

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/329987862>

GOVERNMENT AS A PLATFORM: A HISTORICAL AND ARCHITECTURAL ANALYSIS

Conference Paper · November 2015

CITATION

1

READS

527

2 authors:



Bendik Bygstad

University of Oslo

106 PUBLICATIONS 1,811 CITATIONS

SEE PROFILE



Francis D'Silva

3 PUBLICATIONS 1 CITATION

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Digitalization [View project](#)



Sovereign Digital Platforms [View project](#)

GOVERNMENT AS A PLATFORM: A HISTORICAL AND ARCHITECTURAL ANALYSIS

Bendik Bygstad, Dept. of Informatics, University of Oslo

Francis D'Silva, Accenture Norway

ABSTRACT

A national administration is dependent on its archives and registers, for many purposes, such as tax collection, enforcement of law, economic governance, and welfare services. Today, these services are based on large digital infrastructures, which grow organically in volume and scope. Building on a critical realist approach we investigate a particularly successful infrastructure in Norway called Altinn, and ask: what are the evolutionary mechanisms for a successful “government as a platform”?

We frame our study with two perspectives; a historical institutional perspective that traces the roots of Altinn back to the Middle Ages, and an architectural perspective that allows for a more detailed analysis of the consequences of digitalization and the role of platforms. We offer two insights from our study: we identify three evolutionary mechanisms of national registers, and we discuss a future scenario of government platforms as “digital commons”.

Keywords: e-government, Altinn, platforms

1. INTRODUCTION

In this study we explore the concept of *government as a platform*, and use the case of Altinn to develop our argument. The starting point is that information is power, in particular for a state. In 1086, twenty years after his victory, William the Conqueror ordered the systematic collection and documentation of the assets of England; the population, the land and the buildings. The objective was to create a national register for taxation purposes, and there were no appeal rights for the King's subjects, ever. Therefore it was called Domesday Book (Galbraith, 1961).

The most important part of the Domesday Book was the *cadastre*, the register of property. Defining the property object was important for taxation, but over time even more seminal as the key element in the law of property rights, which is a fundamental element in a capitalist economy (Williamson, 1990). The rest, we might say, is history. Today the digital infrastructures of modern states constitute the backbone of our societies (Scholl, 2015), and the Scandinavian societies have been pioneers in this respect.

In this paper we investigate the development of national electronic platforms, with an emphasis on the Scandinavian tradition. Our case is from Norway, called Altinn, which is a successful and advanced national platform that is used by all business and organizations, and by almost all inhabitants. Our research questions are:

- What are the underlying mechanisms for the evolution of e-government platforms?
- How can government platforms be developed into institutions for a modern society?

Our methodological approach is critical realism, which allows us to investigate the evolutionary mechanisms of digital government infrastructures, i.e. we aim to identify and explain the causal relationships between the assemblages of policies, organization and technology, and successful outcomes.

Our contributions highlight the importance of the historical heritage of national registers, as we identify three evolutionary mechanisms, which explain how national registers grew from simple paper-based

solutions to advanced digital platforms. We discuss how they can evolve into key institutions in the 21st century.

2. THE ROLE OF NATIONAL REGISTERS

We define a register as a repository of structured information on a specific class of objects, such as inhabitants, property or accounts, for a defined set of purposes. Government registers are different from most private registers in the sense that they are based on a law or to enforce the law in a certain domain. Seen from the legislative authority there is a specific intension with the law that the register is created to support. For example, civil (population) registry is typically established in order to protect individual rights, but also support tax collection. National cadastres were usually established for tax purposes, but also to protect property rights (Norwegian Mapping Authority, 2014).



Figure 1. Law, domain and register

As Fukuyama (2011) has shown these legal- administrative structures are lynchpins in nation building. They enable lawful governance of national populations and territories, and help the establishment of trust between government and citizens, and between citizens. For instance, the Norwegian tradition of tinglysing (the public registration and announcement of the details of a transaction) from the Middle Ages ensured that a farmer could trust that his acquired ownership to a piece of land was confirmed, and would be protected.

2.1 National Registers

In Antiquity censuses at irregular intervals were conducted in China, India and the Roman Empire. In China a full census was conducted in year 2 during the Han dynasty, while no documented Roman census exists.

The Chinese Hukou (household) system has been in more or less continuous operation since antiquity, and includes information on birth, marriage, death and residence. It had (and has) several uses; identity management, tax collection, resource allocation, the control of movement and surveillance. It was an important element in establishing and maintaining the Chinese state (Young, 2013).

Parish registers were introduced in Europe in the 16th century, but were only local and often of poor quality. With the exception of Scandinavia civil registries were not established until the 19th century in Europe (France, by the revolutionary government in 1792), in the UK in 1875 by the Births & Deaths Act, and in some countries, such as Germany and USA they are not used, because of constitutional law.

2.2. The Scandinavian Tradition

The Norwegian cadastre has its roots in the Middle Ages. King Magnus the Law-Mender issued in 1274 a national law that established taxation of property. In 1665 a standardized cadastre for local use was introduced, and a national register was established in 1818 (Norwegian Mapping Authority, 2014).

Civil registry, with the purpose of securing individual rights, was first established in Sweden in 1631, and the first office of statistics was founded in 1749. The Scandinavian civil registries were computerized in the mid 1960s, and today constitute a core element in the welfare systems.

The Scandinavian countries also started early to register health information: for example, causes of death have been registered in Sweden since 1751 (computerized from 1952), and in Denmark since 1875. Together with a national identity number these registers have been extremely important to both public health surveillance and research (Rosen, 2002; Thygesen et al., 2011).

