E-Government – Just a Matter of Technology?

Arild Jansen
Norwegian Center for Computers and Law
arildj@jus.uio.no

Abstract

The aim of this paper is to examine the role of technology in the reorganisation of public agencies. The empirical basis is the automation of the admission to higher education in Norway. This long development process has included many steps of technical developments, combined with changes in legislation and radical administrative reforms. Our analysis aims at identifying the factors that have driven these complex development processes. We ask to what extent we may claim that advances in new ICTs have been a decisive factor in these reform processes? Or, has the development by and large been impelled instead by management interests? Our findings indicate that neither of these hypotheses can fully explain these processes. It is indisputable that political and central management priorities have been crucially important in this reform. At the same time, we cannot neglect the dynamics related to the visions that technological developments have created.

1. Introduction

As early as in 1958 Leavitt and Whisler [23] claimed in a Harvard Business review article, Management in the 1980s that “IT would replace the traditional pyramidal hierarchy in organisations with a lean structure resembling an hourglass, and productivity would sour through the elimination of most middle managers”. Since that time, it has been commonplace to assume that ICT has the potential to bring about administrative reform, see e.g. [6, 7, 11, 12, 25, 26]. For example, Fountain [25] writing about the IT in government, argues that “Technology is a catalyst for social, economic and political change at the levels of individual, group, organizational and institutions” (p 68). Others do, however argue that ICT on its own does not tend to produce reforms and that it is implausible that ICT has been an instrument for administrative reforms, see e.g. [9, 22]. It is argued that, at best, IT has been an enabler of reform, and that the primary beneficiaries of e-government have the dominant political-administrative coalition in public sector.

The aim of this paper is to contribute to the discussion by examining the extent to which ICT has been a driving force for administrative reform in the public sector in Norway. The case for this study is the development of NUCAS (The Norwegian Universities and Colleges Admission Service), which coordinates admissions to regular undergraduate studies at all the universities, university colleges, state colleges, and some private colleges in Norway. This development started out as a technical project aiming at providing adequate information to the central government about applications for admission, student statistics, etc. After near 20 years of development and supported by important changes in the legal framework, the result is a web-based, nearly automated admission service, as well as the building of a new organisation.

However, is it justified to claim that this administrative reform to a great extent is the result of innovative applications of new technology? Or is the reform merely another example of the use of new technologies to make public services more efficient and user oriented, in a context where changes in government organisations have been planned and controlled? This study aims to answer these questions by analysing the various stages of the development. We seek to identify the important decisions which have been made, what have caused these decisions, and what have the effects been.

This paper is structured as follows. In the first section we present our theoretical framework, followed by a presentation of the case and an analysis of the different phases in the NUCAS development processes. In the last section we discuss our findings.

2. Theoretical perspectives

Although computers have been in use in public administration for several decades, it is rather recently we see ICT as a way by which to reform public administration, not least from a political point of view, see e.g. [2, 3, 6, 11]. By administrative reform we understand the term to entail “an effort to bring about dramatic change or transformation in government, such as a more responsive administrative structure, greater rationality and efficiency or better
service delivery to citizens” [21], (p 2. Although this definition does not include the use of new technology, one could scarcely entertain the notion of reforming public (or private) institutions today without extensive use of ICT.

E-Government research is not yet a distinct research domain. It is also being questioned whether it should be a separate domain. Scholl claims that e-Government research is at best multidisciplinary, in that it involves multiple disciplinary communities and attempts to approach the phenomenon from the perspectives of different disciplines [33]. E-government has traditionally been seen as including computer and information system research along with public administration and political science. However, as the structure and function of the public sector is to a large extent regulated by statutes and regulations, reforms will most likely involve (or even depart from) changes in legal arrangements. We see that such reforms will include technical developments and changes in organisational structures, as well as legislative reforms (see e.g. [1, 31]). The direction of impact, however, is not unambiguous; new legislation may lead to organisational and managerial changes that are supported by new ICT systems [29, 34], or the other way around [17, 19]. Therefore, we need to identify these different patterns in e-Government reform processes, as illustrated in figure 1:

