

# Evaluation of the Iceland State Financial and Human Resource System

## **REPORT OF THE INDEPENDENT EVALUATOR**

### **1 EXECUTIVE SUMMARY**

The Fjármála- og efnahagsráðuneytið has commissioned me to conduct an evaluation of the back-office information system used in the Icelandic State administration for financial and human resource management (henceforth called the System). The Evaluation has been based on and guided by its agreed Terms of Reference, which are attached to the Report as Annex 3.

This Report sets out my assessments and conclusions. In chapter 6 there are fourteen recommendations for future action.

The System is in my assessment acceptable, adequately functioning, reasonably suitable and able to create value for the State administration. I recommend that the State administration continue to use the System, at least in a medium-term perspective, in order to benefit from the investments already made in adapting the State institutions' procedures and workflows to the use of the System.

The Government needs at the same time to take a decision on the future evolutionary path for the State administration's information system. The System as it is today and as it is managed is a shared back-office system for administrative functions without any links to the government's broader information society programme. The crossroad ahead is whether to continue along the System's present path, or whether to start moving towards a broader coherent information management system containing front office and operational functions as well as back office functions.

In both cases it is necessary with a more active and visionary strategic governance and strengthened operational management arrangements. The structure of the latter would depend on the choice of evolutionary direction.

I have made a number of critical observations on how the System has been set up and configured how it is governed and how it is managed.

Firstly, the System has been set up in an integrated manner so that the human resource, the project portfolio and purchase management applications appear as mere extensions of the financial management application. This means that the System doesn't use the full flexibility of the underlying software and that it has become unnecessarily complex and cumbersome. I recommend that the Government initiate a strategy for unbundling of the different applications.

Secondly, there doesn't seem to be an active strategic governance of the evolution of the System. I recommend that the government designate a unit or a civil servant (a State CIO) in one of the ministries as the strategic owner of the System.

Thirdly, the way the operational ownership is set up is not optimal. I recommend that the government designate a primary operational owner for the System as such, and a secondary operational owner for each of the application modules. The Fjársýsla ríkisins is the logical choice for being the operational owner of the financial management applications, but the choice of institutions for the other roles would depend on the government's choice of evolution path.

Finally, the small size of most State institutions means that they have insufficient own administrative capacity and competence. I recommend that the Service Centre at the Fjársýsla ríkisins be expanded to a State Service Centre of the type recently set up in the other Nordic countries.

## **2 THE EVALUATION: REMIT AND METHOD**

### ***The remit<sup>1</sup>***

The subject of the Evaluation is the investment made in the System, the quality of the system and the cost of operation. The Ministry has requested an objective assessment of the success of the System, and of its suitability for continued use. The overall objective of the Evaluation is to assess how well the System fulfils the requirements and needs of the State, and to propose actions to improve the IT-systems supporting the State finances and human resource management. The following areas were specified in the Term of Reference.

- (1) *System quality*: the functional suitability; the usability; the reliability; and the security attributes of the System.
- (2) *Operation and support*: the cost and quality of the operation, maintenance and support of the System; the adoption rate for new institutions; and the adaptability with respect to the implementation of necessary workflow changes.
- (3) *Actions*: improvements to the System, taking perceived inefficiencies and future needs into account.

### ***The relevant international standards***

The Terms of Reference states that it is preferred to base the System quality evaluation on the Software Product Quality Requirements and Evaluation (SQuaRE) as outlined in the international standard ISO/IEC 25000:2005. This standard is primarily intended to be used for software testing during development and procurement phases, and some parts of it are not relevant for the Evaluation. There are at the time some properties which are relevant for an assessment of the continued use of the System that are not included in the standard.

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<sup>1</sup> This subsection is based on the Terms of Reference. These are attached to the report as Annex 3.

The standard contains two assessment models that have been used to structure the Evaluation; the Product Quality Model and the Quality in Use model. Details on these two models are provided in Annex 2 to the report.

### ***The conduction of the Evaluation***

The Evaluation has a managerial rather than a technical orientation. It is primarily based on existing Icelandic documents, on user experiences and attitudes as observed by the Consultant, and on professional assessments. It has reviewed the process leading up to the present situation, since relevant issues are characterised by a significant path dependency. It is however not an audit of previous decisions and actions.

The Evaluation has been conducted through visits to Iceland to gather information and to interview users and other stakeholders, and desk work in Sweden for analysing the issues, structuring the Evaluation and preparing visits and writing the reports. The scope of the Evaluation has not allowed it to do any formal testing of the System, nor to conduct any user surveys.

I have made three visits to Iceland during the Evaluation, on 17<sup>th</sup> – 21<sup>st</sup> December 2012, on 4<sup>th</sup> – 8<sup>th</sup> March 2013 and on 15<sup>th</sup> – 17<sup>th</sup> April 2013. During my December visit I had a number of informal encounters in order to get an understanding of the subject of the Evaluation and the organization of the Evaluation. On 8<sup>th</sup> February 2013 I submitted as requested an Interim Report that described how the Evaluation would be structured and how it would proceed. It indicated both the focus and the delimitations of the Evaluation, and the methodology that would be used.

During my March visit I made a number of prepared interviews with selected users and stakeholders, and during my April visit I listened to the key stakeholders' reaction to a report outline with tentative conclusions. The outcome of these interviews is reflected in the Report.

I have been given valuable assistance by Jón Óskar Hallgrímsson from Atvinnuvega- og nýsköpunarráðuneytið, and Arnaldur Axfjörð from Admon, who have scheduled meetings, translated and explained Icelandic texts and explained the local context. Staff at the Fjársýsla ríkisins and at Advania have assisted me by providing any information requested.

Information on arrangements in other countries have been downloaded from websites and provided by contacts in the concerned state institutions.

### ***The specific Icelandic context***

The specific Icelandic context has to be taken into account when assessing developments, the situation at hand and forward-looking options. The most salient context element is the relatively small size of the Icelandic population – 315 000 compared to between 5 and 11 million in the other countries reviewed, and the consequently low number of State employees.

This means that Iceland has a substantial scale disadvantage. While the costs for use and data centres may be proportional to size, other costs are more like fixed overhead costs and less dependent on size. The available capacity and talent in the part of the private software sector is limited, and it may be harder to attain a sufficiently competitive market for support services.

The small size of the State administration may also be an advantage in that cross-ministerial and cross-institutional contacts and pooling of resources are easier to achieve. This may at the same time be the reason why governance arrangements seem to be less evolved and formalised than in the other Nordic countries.

Finally, one has to be aware that Iceland is recovering from the recent severe economic crisis. Resources might for that reason be even more limited than normal. That measures and activities for the promotion and development might have been delayed is not serious, as long as the steps that have been taken have followed the best path.

### ***The terms and concepts used***

A number of terms used in this report can be interpreted in different ways due to the flexibility of the English language or to differences in usage between different groups and professional areas. Some of the terms used in this report are therefore defined below.

The term *System* refers exclusively to the evaluated information management system – generally called ORRI – while the term *system* is used in a generic manner. Similarly, the term *Evaluation* refers exclusively to this evaluation, and the term *State* to the Icelandic state. Sub-government entities are called *institutions* regardless of their formal standing and character. The term *government* refers exclusively to the collectivity of Ministers. The term *government offices* refers to the combined ministries. The term *centre of government* is more extensive and includes State institutions assisting the government in its management of the State and its governance of State institutions.