2.3 Registers and Platforms

The digitalization of the national registers opened up new opportunities. The transformative power of digital technology for organizations and society has been documented by many IS researchers, such as Yoo (2013) and it is increasingly recognized that governments should play an active role in this transformation. In *The Entrepreneurial State* Mazzucatu (2013) showed that the state has had a much larger role in innovation than assumed by economic theory, because only the state is willing to invest in long-term research. The potential of open public data for innovation has been recognized in various fields, such as smart cities, transportation and environmental surveillance.

These trends reappraise the value of government registers, in the sense that they are no longer only containers of bureaucratic information, but a resource for innovation and competitiveness. Tim O'Reilly (2010) wrote the following: "There is a new compact on the horizon: information produced by and on behalf of citizens is the lifeblood of the economy and the nation; government has a responsibility to treat that information as a national asset. Citizens are connected like never before and have the skill sets and passion to solve problems affecting them locally as well as nationally. Government information and services can be provided to citizens where and when they need them. Citizens are empowered to spark the innovation that will result in an improved approach to governance. In this model, government is a convener and an enabler rather than the first mover of civic action (p.2)".

A mechanism for exploiting the potential of registers is a *platform*. A platform is usually understood as a stable structure that enables a type of activity, for example entering a train, or (metaphorically) a shared set of policies on which to build a political program. The concept is widely used within the IT world, often to describe an industry standard (such as Windows) or to denote the stable elements of an ecosystem, such as Apple's iTunes (Baldwin and Woodard, 2008). Building on these conceptions we define it for our purposes as a mediating architectural mechanism, which allows for providing services to citizens and organizations, based on the structured information of registers.

In investigating the history and architecture of government platforms we make one assumption; in order to succeed, government services cannot be treated successfully as local, stand-alone solutions, but should be understood as emerging *information infrastructures* (Hanseth and Lyytinen, 2010). Such structures are interconnected systems of technical, social and human elements that together create value.

3. METHOD: A CRITICAL REALIST LENS

In order to analyze the deeper structures and dynamics of national registers we chose critical realism as our methodological approach (Bhaskar, 1998; Sayer, 1992). Critical realism has gained increasing interest and legitimacy during the last decade as an alternative to both positivist and interpretive approaches to Information Systems (IS) research.

Critical realism does not aim to uncover general laws that predict outcomes, but to understand the underlying mechanisms that have generated the phenomena of interest and could do so again ([2, 18]. As the generative mechanisms arising from objects and structures are usually not observable, they must be identified through abstract research. We identify mechanisms through retroduction; we take an empirical observation and hypothesize a causal path that might explain that particular outcome. For example, while we may observe buyers and sellers agreeing on prices and volumes the underlying market mechanism is unobservable.

The layered ontology (illustrated in figure 2) is the key to critical realist-aligned methodology. Contrary to positivist research, the aim of critical realism is not to investigate regularities at the level of events, but rather to uncover and describe the mechanisms that produced these events. Mechanisms are associated with both the nature of the objects of the real and the relations between them.

Mechanisms act transfactually, that is, "the event or events that they are the powers to instantiate may never actually be instantiated; the powers may remain unactualized, yet these powers remain in existence" (Fleetwood, 2009). This means that the identified mechanisms have external validity beyond the case although their explanatory relevance are conditioned.

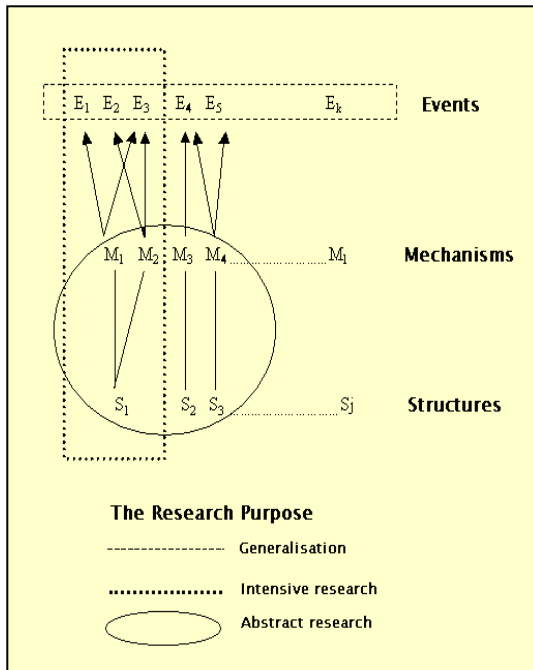


Figure 2. The layered ontology of critical realism [18].

In order to provide a theoretical description of mechanisms that could explain the observed events, a typical critical realist research design would be an intensive study, with a limited number of cases, where the researcher systematically analyzes the interplay the ontological layers.

3.1. Data Collection and Analysis

In line with the critical realist tradition (Mingers, 2001) we chose a multi-method approach. First we conducted a historical investigation of the evolution of national registers, based on published research. Then we did a systematic documentation of history of Altinn, based on written documentation and interviews with central stakeholders. This was supplemented with observations made by the second author, who participated actively in the process as an employee of Accenture. The chronology of Altinn is documented in section 4.1.

With a critical realist lens we then conducted a theoretical investigation, in order to identify and describe the generative mechanisms that explain the evolution of Altinn as a national platform. The steps of this analysis were (Wynn and Williams, 2012) as follows. We first documented the key events and identified the main services of Altinn. Then we analyzed the social and technical structures of Altinn, and through retrodution we identified a number of candidate mechanisms. These were assessed for their explanatory power, and we selected three mechanisms, which were described in detail (see Figure 7).