![Figure 1: The dynamics of e-Government reform processes](image)

Hovy [15] claims that since e-Government research is interdisciplinary, it should include normative perspectives (such as analyses of political goals and values, legislation etc.), technological elements (such as discussions about construction and implementation issues etc.) and evaluative elements (such as, for example, studies on the effects of introducing new technical solutions and organisational patterns). The approach of this paper is to include all three perspectives. We examine how changes in policies and legislation initiated by politicians have caused the development of new technical solutions and organisational changes. At the same time, we investigate whether this drive towards using modern technology has actually been the catalyst for some of these changes.

We will below in particular focus on the role of technology on politics, as on organizations. It will be extended to analyze the impact on their environment.

### 2.1. How does technology matter?

The model illustrated by figure 1 implies a mutual dependency between political, organizational and technological factors or forces, but not how these forces influence the development of e-government systems or services. Grønlund [12] posits a theory of e-Gov stating: “EGov information systems will only achieve long-term success when they sufficiently well implement interests and modes of operation of all three spheres of a governance system: formal politics, administration, and civil society” (p 7). We agree in this claim, but move a step further in asking: how to design technical and organizational solutions that ensure such interests in a way that do not create new and problematic conflicts?

One approach to analyze what factors that influences e-government development is stakeholder theory, see e.g. [5, 8, 32]. Stakeholder analysts argue that all persons or groups with legitimate interests participating in an enterprise do so to obtain benefits and that there is no prima facie priority of one set of interests and benefits over another. Donaldson and Preston claim that the stakeholder theory can be, and has been, presented and used in a number of ways that are quite distinct and involve very different methodologies, types of evidence, and criteria of appraisal, including descriptive/empirical, instrumental, and normative aspects [4]. Even if stakeholder theory has its roots in the private sector, there is relevant to apply it in public sector [32]. We will primarily apply an instrumental approach, aiming at identifying the connections, or lack of connections, between stakeholder management and the achievement of objectives in our case.

However, our approach is a modification of a traditional stakeholder analysis, in that we also include “non-human” stakeholders as the technology itself. We have also been inspired by structural approaches and more specific by Fountain’s technology enactment framework [6], in which we can see technology as an “enabler” of organizational change; it can be viewed as an entity that are at least partly socially constructed (p 87). She held that “this framework allows us to reverse the direction of the causal arrows that that traditionally has been placed between technology and structure to show how the embeddedness of various actors influences the design and use of technological solutions”.

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Proceedings of the 44th Hawaii International Conference on System Sciences - 2011
Thus, departing from figure 1, we outline a somewhat simplified framework, in which technological, political and organizational factors are viewed as interest groups (stakeholders) in the design and development processes.

Research question

Departing from the model above, we pose these propositions:
- The design and implementation of the NUCAS system has been according to political goals and priorities.
- The NUCAS has resulted in a more centralized system, strengthening the management control.
- The technological achievements have had significant influence on the reform process and political priorities.

3. Research method

Our research is based on an interpretative case study in which we have analysed the history of the development process in the NUCAS project, spanning a period of more than 15 years. The empirical data were collected from project reports describing the development phases along with white papers, budget propositions, statutory acts as well as regulations and parliamentary committee recommendations. In addition, we have conducted 2 interviews with members of the development team, furthermore 2 interviews with senior staff members in the Ministry of research and education, and one interview with an executive officer at a local admission office. In addition, it has been conducted a small survey among a selected group of students and similarly another survey among employees in local admission offices.

This method of data collection may entail challenges in terms of reliability since one of the main informants has been closely related to the project, which in turn implies a degree of uncertainty related to the bias and correctness of the data. However, the strength of these sources is their proximity to the case in question, presumably making the data highly valid.