When the Report discusses management and governance issues, the term *supplier* refers exclusively to Oracle and its Icelandic representative, Advania. The Fjárfýsla ríkisins is thus not seen as a supplier in relation to other State institutions, but as a State institution within the centre of government with responsibilities for the shared back-office system.

The term *owner* refers to a State institution assigned specific responsibilities in regard to the System or to one of its constituent parts. The Report will make a distinction between the *strategic owner* of the System with a responsibility for forward-looking and strategic governance of the System, the *primary operational owner* of the System with responsibility for the relations with the supplier and for the global management of the System, and *secondary operational owners* with responsibility for the management of a set of application modules and for its propagation.

The term *user* refers to anyone who interacts with the System on its input or output side. The term *primary users* refers to State institutions generating data and to those of their employees that input data into the System. The term *secondary users* refers to those who receive and use output from the System. A distinction will be made between *high-level users* in the centre of government and *low-level users* in other State institutions. The term *other users* refers to stakeholders outside the administrative line of command such as the Althingi, the Ríkisendurskoðun, the media and the general public.

The term *account* refers to the financial records as such. The term *cost type* (a.k.a. account) refers to the basic structure in bookkeeping. Even if it nominally only should refer to costs, it can also be used for revenues.<sup>2</sup> Cost types are used to break down cost and revenues in different categories. The term *cost centre* (a.k.a. profit centre) is used for references to the concerned organisation, part of an organisation, programme or project. Cost centres are used to break down the account variables for reporting purposes.

The use of the term *explicit* in this report signifies that the concerned statement should be put in writing in such a way that it has a lasting effect. The spoken word or the mere mentioning in a government decision or in a report is not enough; the statement should be included in a standing instruction or guideline.

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<sup>2</sup> I note that the term account or account key is used in Iceland for cost type. I avoid the using that term however, due to it also having a broader general meaning.

### **3 SCENE AND CONTEXT**

The focus of the Evaluation is on the System; i.e. the shared back-office information system in the State administration. Both the State administration and the society that it serves are undergoing a continuous change, and it is necessary to understand the environment in which the System exists. This section begins with a discussion of the on-going technological revolution that has enabled the creation of digitalised information management systems. It also contains a summary of my findings of similar systems in selected European countries.

#### ***The present technological revolution***

Our societies are since a half a century undergoing a major technological revolution, based on the introduction and evolution of microelectronic appliances and digitalised information. The outcome is a transformation of almost all structures, processes and relations in society, as different actors strive to make full use of the possibilities created. The resulting changes are as fundamental as those that followed on the introduction and evolution of electrical appliances, and much can be learnt by analysing the features and outcomes of that technological revolution. The public administrations are no exceptions; an efficient modern public administration is today an administration that makes an appropriate use of the new technologies. The key determinant of efficiency in any organisation – private or public – is now an efficient digital information management, and a continuous adaption to the possibilities opened by the technological evolution.

#### ***Networks replace integrated structures***

One of the salient properties of the new technologies is that they enable a more efficient governance of widespread de-concentrated organisations and decentralised operations. This has led to two seemingly contradictory trends; on one hand towards more centralised governance and management arrangements, but also on the other hand towards more fractured and widespread organisations. In the private sector, large enterprises are increasingly re-organised into separately managed business units while small enterprises are increasingly acquired by or drawn into contractual relations with large enterprises.

The dominant organisational paradigm was previously called *taylorism* and based on hierarchical structures and pre-defined work processes. When extended to the public sector, this paradigm was called *weberian* and based on an ideal type of bureaucracy. These paradigms are now increasingly replaced by an organisational paradigm that can be called *service management* based on empowering line managers and front-line-employees, and focussing on results.<sup>3</sup>

These changes are also visible in the public administrations, as the old organisational paradigm is partly being replaced by a new governance paradigm based on delegation and devolution, setting frameworks and goals, and monitoring results.<sup>4</sup> As a result, the number of separately managed government institutions – so called *arms' length agencies* – is growing even in countries that traditionally have been very centralised, such as France.<sup>5</sup>

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<sup>3</sup> The first two terms refers to Frederik W. Taylor's book *Scientific Management* and to the work of the German sociologist Max Weber. A good introduction to the third term is Richard Norman's book *Service Management*.

<sup>4</sup> I avoid using the label new public management. The reason is that there are so many different interpretations of this concept that it can stand for anything that is not old public management.

<sup>5</sup> À la recherche des agences. Conseil d'État, 2012.

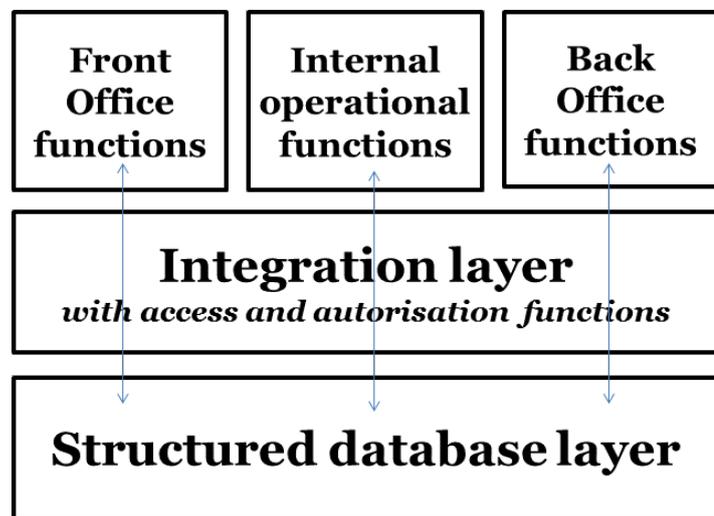
A similar evolution from coherent hierarchies to managed networks has taken place within the information and communication arrangements. The dominant paradigm of the early digitalisation was large integrated systems run on so called mainframe computers. The advent of faster processors and adequately secure and efficient electronic communication has led to mainframe computers gradually being replaced by more modular networked systems. The evolution of website programming has at the same time led to new expectations of usability and user interface design.

The new modular systems have initially been structured in many different ways, but today it is possible to describe an *ideal type* for the design for an organisation's internal information management system; a design that enables the organisation to make full use of the flexibility and possibilities generated by the new information and communication technologies.

This ideal type is based on a system architecture with three discernible layers; a spine, an intermediary integration layer and a functional layer.<sup>6</sup>

The *spine* would be a set of structured databases corresponding to the organisation's need and available to all users in the organisation on a 'need to know' basis. A guiding principle would be that the same set of information should only be stored at one place in the database layer.

The *integration layer* would manage and enable the different interactions between the functional layer and the spine. It would also contain shared access and authorisation functions. The access functions would determine who can use the system, and the authorisation function would determine what parts of the system that each user can access. It would also determine which databases that each functional module can access.



The functional layer would contain a number of functional modules. Which these would be, would vary across organisations and information management systems. The functional modules can for analytical and practical purposes be divided into three main types. *Back office functions* would include supporting administrative functions. *Front office functions* would be functions that enable the organisation to communicate and interact with external persons and entities. Most of the functions referred to as eServices or eGovernment are of this type. *Internal operational functions* would be functions that are part of the organisation's core operations rather than being mere support functions.