4. THE CASE: ALTINN

Our case is a Norwegian national solution called Altinn, which is a portmanteau for “Alternative reporting in”. AltInn became Altinn, a contraction that literally means “everything in” (Cap Gemini, 2011). We first present a brief historical account of its inception and evolution.

The solution we are presenting here consists of several elements, i.e. the national registers, and the Altinn platform, as illustrated in figure 3.



Figure 3: Altinn and basis registers

Briefly, these registers include the following:

- Civil registry: All citizens and registered immigrants
- Legal entities: All businesses and other registered organizations
- Cadastré: All registered property

4.1 History of Altinn

In 1967 the Norwegian parliament approved the move to create a national data facility, which was established in 1972 as the Government Data Centre. Over the next years a number of national electronic registers were established, such as the Register of Movable Property (1980), Register of Business Enterprises (1988) and Cadastré (1993).

In 1988 the Brønnøysund¹ Register Centre (BRC) was established as a national agency, with the vision to be “a world leader in the best interests of Norwegian business and industry and public administration”. One aim was to simplify business and industry’s collaboration with the public sector. In the late 1990s senior civil servants attached to ministries responsible for trade, finance and compliance initiated a discussion on a possible solution to the problem that all companies were required to report various information to a large number of government bodies, including the Bureau of Statistics and various ministries and agencies. This was time consuming for businesses, and the quality of data was often poor.

Why not, they asked, use the powers of IT to design a centralised solution, enabling the companies to report only once?



Figure 4. The signing of Altinn in 2002 – from left Erik Fossum (BRCøysund Register Centre), Bjarne Hope (Tax Authority), Just Erik Næss (Accenture), Svein Longva (Bureau of Statistics).

¹ Brønnøysund is a town midway along the Norwegian coastline

In December 2001, the Tax Authority issued a request for proposal on behalf of the Bureau of Statistics, BRC, and itself. The request was to establish a national solution for company reporting to the authorities (Jansen, 2008; Skattedirektoratet² 2001). Following a procurement process, Accenture was awarded the contract to develop the solution (see figure 5).

Altinn was developed using Microsoft.NET technology and a few 3rd party software products including from Accelio, Zebsign and Adobe. Altinn was built to serve as a forms-based portal for users in businesses and included a forms-management engine and a B2B-gateway for information delivery.

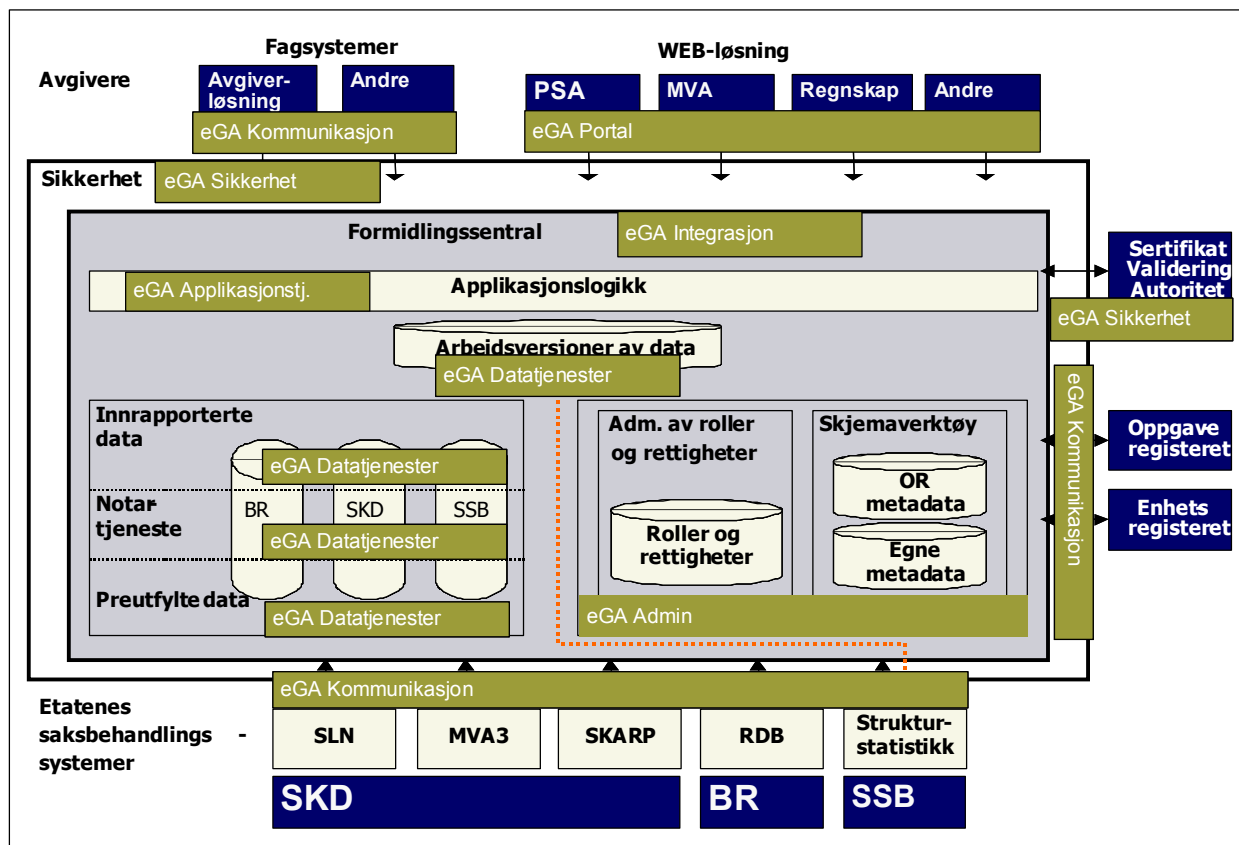


Figure 5. Schematic representation of key components of Altinn (in Norwegian)

A chronology of the development of Altinn is provided below (see also Table 1).