Our analysis is based on a straightforward interpretation of the relevant documents, identifying the important stages in the development processes, the types of decisions that have been made, what have caused these decisions and what have the effects been.

4. NUCAS in the Norwegian educational system

Today NUCAS coordinates admissions to regular undergraduate studies in Norway [26]. However, this has not always been the case. The present organization and administrative routines are the result of more than 40 years of development, although the past 18-20 years have been the most important in the context of our analysis. It is thus important to view the NUCAS process as the continuation of a long line of reforms beginning in the 1960s and coinciding with the growth of the regional universities and state colleges in Norway. The process resulted in more than 100 educational institutions being distributed throughout Norway. The consequence was a massive educational revolution in Norway, resulting in an increase from about 10,000 students in 1960 to 41,000 students enrolled in 1988. However, the application and admission routines at the time were fully decentralized. Each student had to submit his/her application to the individual institution, and there was no central registration system that could provide the central authorities with necessary information in order to survey and control application and admission systems.

This perceived crisis in our higher education caused radical changes in the entire educational sector in Norway through a number of reforms. One change was a reduction in the number of colleges and the foundation of a Norwegian Educational network (“Norgesnettet”) between the universities, university colleges and regional college centres. Another very important element was the harmonising of regulations for universities and regional colleges, resulting in a single, unified law applying to the entire sector. This law became essential for the development of the admission handling system. Furthermore, this regulation was intended to establish a set of common, standardized and formalized rules which would ensure a decentralised, fair and predictable admission process which could also be supported by a computer-based decision-making system.
4.1. The NUCAS development process

This revolution (or perhaps evolution) of the admission system originated from a rather chaotic situation in about 1990, when all handling of cases was fully decentralized and when no one was able to determine the actual number of applicants in any given year, since the applicants had to submit an individual application to each institution to which they applied. A task force was appointed and submitted its report in December 1990. (It was headed by Prof. Bjørn Pedersen at the University of Oslo, and included faculty member from other Universities and colleges as well as students and administrators).

As one result, the NUCAS-project was established. A brief chronological overview of the milestones is presented in Table 1.

Table 1 Milestones in the NUCAS development project

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tr>
<td>1991</td>
<td>The NUCAS-project established. The development of an IS for central registration of all applicants to higher education in Norway</td>
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<tr>
<td>1992</td>
<td>Pilot projects based on a new coordinated, distributed model for admission handling - Selected case handling, NUCAS-project responsible for the coordination of central services - A new, co-ordinated regulation of rankings for colleges, replacing 17 older ones</td>
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<tr>
<td>1995</td>
<td>A common law for universities and university colleges - General competence requirements as the basis for admission to higher education</td>
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<tr>
<td>1996</td>
<td>Implementation of the National coordinated Admission Model (NOM) - Nationally available electronic application handling and admission services available to all</td>
</tr>
<tr>
<td>2000</td>
<td>Implementation of automatic case handling based on electronic diplomas - Full case handling throughout the university and college sector from 2000</td>
</tr>
<tr>
<td>2001</td>
<td>First year enabling submissions of applications etc. via Internet</td>
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<tr>
<td>2002</td>
<td>The Competence reform is implemented</td>
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<tr>
<td>2003</td>
<td>The SO organisation takes over operations and maintenance of the National Diploma database</td>
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<tr>
<td>2003</td>
<td>Quality reform, a number of new bachelor and master studies were initiated</td>
</tr>
<tr>
<td>2003</td>
<td>The NUCAS-project becomes formalised as a permanent administrative agency. Includes all universities and 40 (university colleges</td>
</tr>
<tr>
<td>2008</td>
<td>Online application through NUCAS becomes mandatory</td>
</tr>
<tr>
<td>2010</td>
<td>103,631 applicants, of these were 71,352 offered entrance by nearly automated procedures.</td>
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</table>

A crucial step of this development process was the design of the NAM (National Admission Model), which is a combination of central coordination and service provision along with local responsibilities at each individual institution. This model, allowing the individual local institution to process applications to other institutions, requires close co-operation between them, as well as standardized rules pertaining to admission. The later stages in the development were to include

- Elimination of paper communication and the need to send hard-copy documentation for the great majority of applicants also made possible through the introduction of electronic diplomas.
- Fully automated case handling for the great majority of applicants. Manual case handling was to be eliminated.
- Immediate admission offer or admissions guarantee for those fulfilling admission criteria.
- A simplification and revision of admission regulations.