Coherent programme suites of the type represented by the Oracle eBusiness Suite represent an intermediary stage in the evolution. Their core element is an integration platform that enables a suite's functional modules to interact properly, but they are typically limited to normal back-office functions with integrated databases. It is however normally possible to configure a system based on a programme suite so that it approaches the ideal type described above.

It should be noted that it has not been uncommon for programme suites to use proprietary standards in order to favour the supplier's own applications and to make it more difficult to replace the programme suite. A reasonable assumption, given the evolution in for example

<sup>6</sup> The description of an ideal type is based on the evolution of a system for so called 'networked defence' in the Swedish Armed Forces, which in its turn has been influenced by work on a similar system in the US Armed Forces.

financial services, is however that there is a clear trend towards the use of open standards and thus also better competition between applications and application providers.

### ***Governing networks***

The key difference between a network and a host of separately set up applications and functional systems is that the network is governed by a central authority that sets interaction standards, ensures the availability of required network functions and polices the adherence to network rules and standards. In the ideal type of information management system described above, the network's central authority would also determine the structure of databases in the spines and access and authorisation rules and procedures.

Organisations building coherent information management system – integrated or networked – often designate a Chief Information Officer, CIO, to be responsible for the strategic governance of the system and sometimes also for the top-level management of the system. Initially, the CIO was also normally responsible for the technical systems that the system was running on. The underlying technologies are however becoming so mature and ubiquitous that they can be dealt with at a lower organisational level. Some organisations handle this by designating a Chief Technology Officer, CTO, to handle the technology issues, while the CIO focuses on information as a production factor and on business process re-engineering to optimise the value generated by information use.

### ***Arrangements in some other European countries***

The Evaluation is expected to assess the cost and quality of the operation, maintenance and support for the System and compare with experiences from neighbouring countries. Information has therefore been collected on the arrangements in six small European countries with a reputation for being innovative users of information technologies; i.e. Austria, Belgium, Denmark, Finland, Norway and Sweden. Information is summarised in Annex 1 to this report.

I have not been able to find any international comparative studies or other relevant literature concerning the back-office information management systems in public administrations. Much of the focus of research and international studies has during the last decades been focused on front office functions; i.e. on expanding and improving the services provided online to citizens and enterprises. The back office arrangements have been taken for granted or has been left to the ICT professions to discuss in more general terms.

It is evident from the six countries covered by the survey that there is so far no single best solution, since countries have chosen different arrangements and suppliers. None of the six countries have however chosen to set up a single shared back office system including all the functions that are included in the System. It is also evident that the internal administrative arrangements are salient factors between different choices. Some countries have been open about problems encountered, while problems in other countries can only be inferred from extended implementation times.

Five of the six countries operate shared service centres providing administrative services to other state institutions. Using the centre is compulsory in one country (Finland) and widespread in the other countries. The services provided are typically based on service contracts between the centre and the serviced institutions. The centres are normally not financed by own budget authorisations, but by fees paid by the serviced institutions.

Finally, it is also clear the Icelandic State administration was both an early mover and an unusually daring mover when it already twelve years ago decided to set up a shared back-office information system.

## 4 THE PATH THAT DETERMINED THE PRESENT

In this section, I discuss salient aspects of the initial set up and installation of the System. An evaluation of the implementation itself or of the process of acquiring, developing, adapting or integrating the System and its components is not included among the objectives for the Evaluation. There is however a significant path dependence in System management and development, and the present situation is a consequence of all previous decisions. Personal and institutional memories play a significant role for how different stakeholders interpret different evolutionary options. It has therefore been necessary for me to review past decisions and developments and the evolutionary path followed in order to be able to understand the options available today and make evidence-based recommendations for future action.

The initial decision to move towards a new system was taken in 1997. In 1999 work began on a requirement analysis covering institutions of different sizes and with support from KPMG and PWC. The Request for Tender (RFT) documents were ready towards the end of 2000, and the current system was selected in 2001. The initial decision to build a shared back-office information system for the State administration was thus taken about fifteen years ago, and the selection made about twelve years ago.

My second observation is that the initial decision seems to have been taken against a background of high ambitions concerning Iceland's transition to a digitalised society with a digitalised State administration; ambitions that went beyond the mere creation of a shared back-office information system. The Terms of Reference for the Evaluation says i.a. that

*The purpose of the purchase was to replace some of the older State finance and human resource systems, combine and integrate applications and support new opportunities in electronic government. The goal was to automate procedures and data communication between government institutions and between the state and the citizens and other customers in government services.*

My assessment of the process of the initial set up and installation is based on interviews with stakeholders, many of whom had participated in the process. My impression is that the initial expectations were exaggerated and that there was insufficient understanding of the challenges that would be encountered on the way and of the resources that would be needed for an adequate implementation. There also seems to have been only weak political guidance. The Centre of Government doesn't seem to have exerted a sufficient pressure on State institutions to adapt their internal administrative processes to the new System. The decisions taken at that time have however to be seen against the background of the competence, capacity and options that were available to the Icelandic government at that time.

The acquisition and implementation of a system of this type should not have been seen or managed as a mere IT-project. The State's initial ambitions were also, as seen in the quotation above, higher and implied a modernisation of all structures and work processes in State institutions. An appropriate transformation of the State administration's work processes were also needed in order to maximise the benefits of the investment. This in its turn required a build-up of new competences for both high and low-level users.

The initial setup and installation was entrusted to a committee composed of representatives from the Fjármálaráðuneytið, the Fjársýsla ríkisins and smaller and larger State institutions. My impression is that this committee did not in itself have any authority over other State institutions, and that it thus had to resort to consensual agreements.

The Fjársýsla ríkisins that would become the implicit primary operational owner of the System did not itself have the resources or the competences necessary for the setup and configuring of

all sets of application modules. It was instead agreed that the Landspítalinn would act as lead agency for the setting up of a purchase management application, and the Vegagerðin as lead agency for the setting up of a project portfolio management application. The efforts of these State institutions were financed by their own means and understandably focused on their own needs. They were not given any resources for support to other primary users, and were from what I have observed never given such a role, nor had they agreed to play it.

The Fjármálaráðuneytið is said to have agreed initially to act as the lead agency for a human resource management application, but this does not seem to have worked. Instead, the Fjársýsla ríkisins which acted as the lead agency for a financial management application also took responsibility for the payroll module.

The introduction of new information systems in an organisation with long established work processes is challenging. Inadequate adaptations of the relevant processes and structures within the organisation would limit the efficiency gains from the introduction of a new system. To this can be added that the move to the System included a move from cash based procedures to an accrual based setup, which in itself required considerable changes in work procedures.

The new system as set up and configured was relatively complex and with an inherent rigidity. The transition to the new System proved quite challenging for many users. Nothing that I have observed during my interviews indicates that low-level users were adequately instructed or supported in modernising processes and structures, and their capacity for absorbing the System was probably often insufficient. This lack of support seems to have generated a resistance against the use of the System in some State institutions and a lingering badwill for the System in other State institutions.

The efforts of the Fjársýsla ríkisins seem understandably to have been concentrated on a reasonably quick implementation of the financial management application and the attached payroll module. The lack of support from a strategic owner with an active modernisation agenda seems to have made it necessary for the Fjársýsla ríkisins to make concessions to some other State institutions in the form of adaptation to existing processes. This has reduced the overall gains from the introduction of the System.

