present day, reflects a deliberate strategic decision that FS should be established as a platform facilitating digital transformation, where all data retrieval should occur through programmable interfaces according to an API-first principle.

The technological development can be seen in three distinct phases: SOAP-based web services (first generation), REST-based APIs (second generation), and GraphQL (third generation). The API catalogue for student administration clearly shows this evolutionary development, where older technologies are systematically phased out in favour of modern standards.

GraphQL offers several concrete advantages that have been decisive for Sikt. The query language makes things easier for users by allowing them to retrieve all necessary information in a single request, reducing the need to aggregate data on the client side. The standard also enables flexible development whereby new information and functionality can be added without affecting existing

[§] Feide - federated access for students and employees

users, while the extensions provide exponential added value. The potential for reusability is also far greater with GraphQL, particularly using fragments. In addition, many mature implementations of the GraphQL standard are available, further simplifying development.

Sikt has developed the tool Graphitron[**] to automatically generate code. Developers are spared manual work, and it reduces the risk of errors between API and client. In addition, Sikt has connected Claude Code for AI-assisted development. This combination of automated code generation and AI support provides a significant productivity gain, particularly when many external developers are to build against the platform.

4.4 The Challenge of the FS Client and Multiple Web Applications

The FS client, a Windows-based PowerBuilder application, is used by approximately 4,000 case handlers with almost 2,500 concurrent users. Although the technology dates from the 1990s, it is still in active use and development.

There is a long-term plan for phasing it out, but PowerBuilder is highly cost-effective: only approximately 0.5 full-time equivalents annually for maintenance and renewal. This illustrates the tension between technical modernity and economic rationality.

Over the years, many different web applications have been developed - such as Studentweb, application portal, academic staff portal, online course planning, the career portal, and others - on various technical platforms. A great deal of work is associated with operation, maintenance, and updating of technical platforms, so over time a large proportion of development resources went to this, leaving less room for new development.

4.5 Major Modernisation

In spring 2020, Gartner conducted a technical and functional analysis of FS which concluded that FS is a good basis for modernisation and will meet the sector's need for support of student administrative processes for many years to come. Together with universities and university colleges, a recommendation for the modernisation of FS was put forward, which was decided by the Digitalisation Board in autumn 2021.

The modernisation of FS is based on continuous product development and is not organised as a project.

The modernisation is a transformation of the current service towards a target state including functionality, architecture, and a new model for organisation and interaction, both internally within Sikt and with the sector.

The benefits from the modernisation of FS are intended to be:

- Increased availability - simpler, more, faster
- Standardisation - security, quality, interaction, and efficiency
- Increased user-friendliness - better use of time, better experience
- A more adaptable and open system
- Establishment of a new normal level for interaction and value creation, which provides a good basis for development for many years to come

Through the modernisation, only two user interfaces will be developed: FS Admin and Min kompetanse (My Competence). This is to reduce the number of interfaces that students and applicants must navigate between and be familiar with and make development and maintenance more efficient.

The modernisation FS is financed through user fees from customers, financing from the Ministry of education and research, shared investment funds from universities and university colleges, and risk capital with repayment from Sikt.

[**] https://graphitron.sikt.no/

4.6 Open Data

In Norway, work is underway on the introduction of a data sharing act to ensure availability. Sikt works to facilitate the knowledge sector's sharing and use of data for knowledge development, innovation, and value creation. Secure access to structured data is becoming increasingly important.

Sikt has chosen GraphQL as part of a larger strategic transition in which FS is to be established as a platform facilitating digital transformation. The goal is for developers from both the education sector and the business community to be able to build applications and integrations against FS. This requires programmable interfaces (APIs) as the only way to access FS data, in line with an API-first principle.

4.7 International Collaboration and Standardisation

FS has since the mid-1990s participated in international collaboration, formalised through Nordforum in 2007, the RS3G collaboration on student information, and the Groningen Declaration Network for digital portability of student data since 2012.

In the area of standardisation, FS developed the CDM standard for utdanning.no[††] in 2003, which was adopted by France and used for some years. In the mid-2000s, FS contributed to two CEN standards that today form the basis for the digitalisation of student mobility in Europe: Metadata for Learning Opportunities and European Learner Mobility (ELM). Based on ELM, FS developed the ELMO format, which is today used in the EMREX and Erasmus Without Paper (EWP) networks.

EMREX (funded by Erasmus+ 2015–2017) established a European network for student-controlled exchange of result information, where the diploma portal is the Norwegian node. FS led the development work within EMREX. EWP (Erasmus+ 2016–2017) defined a university network for information exchange in student mobility, where FS had responsibility for standardisation and development of a common European data model for mobility. The European Commission has signalled that EWP affiliation will become a requirement for future Erasmus participation. Both networks are recognised in the EU's most recent policy update in the area of education.