4.2. The structure of the NUCAS system

The data on the applicants are collected from various databases, among them a register containing electronic diplomas from secondary schools. These data are exported to the local administrative systems at the individual sites, and are further used by the Norwegian State Educational Loan Fund in their handling of applications for financial support. In this respect, the NUCAS admission machine may be seen as a hub for many other administrative systems in the educational sector.

A basic building block for this system was the development of a new data model, containing a formalized and codified representation of all existing rules and regulations related to the admission procedures, including competence and ranking data bases (with formalized representation of all competences related to admission and the algorithms for ranking the applicants at the individual institution for all types of educational programs). This data model has been instrumental in supporting the local application and admission handling systems. The robustness of this database was illustrated when the Parliament (Stortinget) in the late spring 1999 revised the admission rules to include credits for having completed military service. This change was easily implemented in the admission “machine” early in July same year, thus into effect almost immediately. Thus, an unintended effect is that it became easier to implement revisions in the rules than in the past, when it was handled manually.

Another challenge was clearly the development of electronic diplomas, which entailed the formalization of a very complex set of rules along with a large number of programs in secondary schools.
4.3. What has been achieved?

The NUCAS system, in its present version has been in operation for nearly 10 years. In 2010 it has considered more than 100,000 applicants and offered entrance to more than 70,000 by nearly automated procedures.

An important feature of NUCAS is the solid coordination of all phases of the admission process:

- **One application form** per applicant, even when applying for admission to study programs at different universities and colleges.
- **One case handling institution** per applicant, thereby eliminating duplicate work even when the application contains study programs at several institutions.
- **One final admission offer** per applicant, to the highest prioritized study program for which the applicant meets admission criteria.
- Coordinated centralized registration of application in combination with decentralised case handling and final centralised selection procedures (the NAM model).

While the 3 first features were included in the original proposal from 1991, the last feature, the realisation of the NAM model, was made possible only through the design and implementation of the rather sophisticated technical solution that grew out of the pilot projects from 1993-1996. These are the achievements [16, 24, 26].

- **No duplicate evaluation work**, as the average number of institutions involved in admission work per applicant dropped from 3.5 before 1995 to currently less than 1.1 per applicant in 2005.
- **More than 85%** of students entering higher education receive their admission offer in the first round of the national selection, while nearly all receive it before mid-August. The collection system for electronic diplomas now annually covers 97% of students finishing secondary school.

For central management, the system ensures updated statistics on the number of applicants and admission to each program. It is even possible to analyse the effects of specific regulation measures, and therefore to fine-tune the admission criteria in a number of different ways.

For the local institutions the new system has reduced and simplified the admission process. It is also important that within a short time after the application deadline administrators will know how many students have applied for admission to each program. Consequently, they may initiate additional recruitment actions was needed. They also have the opportunity to promote their specific programs to targeted student groups. Schools with specific admission requirements are also allowed to manage these autonomously. In the survey we conducted in 2010, all respondents answered that NUCAS ensures the local offices sufficient flexibility and local control.

For the student the system offers a much simpler and quicker admission process. They can retrieve updated information on all study programs as needed; they will have access to all admissions rules and procedures, and they may check the probability of being admitted to the selected program based on statistics from previous years. The admission procedure is fairer, as the best ranked students cannot book additional programs, since they are required to choose a single first priority. In our survey among some bachelor students, they have experiences the system as easy to use and that it offers an effective application process. At the same time, some of the students found it not as flexible as it could be.