There seems to be a widely held opinion that the System is expensive to operate and maintain. These costs were evidently under-estimated during the acquisition process, and it seems that no analysis was made of the total cost of ownership before the decision to build a System on the Oracle business suite was taken.<sup>7</sup> That the costs have turned out to be higher than expected does not necessarily mean however that they are excessive in relation to the value created by the use of the System

It should in this context be noted that the State originally signed one contract with the software vendor for licenses, and another contract with the private company EJS for providing and operating the data centre where the System would run. The Skýrsluvélar ríkisins og Reykjavíkurbæjar (SKYRR) was at the same time designated as responsible for the development and the application administration on day-to-day basis. The reason for this segregation of tasks is said to have been to prevent the State from becoming dependent on a single supplier. The SKYRR had been privatised in 1995 due to a government policy to outsource functions and services, wherever possible. In 2006 SKYRR bought EJS, and the two companies merged in 2010. In 2012 the company was renamed Advania.

This means that the State administration is now – contrary to the original intentions – dependent on a single private company for licenses, hardware operations and support services. This is in my assessment not an optimal arrangement when seen from the State's point of view.

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<sup>7</sup> Mat á þjónustusamningi við Skýrr vegna OEBS. Hjörtur Grétarsson, Hugis. 2006

## **5 THE SYSTEM AS IT IS TODAY**

### **5.1 Initial comments**

In this section, I present my main assessment results.

It should in this context be noted that the design and architecture of the underlying software only sets the potential of the System. The actual properties and quality in use are determined by the configuring of the different parts of the software, by the central management of the System made up of these components, by the support provided to the users of the System, and by the harmonisation of concerned work processes in the State administration. This Evaluation concerns i.a. the suitability and adaptability of the System as set up and installed, and it thus has to cover the governance and management of the System and the usage conditions as well as the properties of the underlying software.

It should also in this context be noted that the users' perceptions of the System does not only reflect their experiences of using the System as configured today. They are also flavoured by previous experiences of the challenges and difficulties of introducing the System. During this phase, the lack of overt political support for the intended modernisation of work processes had a negative effect. It is in my assessment evident that the introduction of a shared accounting system was intended to achieve a certain harmonisation of the concerned processes in State institutions. It seems however as if many of involved users got the impression that the *only* motive for the required changes was that they were required by the System. It is at the same time in my assessment probable that harmonisation ambitions were higher than was objectively necessary.

The System as set up and configured does not in my assessment use the full flexibility of the underlying software. The option of setting up a more flexible system, where different applications feed data into a central database, was rejected at an early stage. The Fjársýsla ríkisins has instead chosen to treat the System as a single application. The System was therefore set up in a relatively integrated mode, and the different sets of application modules now appear more as extensions of the core financial management application than as separate applications. The implementation also seems to have had a bias for central manageability and minimising central transaction costs. While this provided quick gains for the Icelandic State, it has according to my assessment affected both the perceived and actual value for low-level users and their transaction costs negatively.

I want to underline that a system based on a programme suite is not a static product. The suite's core element is the integration platform, on which different applications and modules can be developed and used. Separately developed applications can be adapted to the platform. Application design and development are dynamic processes, and updates continuously generate improved and increased functionality. The primary operational owner will always from time to time have to decide on whether to accept more fundamental upgrades and, if so, how to configure these. There is thus never a single path forward, but always a range of optional paths.

### **5.2 System properties**

For analytical and strategic purposes, the System can be regarded as being composed of at least five parts; an underlying integration platform (a.k.a. integration standard) and four sets of application modules for financial management, human resource management, purchase management and project portfolio management. The sets of application modules have been purchased under separate licenses, and there are more sets of application modules available in the

Oracle product range. For a full picture of the System, one should include that it also contains a number of data bases (a.k.a. ledgers or data registers). When making my assessments, I make a distinction between the underlying integration platform and the sets of application modules, and when relevant between the different sets of application modules.

The System is often described as a single application. This primarily reflects the way it has been set up and configured by the Fjárfýsla ríkisins, and the way it is managed. For practical purposes, the other three sets of application modules can today be described as extensions of the financial management application.

It should at the same time be noted that almost all other administrative back-office functions have to interact with the core financial management application in an adequate way and provide correct information to that applications. This property requirement can however be achieved in different ways.

The properties of softwares can be described in different ways. I have based the structure used in the Evaluation on selected parts of the ISO/IEC 25010:2011 standard, labelled Systems and software engineering - Systems and software Quality Requirements and Evaluation (SQuaRE). This standard contains two main models for structuring software properties. I have also made use of an older standard for evaluation processes<sup>8</sup> and a standard for usability<sup>9</sup>.

The Quality in Use Model<sup>10</sup> structures properties in five groups; Effectiveness, Efficiency, Satisfaction, Freedom from risk and Context coverage. The Product Quality Model<sup>11</sup> structures properties in eight characteristics; Functional suitability, Reliability, Performance efficiency, Usability, Security, Compatibility, Maintainability and Portability. Each of these groups is composed of sets of related sub-properties. Some of these properties are not relevant for this Evaluation.

The definitions of the different groups of properties and sets of sub-properties can be found in Annex 2.

I have analysed these models and chosen to structure my assessments in five groups of software characteristics, namely Security, Adaptability, Usability, Suitability and Replaceability, and in three additional System properties; Costs and efficiency, System management and Strategic Governance.

### **5.3 Issue: Security**

In this subsection, I discuss selected aspect of the *security* of the System. Security is defined in the Product Quality Model as the degree to which a product or system protects information and data so that persons or other products or systems have the degree of data access appropriate to their types and levels of authorization. The Security property includes the sub-properties Confidentiality, Integrity, Non-repudiation, Accountability and Authenticity.

In the Evaluation context it is also relevant to include the *reliability* of the System. Reliability is defined in the Product Quality Model as the degree to which a system, product or component performs specified functions under specified conditions for a specified period of time. The Reliability property includes the sub-properties Maturity, Availability, Fault tolerance and Recoverability.

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<sup>8</sup> ISO/IEC 14598-5 Process for evaluators

<sup>9</sup> ISO 9241-11 Guidance on usability

<sup>10</sup> ISO/IEC 25010 section 3

<sup>11</sup> ISO/IEC 25010 section 4

The Security of the System doesn't only depend on the underlying software, but also on a number of different features, where the weakest point determines the total level of security. These features include the physical and electronic protection of the data centre where the System is run, the protection of the transmissions between users and the data centre, the set-up and configuration of the System and the management of access and authorisations. Availability also depends on the possibilities of withstanding so called 'Denial of Operation'-attacks; i.e. of attempts to overloading a system with massive access calls.

The main responsibility for ensuring the Security of the System rests with its primary operational owner, the Fjársýsla ríkisins. The actual level of security also depends on measures taken by the supplier, both in the maintenance and updates of program code and in the management of the data centre. It also depends on measures taken by each State institution for the management of access codes and authorisations for their own employees.

A proper assessment of the level of Security would require formal testing of the security functions through unauthorised access attempts, and an audit of the procedures, routines and documentation for access and authorisation management in State institutions. It has however not been possible for the Evaluation to undertake such efforts. My assessment is thus based on previous experiences of security audits and on interviews with stakeholders.