2003: *Altinn I introduced.* A key component was forms management technology used in the portal. Two central registers served as authoritative directories for the solution, the National Register (of inhabitants) and the National Register of Businesses. The solution covered 80 forms for business-to-government usage, and was well received by the business community. Two services were introduced:

(i) *Submission:* A service owner creates a service to allow a user to submit data as per a defined schema. Submitted data will be sent to the inquiring agency (service owner) and can also be stored in the user's storage area in Altinn. The service allows the service owner to split the data to different agencies. The service pattern offers different mechanisms for preparation, signing and submitting data. Other mechanisms allow for notifications and allocation of tasks with deadlines.

(ii) *Message:* Service owners can send messages to registered users of Altinn. The messages reside in the user's Altinn mailbox. Messages support HTML messages and attachments. The user can be notified by SMTP-based e-mail or SMS that information has been made available for review or processing. The

² The Directorate of Taxes

service owner can monitor which messages have been opened and request the user to confirm receipt by a certain deadline. Messages can be retained in the user’s Altinn mailbox or deleted as applicable.

2005: Automated tax return. This solution, developed by the Tax Authority, generated a tax statement based on the information obtained via Altinn (incomes, property) and banks and insurance companies (accounts, pensions). Altinn’s portal capability provided taxpayers with the ability to approve pre-filled statement of returns. This automated functionality served most of the tax returns and most inhabitants regarded this as a great time saver. It also greatly simplified the work for the tax authorities, since data extraction and algorithms did most of the job.

2005: More actors. The success of Altinn attracted other public organizations: the Central Bank of Norway, other ministries and several public agencies started engaging with businesses using Altinn.

2006: Security Portal. Altinn adopted ID-porten, the public authentication portal established by the Agency for Public Management and eGovernment (DIFI). This provided a flexible solution i.e. it allowed for different electronic IDs to be used. The same year Altinn received the prestigious “Rosing Award”.

Altinn I (2003-2008)	Altinn II (2009-2015)
Portal for form-based submissions	New architecture for co-operation
Company reporting Automated tax return	Six types of services
Software vendors offered Altinn plug-ins	APIs available; web services and REST
Financed by Accenture, service owners paid per transaction	Fixed price for development and operation
Mainly technical development	Innovation@altinn to support new ideas

Table 1. Altinn versions

Altinn II

In 2007 the Tax Authority issued a request for proposal to extend the functional scope of Altinn. Accenture was awarded this contract in a dialogue-based negotiation.

2008: Altinn II introduced. Altinn II was a significant increase in scope of functionality and technology capability. While Altinn I was developed as a portal, Altinn II was commissioned to be a platform for collaboration.

These services allowed 3rd party company to implement an Altinn plug-in in their software products, i.e. accounting, financial, CRM systems and others.

2011-12: Media storm. Altinn had now become a service most Norwegians knew well, and two unfortunate incidents occurred. In 2011 the system crashed the day of tax return, because of user overload. In 2012 an error in a cache allowed all users to see the name, address and communication headers of one specific taxpayer. The following media storms exaggerated the damage done, but triggered improvement of the security and privacy mechanism.

2013: API for developers. Recognizing the status as a national platform Altinn provided a REST API for external developers. In 2014 an Altinn app was released, supporting a larger innovation arena for 3rd party developers. (See figure 6).

The following types of services were made available:

- Access: Service owners use this service to provide access to information from their own systems.
- Links Allows users to access schemas and services on other websites. Access is secured through Altinn’s authentication and authorization mechanisms.
- Transmission: Service owners use this to transfer large volumes of data between parties.