The combination of centralized and decentralized case handling offers opportunities for better quality control of data. It is also much more difficult to cheat the system, as electronic diplomas are collected automatically from the upper secondary schools and are sent to the local institutions. For both the ministry/directorate and the institutions, this has contributed to greater efficiency and fewer errors [10].

5. Analysis and discussion

Seen from the viewpoint of the NUCAS-project participants, there has been a well-defined division of work and responsibilities between the Ministry of Education and Research, the NUCAS central service and the institutions of higher education. The Ministry has played an instrumental role in funding the NUCAS central service and in implementing the necessary revisions in legislation and other regulations covering application procedures and admission criteria. In this respect, we may say that the project has been mandated and controlled by the central authorities, pursuant to political decisions made by the parliament.

What are the main drivers behind these reform processes? The review of the development processes above shows that the growth in the number of applications to higher education in Norway created an unmanageable situation, leading to the establishment of the NUCAS-project as a political response. The improved general outlook influenced further development, and along with various reforms, a new national admission system was implemented, finally as a nearly automated decision-making system. One way of illustrating these processes is the following relation between political and legal initiatives, admin-
It is therefore important to understand how all three factors (political goals, organizational settings and technical achievements) have influenced the development work and reform processes in various ways. Although the ministry and the political system have had an overall plan, the technically-oriented initiatives as well as the local institutions, including the administrative staffs, have been instrumental in the processes [14, 27].

As we see from table 2, the process was initiated by politicians, as a response to an untenable situation. The task force, mandated by the Ministry, proposed initially a centralized model. This model was, however, later revised to become a combination of a centralized registration and decentralized case handling, thus meeting some of the objectives from the local admission offices at the individual colleges. This was possible due to the use of new technical solutions. However, the overall central management control do exist.

What is interesting in this case is that the project group has had a rather weak institutional binding, as it was (partly) recruited from a technical community along with professional staff, but without a close connection to the ministry or the central bureaucracy. In that sense, the project was fairly independent of administrative and organizational changes and technical developments as illustrated in table 2 below.

Table 2: The development of NUCAS: important political, organisational and technical actions

<table>
<thead>
<tr>
<th>Time period</th>
<th>Status in the educational sector</th>
<th>Political action, changes in regulations etc.</th>
<th>Administrative and organisational actions</th>
<th>Milestones in technical developments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970-90</td>
<td>Increasing growth and complexity Uncontrolled and unmanageable rush of student applicants</td>
<td>A committee, mandated to review higher education, proposed to reform the whole sector</td>
<td>A task force was mandated to propose measures for more regulation and control in the admission system</td>
<td>Development of local administrative systems – no interaction between these systems</td>
</tr>
<tr>
<td>1990-91</td>
<td>Implementation of the Hennes committee proposals</td>
<td>Establishment of the NUCAS-project. Introduction of the admission deadline across the sector</td>
<td>UNINETT in operation Development of a management information system</td>
<td></td>
</tr>
<tr>
<td>1992-94</td>
<td>Focus on structure: Collaboration and cooperation in the sector</td>
<td>Norgesnettet and the college reform</td>
<td>Lay down the NOM-model as basis for the reform work</td>
<td>Development of the NOM-model. Pilot projects were carried out</td>
</tr>
<tr>
<td>1995-99</td>
<td>Focus on content in the education: Increased quality and efficiency</td>
<td>A unified law for all higher education. Harmonization of admission &amp; ranking procedures</td>
<td>Consolidating NUCAS-project and local admission offices</td>
<td>Implementation of a new data model and a admission machine Pilot version of Web-based system</td>
</tr>
<tr>
<td>2003-</td>
<td>Quality reform: Focus on structure and content in the educational programs</td>
<td>NUCAS became a permanent organization</td>
<td>Application and admission handling is 90% automated</td>
<td></td>
</tr>
</tbody>
</table>