Nothing that I have observed would indicate any apparent security faults inherent in the software as such. Reasonable efforts seem to have been made to ensure that the hardware that the System runs on is adequately protected. The procedures for recurring backups also seem adequate. Data provided by the Fjársýsla ríkisins has showed that unplanned downtimes – i.e. when the System has not been available to users – have so far been at a satisfactory low level.

The supplier has allowed me to look at a report from a recent external security review that the supplier had commissioned.<sup>12</sup> This review has identified a number of areas where measures ought to be taken to improve the security of the operation of the System. None of these are system critical, but they should be attended to without undue delay. Some of the observations in the report may concern weaknesses that should be attended to by either the operational owner or the State institutions that are users. This might require additional expenditure for the State.

Some of the weaknesses identified by the external security review mentioned above concerned user accounts including access authorisations. Similar weaknesses were identified in an external review<sup>13</sup> commissioned by the Ríkisendurskoðun in 2010. That review identified material weaknesses classified as 'High risk' in connection with (i) Active user account termination, (ii) Usage of generic accounts and (iii) System Administration Accounts. It also identified a number of other significant weaknesses classified as 'Medium risk'. It should in this context be noted that this type of weaknesses is not software dependent or specific.

I recommend that the Government take appropriate action to ensure that the identified security weaknesses have been or will be attended to within a reasonable timespan. This would include action to ensure that the State institutions' own routines for the management of user accounts and access authorisations are adequate.

The System was configured so as to optimise central manageability and reduce central transaction costs. As a consequence, transactions originating from different State institutions were initially run in the same batches, enabling users to note the existence of transactions originating from other users. This could have involved certain transactions originating from the Landspítalinn. I have however been told that core transactions from the Landspítalinn were always run separately

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<sup>12</sup> This report is only available at the supplier. I have chosen not to ask for a copy since it contains information that should not be in the public domain.

<sup>13</sup> Report to Director Albert Ólafsson on Oracle instance business setup. PWC 2010.

from other transactions, and that they should never have been visible to users in other State institutions. Although not engendering any serious integrity risks, it was a less appropriate practice which according to my information has been amended.

#### **5.4 Issue: Adaptability**

In this subsection, I discuss selected aspect of the *adaptability* of the System. Adaptability is included in the Product Quality Model as a subset to Portability and defined as the degree to which a product or system can effectively and efficiently be adapted for different or evolving hardware, software or other operational or usage environments.

In the Evaluation context it is also relevant to include i.a. the *compatibility* of the System, defined as the degree to which a product, system or component can exchange information with other products, systems or components, and/or perform its required functions, while sharing the same hardware or software environment, and the *maintainability* of the System, defined as the degree of effectiveness and efficiency with which a product or system can be modified by the intended maintainers.

I have found it relevant to make a distinction between the adaptability of the underlying software on one hand, and of the System as set up and installed on the other hand. I have also found it rational to make a distinction between the integration platform and the applications run on it.

The first Evaluation question is whether the underlying software is sufficiently adaptable. I have noted that the System is based on a programme suite designed to be used in a broad range of different types of organisations, and concluded that it should thus allow for a very varied implementation. Nothing I have observed has indicated that the software would have any significant deficiencies in this regard, nor that the software would be less adaptable than the alternative programmes that are available. One may even argue that some of the applications provided as part of programme suite are *too* adaptable. This issue will be discussed in subsection 5.6 on Suitability.

The second Evaluation question is whether the System as set up and configured is sufficiently adaptable. The System has been set up in such a way that the other sets of application modules function as extensions of the core financial management application, and it has therefore become more demanding to configure other applications. That financial management application has in its turn been configured so that the Fjársýsla ríkisins has to approve adaptations to specific needs and interests of other State institutions. This enables the Fjársýsla ríkisins to protect the integrity and cohesiveness of the State accounts and of the financial management application. The relatively tight integration with the other applications means however that this restrictiveness has been extended to the other applications, where it is not equally motivated and where it even might be counterproductive. This tight integration has led the Fjársýsla ríkisins to resist customisations since these tend to generate errors and costs in connection with upgrades and maintenance. These problems could however in my assessment have been at least diminished if not totally avoided if the System had been set up in a less integrated manner.

There are indications that some State institutions have found it difficult to adapt some of the System's modules for their own needs. There can however be different reasons for this. Firstly, one should note that the system was not fine-tuned when first rolled-out, and that many comments may refer to initial installation difficulties. Secondly, it may be that the way the System has been set up means that State institutions have become too dependent on the Fjársýsla ríkisins and/or the supplier for the adaptation of other application than the financial management application. Thirdly, the underlying cause might be inertia, i.e. that a State institution is unwilling or unable to adapt its existing procedures.

The System has been configured with only four basic setups or general ledgers. The Landspítalinn and the Vegagerðin have own setups or general ledgers, but all other normal State institutions that use the financial management application share the same general ledger.<sup>14</sup> While this has facilitated the management of the System and reduced central transaction costs, it may however have had a negative impact on the usability of the System. This issue is discussed further in subsection 5.5 on Usability.

A specific issue that has come up in the interviews is whether the project portfolio management application is sufficiently flexible for projects financed by EU programmes. I have noted that the EU project designation would normally be used as part of the project name or label, and that the use of separate cost centre numbers should not cause any problems. I have also noted that the System allows the use of separate bank accounts if and when project funds need to be kept separate from the concerned State institution's own funds.

The vendor of the programme suite – Oracle – has expanded during the last decade through the acquisition of a number of other application vendors, and has a declared company policy of providing for easy integration with applications developed separately from the programme suite. I have also noted that several State institutions use applications provided by other application vendors. These then have had to be set up and configured to be compatible with the System's integration platform. It should in this context be noted that the use of separately developed applications is not a problem or weakness, as long as they are able to interact and coexist with the System in an adequate manner.

Nothing that I have observed would indicate that there are any significant weaknesses in the integration platform used by the System. Information on its integration platform is freely available, and its databases are using standardised data formats. The System is therefore in my assessment at least as *compatible* as other coherent programme suites and possibly more so.

## **5.5 Issue: Usability**

In this subsection, I discuss selected aspects of the *usability* of the System. Usability is defined in the Product Quality Model as the degree to which a product or system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use. The Usability property includes the sub-properties Appropriateness/recognisability, Learnability, Operability, User error protection, User interface aesthetics and Accessibility.

In the Evaluation context it is also relevant to include the *Satisfaction* property, defined in the Quality in Use Model as the degree to which user needs are satisfied when a product or system is used in a specified context of use. The Satisfaction property includes the sub-properties Usefulness, Trust, Pleasure and Comfort.

The Evaluation has also made use of the Guidance for Web Development<sup>15</sup> published by the Swedish state institution responsible for promoting e-government.

Usability is essentially a subjective property, dependent on the user's abilities and experiences, although the interface design and architecture has a significant influence. The usability of a software thus doesn't only depend on its properties, but also on the expectations and abilities of the individual user. User expectations have generally increased significantly during the last decade with the advent of recent generations of web services and office programs.

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<sup>14</sup> The fourth ledger is used for a varied set of institutions. The common denominator may be that they are part of the State sector but mainly financed outside the budget.