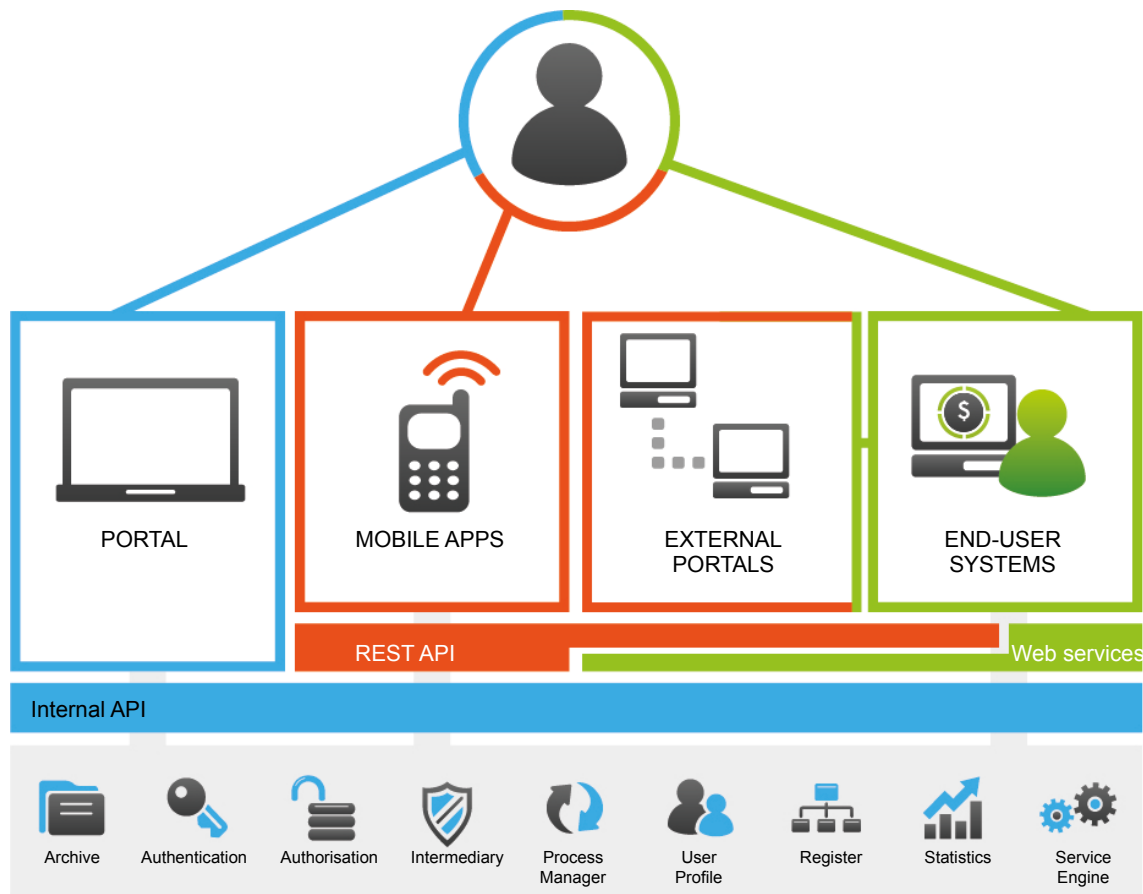


Figure 6. Altinn as an innovation arena

2013: *Digital bankruptcy process*. The debt restructuring process of a company involves many actors, such as banks, creditors, lawyers and accountants, tax and legal authorities, and often takes months and years. Based on the Altinn platform a much faster process was supported, with digitally enabled and secure interaction between the actors.

2015: *“The A-message”* (Work report). Earlier, employers had to report information on employees and wages to the Tax Authorities, the Welfare Agency and Bureau of Statistics on different forms, at different times of the year. With the A-message they only report on one electronic form via Altinn that allows the agencies to integrate the information in their respective systems.

2009-2015: *Innovation@Altinn*. This started as a “think tank” programme including the Altinn managers and developers, members of academia, representatives from the agencies, IT vendors and system integrators. The programme was run on an annual basis including 4-5 network meetings where participants discussed ideas and created prototypes for new services and capabilities in Altinn. Brønnøysund Registry and Accenture were co-hosts of the program.

The overall results are impressive: In 2014 Altinn handled up to 1 mill requests each day, supported the co-operation between more than 40 government agencies and was used by 70% of the population. As a part of a benefit realization analysis, the net present value of Altinn was estimated to 2.6 billion USD (Flak and Solli-Sæther, 2013).

The solution builds on long-term and careful standardization: shared metadata (semantic interoperability), open technical standards, co-operation between public agencies and private vendors (organizational interoperability) and adapting laws and regulations to digital services.

The highest value of Altinn in our opinion, however, is not the services, but the platform: Altinn was built to build: In the tender for Altinn II was written: “The platform of Altinn must be robust, flexible and prepared for the future, in order to become an enabler to help the different actors in the public sector to realize their modernization needs into full e-government organizations. The platform must be sustainable

and support the change of applications and components and include new ones” (Skattedirektoratet 2001, p.9).

Considering the evolution of Altinn we can identify a development pattern that is well known from successful digital infrastructure (Henfridsson and Bygstad, 2013). First, the development of new and more advanced services, as the growing solution increases the “space of possibilities”. Second, the success of Altinn creates a gravitation center that attracts ever more partners. Starting with three initiators, the current solution includes a large number of public organizations. Third, as Altinn grows in services, users and partners, it is institutionalized in a deep sense: it provides not only a national IT service, but it becomes a cornerstone of a national digital infrastructure.

5. ANALYSIS

In order to analyze the attributes and dynamics of this platform we draw on two theoretical perspectives. We regard Altinn as an innovation, but also as the descendant of a long tradition of national registers, from which the solution also inherits its institutional weight.

We draw on critical realism, focusing on generative mechanisms, i.e. underlying causal structures that explain events. Combining these two perspectives, we offer the following analysis, illustrated in figure 4.