This places Norway in a unique international position. A survey associated with EWP identified 2,000 different student information systems in Europe, a fragmentation that makes cross-border mobility demanding, and which underscores the value of a national system with the capacity to lead European standardisation work.

5 Digitalisation Gains

Digitalisation Gains in Norwegian Higher Education

Digitalisation through FS has over three decades transformed administrative processes in Norwegian higher education from manual, time-consuming tasks to efficient digital solutions. Semester registration, which previously required several days of physical arrangements with queues and paper forms, is now fully digitalised. Compulsory education plans, introduced in 2003, have contributed to the standardisation of large parts of student administration across institutions and enabled diploma production on the same day the last grade is registered - a process that previously could take weeks. The diploma portal, launched in 2017 as the world's first national service based on pure data exchange, is estimated to generate substantial annual societal gains. It won the OSPA award in 2017[‡‡] for best security product.

[††] Utdanning.no is the national website for education and career information.

[‡‡] https://no.theospas.com/2017/09/21/2017-norwegian-ospas

Automation and Mobile Solutions

Automated case handling in admissions has revolutionised the application process, where over 80% of applicants to undergraduate programmes are now processed fully or partially automatically through the National Database for Diplomas. This yields high efficiency and significant savings. The student ID app, introduced in 2016, has replaced physical semester receipts and saves the sector substantial sums every year in printing and postage. Digital examinations have made Norway a frontrunner in the Nordic region, where shared solutions through APIs have resulted in relatively low costs with full information control for all institutions.

6 Challenges and Future Perspectives

After three decades, FS faces global development trends that challenge both technology and governance model. AI is transforming expectations of administrative systems - students and staff will demand intelligent automation and personalised services that large commercial players can deliver far beyond Sikt's resources, pointing towards a hybrid model with control over the core and strategic use of commercial AI services. Internationalisation and European requirements for interoperability are forcing Norway to balance sovereignty with standards increasingly set in EU. Demographic changes towards lifelong learning and micro credentials challenge systems designed for traditional study programmes. Privacy requirements demand more student-centred data management, cybersecurity is escalating resource needs, and changes to the governance model threaten the sector-specific adaptation that has been FS's strength. Climate requirements and digital teaching are further changing mobility patterns.

Taken together, this raises a fundamental question: Is sector-based in-house development still optimal, or is greater openness to commercial components, closer European integration, and radical renewal required? The key will be to retain control over data and domain logic, while opening up to commercial components, closer European integration, and radical renewal where required.

7 Discussion of Central Issues

There are three issues surrounding FS that have been important to assess. The first concerns considerations related to standardisation versus autonomy, the second to off-the-shelf software versus in-house development, and the third to open versus closed data. All these themes have been central to the development of FS.

7.1 Standardisation versus Autonomy

Autonomy versus standardisation has no simple answer — the optimal balance depends on institutional context, national culture, and digitalisation maturity.

Institutional autonomy allows universities to adapt systems to their own academic profile and strategy: a technical university has different needs than an arts college, and standardised solutions risk being satisfactory for all but optimal for none. Autonomy also fosters innovation — the student ID app, developed locally by Oslo university college before national adoption, illustrates how local freedom can generate sector-wide gains. Autonomous institutions can also respond quickly to strategic changes without waiting for sector-wide consensus processes.

Notably, FS itself originated from a desire to avoid an imposed solution. The voluntary membership model — where institutions chose to join rather than being mandated — was decisive for the legitimacy the collaboration built over time.

Standardisation, however, yields gain impossible to achieve at institutional level alone. FS serves the entire public sector for relatively modest funds — cost-effectiveness unattainable with 36 separate systems. It reduces transaction costs, simplifies student mobility, and enables employers to process applications digitally through the diploma portal. Critically, standardisation gave Norway a unified voice in international work: the roles in EMREX and Erasmus Without Paper, both recognised by the European Commission as models for European digitalisation, required a national actor with authority to represent the whole sector. Standardisation also ensures data quality, security, and GDPR compliance far more efficiently than each institution managing this independently.

The key lesson is that autonomy and standardisation are not mutually exclusive. Standardise where collective benefits are clear — technical infrastructure, data formats, core processes — while preserving institutional autonomy at the academic-pedagogical level. The challenge going forward is maintaining this balance: standardisation perceived as imposed loses legitimacy, while excessive autonomy undermines the very collective gains that justify the collaboration.

7.2 In-house Development versus Off-the-Shelf Software

The choice between off-the-shelf software and in-house development is not only about technology and costs, but about control, flexibility, dependence, and long-term sustainability.