<sup>15</sup> Vägledning för webbutveckling. E-delegationen, 2012.

In section 2 above I have defined a range of different groups of users. The members of each of these groups typically have similar expectations and abilities. The user group which is most sensitive to deficiencies in the interface design and architecture is reasonably low-level users in small State institutions. Many of these State institutions are however serviced the Service Centre at the Fjársýsla ríkisins.

The *user interfaces* in the System are in my assessment not up to reasonable expectations and the present best practices. The main reason for this is that the underlying software was installed more than a decade ago, and that most of its user interfaces reflect what normal practise was at that time. Many application modules have since been updated and transferred to html-code<sup>16</sup>, which improves the usability. Presently, approximately one third of the interfaces have been transferred and the supplier is expected to gradually update the rest as well. Even the new updated modules seem however to lag behind best practices. The usability of the System is however in my assessment acceptable.

The supplier has informed me that Oracle has recently launched a new suite of application modules called *Oracle Fusion Applications* that are said to have been designed using the latest technology advances and incorporating the best practices gathered from different customers. I have not been able to review and assess any of these application modules. Transiting to the Fusion applications would generate additional installation and support costs, and may require the purchase of new licenses. It is however possible that Oracle might decide to allow them to be used under the present licences.

I have heard recurring complaints about the *time behaviour* of the System. These concern both micro-pauses in normal use, system freezes and more substantial waiting times when generating reports. I have from what I have heard drawn the conclusion that these problems are mainly caused by insufficient server capacity and that they are not a reflection of the underlying software or of the way the System has been set up. I also understand that the Fjársýsla ríkisins is already contemplating an investment in increased server capacity.

The System has been configured in such a way that only the Landspítalinn and the Vegagerðin have own general ledgers, while all other State institutions that use the financial management application share the same general ledger. Most State institutions can add own cost types and cost centres – provided that the Fjársýsla ríkisins agrees – but cannot as far as I have understood reduce the number of available cost centres and cost types visible to the person entering data into the System. Allowing other State institutions with special needs to have own set ups might in my assessment be a way of improving the usability of the System. The necessary alignment of the accounts of the individual institutions with the State's aggregated accounts should in my assessment be made openly through an accounting policy or statute rather than indirectly through a restrictive setup of the System.

Installing the project portfolio management application is for example said to be a demanding exercise requiring special competences and understanding of the internal data flows in the System. As a consequence an institution that wants to install it would have to make substantial own effort and substantial purchases of support from the supplier. This option is therefore in my assessment only a realistic option for a limited number of State institutions. I have been informed that it would be possible for a State institution to opt for a less advanced configuration mode that would be simpler to manage. State institutions wanting to introduce and strengthen a project orientation of their internal work processes should thus be able to use selected parts of this application. This mode seems however to be relatively unknown, possibly due to the absence of an active secondary operational owner.

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<sup>16</sup> This is the code used for programming web pages.

I have heard recurring complaints about the *report generation* function of the System; labelled the Discoverer. This report generator has been designed for generating recurring reports. In the part of the System using a shared general ledger, new report templates can only be added by the supplier. There is a large set of preconfigured reports, but this set lacks internal structure and logic and seem to have grown through responses to ad-hoc demands. Most State institutions cannot limit the number of available report templates shown to the user to those templates that are relevant for the institution.

The System as set up seems to have an insufficient ability to generate ad hoc reports for analytical purposes. I have been told that this is because the Fjársýsla ríkisins has decided to limit the use of this feature to a small number of State institutions. The stated reason is that it requires a great deal of understanding regarding to the underlying database, tables and connections. That a State institution cannot itself set up new report templates makes an iterative development of new report templates a cumbersome procedure. Users therefore frequently address the need for ad hoc reports by downloading data to more easily modified spreadsheets in standardised office programs. While this might be appropriate for some tasks such as analytical modelling, it also entails cumbersome work processes and a potentially weaker reliability for the generated reports.

Some users have stated that they have experienced data errors in the reports generated by the report generator. It is not clear to me if these errors are caused by software deficiencies or user mistakes. The operational owner – at present the Fjársýsla ríkisins – should take appropriate steps to collect and evaluate such reports in a systematic manner, in order to be able to address any deficiencies in an appropriate manner.

I have been told that the software vendor – i.e. Oracle – has a policy of moving report generation functionality out of the application modules that the System is based on to a separate set of application modules called *Business Intelligence*. It seems reasonable to assume that it will cease to provide support and updates for the Discoverer function at some point in the future. I have not been able to assess the usability of the business intelligence application, but it seems reasonable to assume that it might provide better functionality than the Discoverer. The State would have to purchase a new license if State institutions are to be able to install and use that module.

## **5.6 Issue: Suitability**

In this subsection, I discuss selected aspects of the *suitability* of the System. Functional suitability is defined in the Product Quality Model as the degree to which a product or system provides functions that meet stated and implied needs when used under specified conditions. The functional suitability property includes the sub-properties Functional completeness, Functional correctness and Functional appropriateness.

All similar coherent programme suites presently available on the market are designed so as to be able to be used in many different types of enterprises. Their basic design allows for a very varied configuration, and many of their properties in use are determined by the setup and configuring of applications rather than being inherent in their design. One can actually compare the configuring of a coherent programme suite with programming in an extremely high level programming language. There is at the same time a generic risk that coherent programme suites are implicitly or explicitly designed for use in relatively homogeneous enterprises organised and led as hierarchies. It would thus always be a challenge to implement a coherent programme suite in a heterogeneous public administration with separately led government institutions.

There is in my assessment nothing that would indicate that setting up, configuring and using another programme suite would have been less challenging than the same process for the presently used programme suite, provided that the resources available and the priorities applied had been the same.

My main conclusion, based on what I have observed, is that many State institutions are well able to use the core part of the System; i.e. the financial management application and the payroll module. The two major State institutions that were leading in the initial installation of the System have both found that the System satisfies reasonable expectations. Small institutions with less sophisticated needs are also able to use the System by using the service centre at the Fjárfýsla ríkisins as intermediary. The System is thus in my assessment reasonably suitable, but the relevant questions are if it adequately suitable for all State institutions, and if it is the most suitable system.

The alternative available in the late 1990s was to allow a more diverse set of applications depending on the preferences of the individual State institution. This has been a realistic alternative for a State administration such as the Swedish, where the basic data are only registered at institution level, and where reporting to central databases is limited to selected aggregated data. The more information concerning the operations and management of the State institutions that a Government wants to have direct access to, the stronger is however the need for an adequate integration platform and compilation function. If that is not supplied as part of an coherent programme suite, then the Government would have to develop a proprietary integration platform and compilation function, and instruct State institutions to adhere to it. Choosing this alternative would not have been less challenging. It would have required substantial own design and construction capacity, and would have shifted the challenges and efforts from the implementation phase to an earlier design and construction phase.

The important choice facing the Government today is the choice of future evolutionary direction. One alternative is evidently to continue on the present path with a relatively integrated shared back-office system dominated by the financial management application. The alternative path entails gradually unbundling the System, using the full potential of the underlying software for moving towards the type of more open, flexible and broader information management system described in section 3.