This table may appear to indicate that the organizational and administrative changes, supported by adequate technical solutions, have been the result of overall, planned actions. The central authorities have mandated the NUCAS-project and defined the general framework for the development processes, and have initiated and implemented the necessary changes in laws and regulations. However, when looking closer into this chronology of development, as illustrated by the arrows in table, it seems it seems quite clear that the technical achievements along with local initiatives have also been influential in the implementation of the reform process, and that the results are different from what was originally planned. The design of NAM (National Admission Model), which combines central coordination and service provision with local responsibilities in the handling of the admission, is strongly influenced by the project group. The latter was not part of the original proposal, but grew partly out of the development work [28]. Furthermore, the establishment of NUCAS as a permanent organization was not planned from the outset, as neither was the development of a diploma database from secondary school.
most interest groups, and had limited self-interest beyond getting the job well done.

An important part of this reform process has been changes in laws and regulation, which by and large has been initiated and controlled by politicians. However, at the more detailed level, politician and management had to take into consideration technical “requirements” in order to have a manageable solution, and to secure justice and rule of law [18]. In particular the design and development of the admission machine and web-based application handling routines have been important in the implementation of the overall solution. An example is the details in the admission rules (how the regulations are interpreted) that has been determined by the project group. (The admission program, that were developed by the project is a variant of the algorithm for “The stable marriage problem”, aiming at finding an optimal solution for matching peoples priorities and choices. This program is thus a technical solution to an administrative problem by implementing and enacting a regulation that from the outset was unambiguous).

Furthermore, a master thesis that studied what consequences this system have had for applicants being disabled, concludes that the legitimate interest from this group are not given sufficient weight [20]. NUCAS has contributed to case procedures based on routinization and bureaucracy rather than individual judgements. The result is thus a disparity between political priorities and the existing practice.

6. Concluding discussion
How do our findings relate to the propositions that were put forward in section 2?
Our first question was whether the design and implementation of the NUCAS system has been according to political goals and priorities?

As we have seen, the NUCAS-project, initiated in order to provide a management information system for the central authorities, has turned out to be an electronic decision-making system, however partially delegated to local institutions for processing and decision-making. This process of technical development has been enabled by necessary changes in legislation. We do not claim that these legal reforms were caused by the (technical) development work; the new laws implemented in 1995, 2001 and 2003 (see table 1 above) were the result of deliberated political processes. But in the writing of the detailed regulations, some consideration of the automation of the admission process was also taken. Another important step was the establishment of NUCAS as a separate agency. This would not have been an option without the success of the technical development and implement-
visions, combined with successful development work and supportive managers in the various local institutions seem to have created an environment for innovative technical and administrative solutions.

To what extent can these findings be generalized? Our case is unique in the sense that it applies to the development of a new, specific system. It has been selected for this study because it succeeded in fulfilling a political goal (indeed, even goals that were not defined at the outset). One may say that a total match has occurred between technical achievements, organizational developments and political ambitions. The creation of a new organization may be an “easier” administrative reform process, even though it also entailed more substantial changes in existing rules and procedures, than it would be to implement radical changes in an existing organization. We believe that another, very important factor for the success has been that all government agencies involved in this reform process are subordinate to the same minister, who has the authority to enact necessary revisions of laws and regulations without negotiating with other members of the government. This implies that it has been an inter-organizational reform, and not a cross-sectoral one. The latter is much harder to accomplish, see for example [2]. Thus, our findings cannot be generalized without taking into consideration the specific context of this reform.

There are a number of lessons to be learned concerning how to carry out this type of technical development and administrative reform in general. One lesson learned is found in the step-by-step, chronological history of development, in which each goal was linked to political priorities. A second lesson is that there is a need to build a technical and organizational infrastructure that supports the reform process. A third lesson is the understanding of the mutual relationship between technical achievements, changes in legislation and organizational developments, as illustrated in Figure 1 above. We believe these lessons may be useful to others, too.

References

[10] Gjøsten, Kirsti. Senior advisor, Norwegian Directorate for Education and Training From interview 15.06.2005