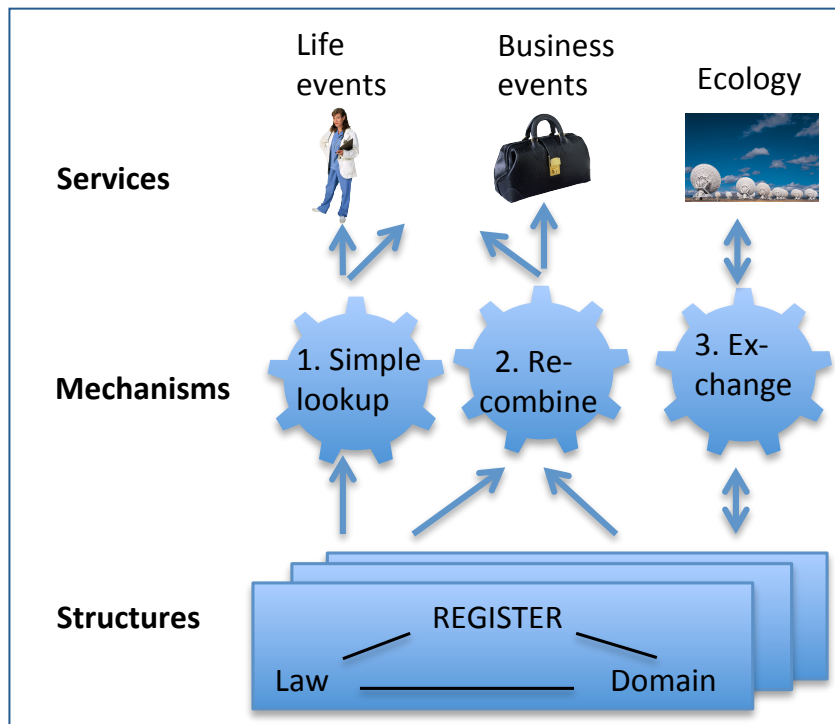


Figure 7. Structures, mechanism and services

5.1 Event level

We find three main categories of events, as shown in Figure 7. Historically, the oldest category is the business (property) events, including property tax collection and documentation of land ownership. Today they include various types of property and business transactions, for example buying a house, starting a company and “tinglysing” a right to fish salmon in a river.

The initial life events were birth, marriage and death. In modern societies they may also include services such as tax declaration, health care, social benefits and the certification of academic grades.

The third category, ecologies, did not exist before the digitalization of services. Broadly, it denotes interaction services, where private and business actors exchange information with government and each other. Examples are discussed below.

5.2 Structure level

Modern states have a large number of digital registers, not only on the basic information of people and property, but for many other purposes. For instance, the Brønnøysund registers include such registers as Marriage settlements, Private Debt Amnesty, the Central Coordinating Register for Legal Entities, and the Norwegian Register of Hunters. It also, interestingly, includes the Semantic register for electronic collaboration (SERES), which contains metadata describing semantics and structure of public data, helping to exchange data between sectors.

State registers have owners and are based on a specific law. For example, the Central Coordinating Register for Legal Entities was based on a new law in 1994³, specifying the purpose (supporting effective use and co-ordination of public information on companies and organisations), ownership, types of information, and the duty of all organisations to register.

While the registers were built on specific purposes and law, Altinn was quite different (Harnang, 2013); Altinn was not a register, but a platform built on various registers, and their relationships. To understand the nature of this platform we draw on the concept of mechanism.

5.3 Mechanisms

Through retrodution we identified three generative mechanisms that explain the evolution of government as a platform.

(i) Simple look-up mechanism

The first mechanism is the simple lookup, where the user is allowed to access (and update) one record at the time. In traditional paper-based registers this would mean to browse the pages until it was located. Modern IT systems allow the user to enter a key, and locate it easily. Authorization to the information was previously with the book owner. In Altinn, access and authorization is granted through the ID-porten, the common login gateway.

Other typical look-up and update services in Altinn are:

- Dispatch: Enter information, for example annual financials
- Transfer: Send information to other actor
- Linking: Connecting to other services
- Alert: Notice on some event

(ii) Recombination mechanism

The second mechanism is recombination. This is made possible by IT by linking information from different registers to produce new services. It is well documented that recombination is a core element in digital innovation (Henfridsson and Bygstad, 2013), it allows for continuous innovation in a modular structure.

During the first years Altinn has introduced a number of such services, of which the Automatic Tax Return is the most spectacular. The Automatic Tax Return works this way: Based on the civil registry, all inhabitants are identified. For each ID all tax-relevant sources are checked: income statements from companies, bank accounts, insurance policies, welfare benefits etc. Based on this information a tax statement is calculated. This is sent to the individual, who will check the information. If he or she is not satisfied, objections and corrections are entered electronically in Altinn. If not, the tax return statement is considered approved.

It is relatively easy and cheap to connect external partners into Altinn. Today, 82 different software solutions from private vendors, such as financial, CRM and HRM systems, have integrations with Altinn.

The recombination mechanism presents some new challenges related to purpose and law. As shown by Bing (2008) electronically supported (or automated, as in the case of the tax return solution) casework

³ <http://lovdata.no/dokument/NL/lov/1994-06-03-15>

integrates law into computer programs, and raises issues on interpretation and the rule of law. Recombination also extends the uses of information from the initial purpose of the register; we particularly see this in the on-going debate on uses of the growing numbers of medical registers, which were established for one purpose, but can be used for many other purposes, such as research and commerce.

(iii) Exchange mechanism

The exchange mechanism takes this functionality further; however it is not primarily producing a service, but allowing actors in a network to co-operate. Many public responsibilities, such as legal procedures, are not single services, but complex processes involving many private and public actors. A collaboration service will have one responsible service owner for the entire process, but enable the inclusion of formal communication with many public agencies that have independent responsibility for their respective parts of the process. From our analysis we find that the exchange mechanism offers a particularly strong potential for innovation based on public registers. The reason is that public registers are backed by law, and therefore can support innovation of services that are law based.

It is easy to envision a number of complex cases in which the same logic could apply. It is well documented that many countries suffer from poor processes in such areas as starting a business, conducting a bankruptcy process, or the regulation of land use.

For instance, the bankruptcy process, which was introduced in Altinn in 2013, was a salient example of this mechanism. The bankruptcy process in modern societies takes between 1 and 3 years (The Economist), and most of this time is spent in the legal system. As the Altinn case shows, it is possible to speed up this process greatly, provided a digital governmental platform.