## **5.7 Issue: Replaceability**

*Replaceability* is a sub-property of the property Portability and defined in the Product Quality Model as the degree to which a product can replace another specified software product for the same purpose in the same environment. I have instead considered the inverse of that sub-property; i.e. to which extent the System can be replaced by another software product for the same purpose in the same environment.

It is in my experience essential that the user of a software has a viable exit option; i.e. that the user can replace the software if there is a better product available on the market at an attractive price. It should be noted that coherent programme suites are sometimes designed in such a way that it would be costly to replace the suite, thus limiting the choices of the users.

Information on the System's integration platform is freely available, and its databases are using standardised data formats. The System is therefore in my assessment at least as open as other coherent programme suites and possibly more so. The inherent exit conditions – i.e. the inverse replaceability - is in my assessment accordingly better for the System than for most other coherent programme suites.

That the System has been set up as a single relatively integrated application has however increased the costs that would be incurred if the System was to be replaced by another system or arrangement, and has therefore reduced its replaceability and raised the exit threshold.

## 5.8 Issue: Costs and efficiency

This sub-section discusses the financial aspects of the System. The main evaluation issues are if the cost and efforts of (a) operating and maintaining the System and (b) developing the System to adapt to changes in requirements are acceptable compared to other similar systems in neighbouring countries. The available information on similar systems in other countries are summarised in Annex 1 to the Report.

In addition to comparison with other countries it is in my judgment relevant to compare the cost and efforts necessary for the *continued* use of the System with the value generated by the System. Both cost and efforts and generated value vary across the user groups defined in section 2 and across individual users.

The cost of operating and maintaining a programme is not explicitly included in any of the international standards referred to in section 5.2. The probable reason for this is that the cost of operating and maintaining a programme mainly reflects other elements than the properties of the software evaluated. Two of the properties in the relevant international standards are however of interest in this context. The Quality in Use Model contains the property *Effectiveness* defined as the accuracy and completeness with which users achieve specified goals. The Product Quality Model referred to in the preceding subsections contains the property *Performance efficiency* defined as the performance relative to the amount of resources used under stated conditions. Both these indicate that cost cannot be evaluated separate from such parameters as performance and outcome.

The costs associated with an information management system can roughly be divided into (i) licence fees, (ii) initial installation costs, (iii) operating costs, and (iv) support and upgrade costs. They consist of costs for equipment purchases and for external services, and the value of own labour inputs. The costs are depending on the administration's structure borne by different owners and users.

The initial *licence fees* tend to represent an insignificant part of the total lifecycle costs for information management systems. The suppliers need a steady revenue flow, and their main revenues come instead from annual fees for support and upgrades. The license fees are also costs that already have been incurred and that cannot be recovered, and are thus irrelevant for the assessment of the cost and efforts related to the continued use of the System and to any recommendations for future action. The same goes for the *initial installation costs*.

The latter type of costs probably varies between systems from different suppliers, but also between different organisations using the same system. Coherent programme suites tend to require more effort – work hours from own employees or hired consultants – but this would be partially offset by more effortless continued operation. Specialised applications may require less effort to install – especially if pre-configured for the customer's needs – but more effort would then be needed to make the different applications interact properly.

The main *operating costs* are generated by data centres housing the servers that the systems runs on, and by the terminals used for accessing the system, whether for data inputs or for data retrievals. The overhead cost of operating a data centre is reasonably independent of the systems using the data centre. The key cost driver would instead be the server capacity needed for the systems, and that would probably depend as much on the setup and management of the systems as on their inherent properties. The issue will be discussed in the next subsection.

The operating cost structure would depend on how the databases are set up. The System uses a central set of databases, and thus requires a substantial central server capacity. Users can use the same access terminals as for normal office systems. A system based on distributed data bases would need less central capacity, but State institutions would then instead need more own storage capacity.

Both initial installation costs and *support and upgrade costs* would typically depend on the structure of the administration concerned, and its level of previous experience. Large organisations would have lower costs per user, and small organisations higher. A complex system would generate higher costs than a more easily manageable system. An organisation used to working with IT-supported administrative systems would find it easier and less costly to install a new information management system than an organisation with less experience would.

I have collected information on the systems used in a number of European countries. I have also requested information on total costs from these countries. The result is however insufficient for a comparison of costs. There may be several reasons for this, including that costs are registered and reported in different ways in each country so that data are not comparable or sometimes not even available. The costs are normally borne by different institutions, and countries may not have produced aggregated data across the entire State administration.

I have thus not been able to make an objective validation of the appropriateness or competitiveness of the cost of operating and maintaining the System due to the lack of usable reference points. There are no data on what cost and efforts an alternative system would require, no comparable data for other countries, and no quantitative assessment of the value generated by the System.

My professional assessment is however that the cost and efforts for continuing to use the System are acceptable. I have not found anything that would indicate that the cost of operating and using the System is excessive, when compared to alternative arrangements. Nor have I found any reason to doubt that the value generated by the use of the System is sufficient to motivate a continued use of the System. Furthermore, the State administration has in my assessment not yet been able to exploit the full potential of the System. There is thus, according to my assessment a potential for an improved return on the investment made.

## **5.9 System management**

The management of an information system is a property of the organisation using the system and not of the system as such. There are no international standards or guidelines for the design of the management organisation. The management organisations also vary across public administrations in different countries depending on their general administrative and political arrangements. My assessment of the management of the System is thus based on knowledge of practices in other countries and on professional judgment. The focus is in this section naturally on the Fjársýsla ríkisins, although I will also address management aspects relating to low-level users of the System.

The Fjársýsla ríkisins has in my assessment been reasonably successful in setting up and implementing the System, especially when considering its available resources and mandates. The introduction of a coherent system that both requires and is expected to achieve a standardisation of administrative processes and of reporting naturally generates a certain number of conflicts due to inevitable inertia that makes many institutions resisting change. The System as such seems to some extent to have been blamed for demanding changes, while the real driver was actually the Government decision to improve the information management in the State administration. A more visible government strategy and strategic governance of the implementation process would probably have facilitated the implementation. That issue is discussed further in the next section.

Presently, the Fjársýsla ríkisins has three separate responsibilities; (a) for the management of the System; (b) for the management and consolidation of the State's financial accounts, and (c) for the provision of administrative services to selected State institutions. These are reflected in its internal organisation. It has at the same time pointed out that having all three responsibilities enables a flexible use of the available staff. There is thus no strict functionally separation, and the

management of the State's financial accounts may understandably sometimes have taken precedence over other aspects of the management of the System.

I have in section 2 defined management roles and responsibilities in connection with the System. The present situation in this regard is in my assessment not satisfactory. The meaning of operational ownership seems not to be resolved; neither at the System level, nor in regard to the different sets of application modules.

The Fjársýsla ríkisins is evidently functioning as the primary operational owner of the System. This role seems to be more implicit however, and it does not have any statutory authority in connection with the System. The resources that it has available for this task seem to be relatively limited.

The Fjársýsla ríkisins is at the same time the secondary operational owner for the financial management application. It isn't completely clear whether it has also been expected to be the secondary operational owner for the human resource management – where it has assumed responsibility for the payroll module – or if the Fjármála- og efnahagsráðuneytið has that role and responsibility. No State institutions have been tasked to be the secondary operational owner of the purchase management and the project portfolio management applications, although it is frequently assumed that the two State institutions that acted as lead agencies for the initial implementation of these applications – the Landspítalinn and the Vegagerðin – still have some kind of responsibility for these applications.