Off-the-shelf software offers lower initial costs, faster implementation, and vendor responsibility for operations and security. Large vendors like Ellucian and Oracle bring insights from hundreds of institutions globally and can invest in development at a scale no national project can match.

The drawbacks, however, are significant. International systems lack adaptation to national characteristics — Norway's specific laws, funding model, and integration needs with the National Population Register, ID-porten[§§], and the State Educational Loan Fund require costly customisation. Vendor lock-in creates vulnerability to price and system changes, and critically, the data model and student information are controlled by the vendor. Niche innovations like the diploma portal, and Norway's leadership in EMREX and EWP, would simply not have been possible without full control over own data models.

In-house development provides exactly that control — over data model, code, and architecture — along with 30 years of accumulated domain knowledge that cannot be bought. The system integrates precisely with Norwegian infrastructure and serves the entire sector cost-effectively at national scale. The disadvantages are real: high initial investment, long development time, competence dependency when key personnel leave, and continuous resource demands for technological renewal that compete with new functionality.

The most promising path forward is a hybrid model: retain in-house control over domain-specific core functionality and data models, while using commercial solutions for general technology components. Control over data and student information — the foundation of both national sovereignty and international influence — must remain under the sector's own governance.

7.3 Open versus Closed Data

FS's approach to data sharing balances technically open API architecture against legally closed access management where institutions own the data. Four dimensions of openness matter here: technical openness (GraphQL is standardised and well-documented), legal openness (restrictive — institutions own the data, not open in the public law sense), functional openness (GraphQL enables flexible querying for unforeseen use cases), and semantic openness (FS's long data modelling tradition means concepts are well-defined across the sector).

Arguments for greater openness are substantial. Edtech companies, career services, and

[§§] ID-porten a common log-in solution for many Norwegian public services

researchers could benefit from aggregated, anonymised data on study pathways. Norway's forthcoming data sharing act and Sikt's ministerial mandate to "share and use data for knowledge development, innovation, and value creation" signal political pressure towards availability. Open data would strengthen democratic accountability, simplify integration with other public services, and align with the EU's digital education area — where EMREX and EWP already presuppose cross-border data sharing, making closed access management increasingly difficult to sustain.

Arguments for restrictive access are equally serious. Educational history can reveal social background, health challenges, and political orientation — GDPR Article 9 "special categories" requiring extra protection. Anonymised data still risks re-identification, especially in small academic communities. Open data could be exploited for targeted advertising, identity theft, or foreign recruitment of future elites. Education data also requires domain expertise to interpret correctly.

There is no simple answer. Sikt's response is to pursue student-controlled openness inspired by the EMREX model: infrastructure where data sharing is controlled by the individual, not by institutions, Sikt, or commercial actors — consistent with both new Norwegian data sharing legislation and GDPR's core principle that personal data belongs to the person it concerns.

8 Conclusion

FS represents a unique story in public IT development: over 30 years, it has transformed Norwegian student administration from manual semester registrations to a fully digital infrastructure serving 250,000 users annually. Its cost-effectiveness, socioeconomic gains, and leadership in European standardisation through EMREX and EWP demonstrate that sector-based in-house development can outperform both commercial and competitively tendered alternatives.

Success rests not primarily on technology, but on the Norwegian collaborative model — trust-based governance, extensive user participation, and a voluntary "collective effort spirit" that chose community over fragmentation. Control over data models and student information has enabled distinctively Norwegian innovations like compulsory education plans and the diploma portal, while giving Norway a unified voice in international standardisation recognised by the European Commission as a model for European digitalisation.

Autonomy and standardisation are not mutually exclusive: standardising technical infrastructure and core processes while preserving institutional autonomy at the academic level has been FS's defining balance. The shift towards open APIs and GraphQL extends this logic, enabling institutions to build local solutions on a standardised core.

Going forward, AI, internationalisation, lifelong learning, cybersecurity threats, and tighter finances will test whether the 30-year-old model remains fit for purpose. The challenge is not whether to modernise, but whether to preserve control over core data models and domain logic — the source of national sovereignty and international influence — while selectively opening to commercial AI services, closer European integration, and technological renewal where the market offers better alternatives.

The Norwegian experience shows that the public sector can achieve comprehensive digitalisation with limited resources through structured collaboration and a long-term perspective. This cannot be copied mechanically; it requires time, trust, and cultural anchoring. FS's future viability will depend on the same principles that built it: control over core data, trust-based collaboration, user participation, and a continuously reassessed balance between what must be standardised for the common good and what must remain autonomous to preserve innovation and institutional distinctiveness.

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