Figure 8. The Altinn App

Another example is the proposed app Moving House, which may be seen as a simple update of the Civil Registry, of my family changing the address. It involves however, many other actors; the kindergarten and school for the children, regular doctor, car registration and municipal services such as garbage collection and support for elderly. It may also include dentist and car service provider. Today all this information is paper-based, and very time-consuming to update. Using Altinn as a platform allows for a total redesign of the process: the app moving house in Altinn will trigger other messages, such as contacting the kindergarten, school and municipality. These actors will respond by initiating communication, suggesting for example a specific primary school, and asking for a start date.

The potential benefits from this use of the exchange mechanism of a government platform are considerable, both in terms of public expenditure and business benefits. These solutions development in Altinn are currently under development.

6. DISCUSSION: LOOKING AHEAD

In this paper we have tried to place public registers in a historical context, and analyze their significance in nation building and digitalization. Further, we have presented how the contents of certain registers enable digital platforms to deliver secure and trustworthy services. In this section we speculate more freely on the future of digital platforms and the role of registers.

6.1 Implications of Government as a Platform

The notion of “commons” i.e. resources made available to all members of society has been applied to the digital context with a social community perspective (Fuster Morell, 2010). We suggest that a digital platform with mechanisms for connectivity, domain-specific functionality and registers can be considered as a “digital commons”. Such a digital commons would be applicable in a cross-sectorial context as well as within a sector like Healthcare or Education.

Digital commons for a cross-sectorial context would serve the entire nation, much like how Altinn operates as a national component. A modern digital society should not develop its services and components as stand-alone services, but be part of a platform. We suggest that government platforms, such as Altinn, can be envisioned as a *societal operating system*. An operating system connects resources in a computer to provide users with means to utilize the resources for memory and storage, input and output devices and computing units. Analogously, a societal operating system would connect the basic resources in government to provide individuals and businesses with a unifying and simplified point of access.

We suggest that digital commons for a particular a sector would exhibit similar behaviours to that of a cross-sectorial digital commons. For eg in healthcare the registers in such a digital commons would contain information about patients instead of persons. This could extending the notion of “person” to record extra healthcare information to characterize “patient”. Registers in a digital commons for healthcare would contain information about healthcare enterprises and healthcare professionals instead of all enterprises. The commons would comprise registers that capture information on roles and authorizations and patient consent and delegation.

This approach has significant implications for software architecture being used in modern society. Businesses and government agencies within each sector have traditionally built their own solutions more or less from scratch and independent of agencies in other sectors. For instance, the justice and public safety sector has built a number of separate systems, and is struggling today with difficult and costly integration endeavours (Contini and Lanzara, 2012). Likewise, the health sector has literally thousands of IT systems in just one country, such as Norway, and struggles to manage and evolve these solutions to meet the growing business challenges. The delivery and management of standalone systems are technically very demanding and cost billions of Euros.

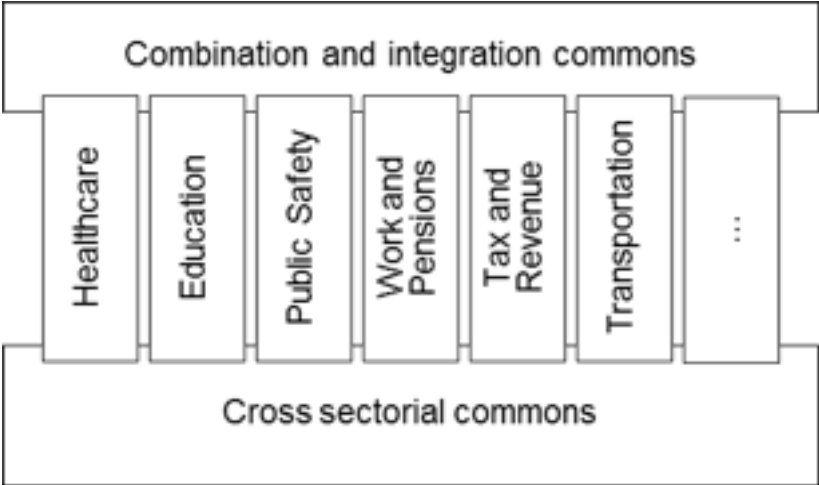


Figure 9. Digital Commons - Cross-sectorial and sectorial commons

One architectural approach would be to think in terms of verticals and horizontals, where a shared foundation serves collective purposes – a cross-sectorial digital commons (see Figure 9). The resources at this layer are stable, and they can be standardized in terms of functional behaviour and shared information. In Norway, a set of “common components” (of which Altinn is one), is now available for the entire public sector in its dialogue with businesses and individuals. Similarly a “combination commons” could serve as means to create integrated services from different sectors so that users – individuals and businesses can access these in a convenient manner.

6.2 Transnational collaboration

Digital commons can be implemented in sovereign states with minor architectural changes. The most significant variation will occur in domain-specific functionality. The approach to interoperability between the verticals and within a vertical can be extended to secure transnational collaboration and service integration. The mobility of individuals and the growth of multinational corporations will drive the need for more collaboration between sovereign states and interaction within and between trade blocs like the EU. The applicability of digital commons in a transnational perspective requires further research.

6.3 Supporting innovation – and surveillance

While the trustful relationship between the governments and populations in Scandinavia provided a beneficial ground for national registers, such registers have certainly also a darker side. We do not go into depth into this complex area, but will briefly comment on it.

Historically, people have often resisted registration. One reason that the parish registers of the 16th and 17th centuries often were of poor quality was that the parishes – quite rightly – suspected that they might be used for other purposes, such as taxation.

Control and surveillance has always been one aspect of national registers. The Chinese Hukou system – although weakened - is still used to control the movements of the population, and also to conduct surveillance of individual citizens (Wang, 2010). The current discussion on privacy after the Snowden scandal raises many questions (Zuboff, 2015): will everything on the net be used (and misused) by public surveillance agencies? Are the private actors, such as Google and Apple, the greatest threats? How can the deeply asymmetrical relationship between the “Big Other” (governments and companies) and the ordinary citizen become subject to democratic and transparent processes, and possible mitigated? We do not aim to contribute to these issues here, but we strongly believe that the potential of national digital platforms can only be realized with the necessary mutual trust, legislation and transparency.

7. CONCLUSION

In this paper we discussed the significance of government platforms, building on national registers, from a historical and architectural perspective. To develop our argument we built on a critical realist lens, and analyzed a successful national platform in Norway, the Altinn solution.

We identified three evolutionary mechanisms of national registers; simple look-up, recombination and exchange. We also discussed government platforms as “digital commons”.

ACKNOWLEDGEMENTS

We thank the Nokobit reviewers for useful suggestions, and we thank Arild Jansen for critical comments on an earlier draft of the manuscript.

REFERENCES

- Baldwin, C. and Woodard, J. (2008). "The Architecture of Platforms: A Unified View". Working Paper, Harvard Business School.
- Bhaskar, R. (1998)[1979]. *The Possibility of Naturalism: A Philosophical Critique of the Contemporary Human Sciences*, London: Routledge.
- Bing, J. (2008). "Bruk av rettslige informasjonssystemer – fortid, nåtid, fremtid." In (red.): Jansen og Schartum (red.) *Elektronisk forvaltning på norsk. Statlig og kommunal bruk av IKT*. Bergen: Fagbokforlaget.
- Cap Gemini (2012). Altinn – en platform å sates på? Report (in Norwegian).
- Contini, F. and G.F. Lanzara (2012), "Beyond Interoperability: Designing Systems for European Civil Online", Proceedings Research Conference - Bologna, 15-16 June 2012.
- Flak, L.S. and Solli-Sæther, H. (2013). "Benefits Realization in eGovernment: Institutional Entrepreneurship or Just Hype?" *Proceedings of the 46th Hawaii International Conference on System Sciences* (HICSS).
- Fleetwood, S. (2009). "The Ontology of Things, Properties and Powers". *Journal of Critical Realism* 8(3): 343–366.
- Fukuyama, F. (2011) *The Origin of Political Order*. Profile Books, New York
- Fuster Morell, M. (2010). "Governance of Online Creation Communities: Provision of infrastructure for the building of digital commons". Florence, European University Institute.
- Galbraith, V.H. (1961). *The Making Of Domesday Book*. Larendon, London.
- Hanseth, O. and Lyytinen, K. 2010 "Theorizing about the design of Information Infrastructures: design kernel theories and principles." *Journal of Information Technology*, Vol 25: 1–19
- Henfridsson, O. and Bygstad, B. (2013). "The Generative Mechanisms of Digital Infrastructure Evolution". *MIS Quarterly*, 37(3):907-931
- Jansen, A. (2008). "Fra EMMA til Altinn." In (red.): Jansen og Schartum (red.) *Elektronisk forvaltning på norsk. Statlig og kommunal bruk av IKT*. Bergen: Fagbokforlaget.
- Mazzucato, M. (2013). *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*. Anthem Press, London.
- Mingers, J. 2001. "Combining Is Research Methods: Towards a Pluralist Methodology," *Information Systems Research* (12:3), pp. 240-259.
- Norwegian Mapping Authority, (2014) "The History of the Norwegian Cadastre". (In Norwegian).
- O'Reilly, T. (2010). "Government As a Platform". In Lathrup, D. and Ruma, L. (eds). *Open Government: Collaboration, Transparency, and Participation in Practice*. O'Reilly Media.
- Rosen, M. (2002). "National Health Data Registers: a Nordic heritage to public health". *Scandinavian Journal of Public Health*, 30:81-85.
- Sayer, A. (1992). *Method in Social Science. A Realist Approach*, New York: Routledge.
- Scholl, H.J. (ed.) (2015). *E-Government. Information, Technology and Transformation*. Routledge.
- Skattedirektoratet 2001. "Forespørsel for AltInn Elektronisk innrapporteringskanal for næringslivet - Anbudsnr. 2001/043.
- Thygesen LC, Daasnes C, Thaulow I, (2011). "Introduction to Danish (nationwide) registers on health and social issues: structure, access, legislation, and archiving". *Scandinavian Journal of Public Health* 39:12–6.

Wang, Fei-Ling (2010), "Renovating the Great Floodgate: The Reform of China's Hukou System," in Martin King Whyte ed., *One Country, Two Societies: Rural-Urban Inequality in Contemporary China*, Harvard University Press, pp. 335-364.

Williamson, O.E. (1990). *The Economic Institutions of Capitalism*. Simon and Schuster.

Wynn, D. and Williams, C.K. (2012) "Principles for Conducting Critical Realist Case Research in Information Systems". *MIS Quarterly*, 36(3), pp. 787-810.

Yoo, Y. (2013). "The Tables Have Turned: How Can the Information Systems Field Contribute to Technology and Innovation Management Research?" *Journal of the Association for Information Systems*, 14(5): 227-236.

Young, J. (2013). *China's Hukou System: Markets, Migrants and Institutional Change*. Palgrave Macmillan.

Zuboff, S. (2015). "Big other: surveillance capitalism and the prospects of an information civilization". *Journal of Information Technology*, 30:75-89.