Both the Fjársýsla ríkisins and other State institutions rely extensively on the support provided by Advania. While this may be understandable considering the limited staff resources, it may not be the best option. It hampers the State administration's acquisition of own competence and generates costs that might instead have been used for capacity and competence build-up within the State administration. It would in my assessment be advisable to increase the State administration's own capacity to provide support in order to reduce the State administration's tie-in to Advania

No State institution seems to have been given an explicit remit to provide continuous support to System users in State institutions. Insufficient efforts seem to have been made to create a user community<sup>17</sup> and to support it through for example guidelines and Q&A resources on a dedicated internet side. There is a service centre at the Fjársýsla ríkisins providing accounting services to small users, but this centre can be seen as merely an extension of its responsibility for the management and consolidation of the State accounts.

All other Nordic countries have relatively recently set up State Services Centres that provide administrative services to State institutions. Using the centre is compulsory in Finland, but nominally voluntary or selective in the other countries. In Finland and Sweden, the services are financed with fees paid by the institutions that use the Centre's services. The main argument for this arrangement is that the costs for the administrative services should be reported in the Expenditure Statement of the institutions benefitting from the services. It should in this context be noted that an expansion of the services provided by the Fjársýsla ríkisins is hampered by it being financed within the Fjársýsla ríkisins' own budget allocation and not by user fees.

The support provided to State institutions in the other three functional areas covered by the System is in my assessment insufficient. I note that the Ríkiskaup will make efforts to promote and support the use of the purchase management application, but it is not clear how strong its mandate will be or if it will be given an appropriate authority as the designated operational owner of the purchase management application.

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<sup>17</sup> The term 'user community' refers to interaction among *all* relevant System users using modern webbased interaction tools. The reference groups set up by the Fjársýsla ríkisins may be valuable but cannot play the same role.

From what I have observed, I conclude that the System has been set up and configured in such a way that the other three applications have been relatively integrated with the financial management module. Priority seems to have been given to uniformity and low central transaction costs. A reasonable interpretation of this choice is that the Fjársýsla ríkisins' inadequate formal authority over low-level System users led to a need to use the System as the main tool for achieving the necessary standardisation of data entry and accounting processes. The relatively limited resources available for the Fjársýsla has probably also contributed. As a result, part of the flexibility and adaptability of the underlying program suite has been lost. Most of the value added seems to have been generated at the central level, while low-level users have benefitted less.

## 5.10 Strategic governance

The strategic governance of the State's information management system is essential both for providing direction and guidance for the State administration, and for driving the changes and development that the Government deems necessary.

The setup of the System was largely left to the discretion of the Fjársýsla ríkisins, assisted by the Landspítalinn and the Vegagerðin. The Fjármálaráðuneytið was represented in the group coordinating the introduction, but does not seem to have played a leading role. The strategic configuring choices seem instead to reflect the preferences of the three institutions mentioned previously rather than any government goals or priorities. The propagation of other applications than the financial management application and the payroll module does not seem to have attracted sufficient attention from the Government's side. Insufficient attention seems to have been given to how the System could have supported more modern organisations and work processes in the State administration.

This may in my view be understandable, given the strain that the recent economic crisis has placed on the machinery of government, although the weaknesses seems to have existed even before that. It is also in my assessment difficult to understand why the Government has allowed some State institutions to abstain from using the shared accounting system.

The decision made in 2001 to acquire and implement a programme suite for use in the Icelandic State administration was in my assessment a timely strategic government decision. It also seems to indicate that Iceland was then an early mover, looking at the back-office information management in a visionary and whole-of-government perspective. I have however failed to find the same vision and engagement today. The Government's e-strategy<sup>18</sup> adopted in 2008 focused as many similar documents in other countries on the provision of public services online, and seems to have been overshadowed by the severe economic crisis. The six-point programme in the recently adopted policy on the Information Society<sup>19</sup> does however contain two points of importance for the future development of the System; point 3 about the establishment of a uniform national structure for interoperability and shared safety and quality standards; and point 4 about using information technology to achieve increased automation, sharing information, and overall efficiency, and to improve the quality of operations and services. Implementing this policy would in my assessment require a more explicit coherent strategic ownership of all information management projects and programmes in the State administration, including the System.

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<sup>18</sup> Iceland the e-Nation. Icelandic Government Policy on the Information Society 2008 – 2012

<sup>19</sup> Vöxtur í krafti netsins - byggjum, tengjum og tökum þátt. Stefna ríkis og sveitarfélaga um upplýsingasamfélagið 2013-2016

## 5.11 Summing up the assessments

The previous subsections contain analyses and assessments of different aspects or dimensions of the System; i.a. Security, Adaptability, Usability, Suitability, Replaceability and Cost and efficiency. Other properties included in the relevant international standards have either been addressed in one of these subsections or considered as irrelevant for the Evaluation. There are also two subsections with my observations and assessments of the System management and the strategic governance. In this subsection, I summarise these observations and assessments and reiterate the most salient conclusions.

The overall objective of the Evaluation is according to its Terms of Reference to evaluate the investment made in the System by assessing how well the System fulfils the requirements and needs of the State and to propose actions to improve the IT-systems supporting the State finances and human resource management.

My main conclusion is that the System is adequate for the needs of the Government and the State administration. Nothing that I have observed during the Evaluation indicates that the State administration would have fared better with an alternative solution than the System. The difficulties encountered in the implementation of the chosen programme suite reflect according to my assessment generic aspects of the modernisation of the State administration, generic weaknesses caused by the small scale of the Icelandic State administration and the Icelandic economy, and choices made when configuring the System. These difficulties would thus have been encountered regardless of which system that had been chosen.

The System has in my assessment generated substantial value for the State and its administration. The creation of a unified accounting system and structure has provided the Government with continuous access to up-to-date and trustworthy information on expenditures. Major State institutions such as the Landspítalinn, the Vegagerðin and the Ríkislögreglustjóri have been able to use a range of different operational systems and applications based on the System's integration platform.

The cost and efforts for continuing to use the System are in my assessment acceptable. I have not found any reason to doubt that the value generated by the use of the System is sufficient to motivate a continued use of the System. The State administration has however in my assessment not yet been able to exploit the full potential of the System. There should thus be a potential for an improved return on the investment made.

The State administration has made a substantial investment in installing and learning how to operate and use the System. Much of these investments would be lost if the administration was to abandon the System in favour of an alternative System or arrangement for its information management, although some of the experiences and knowledge gained might still be useful. More specifically, replacing it with an alternative coherent programme suite would not be defensible unless the new solution generated sufficient added value compared with the System to cover both the replacement investment in terms of licenses and installation costs and efforts, and the cost and efforts for operating the new System or arrangement.

The value created by the acquisition and implementation of the System has at the same time been asymmetrically distributed. The main benefits have fallen to the Government and to large State institutions, while benefits have been smaller or even non-existent for small State institutions. This is however not a reflection of the System as such, but of the administrative context and of choices made when setting up and implementing the System.

The System as used today is in my assessment primarily a financial management system that also uses the payroll management module. That other applications are not used to the same extent can be explained by the fact that they have failed to create sufficient value for most low-level users. The small scale of many State institutions means that their advantages of using digital applications

may not be large enough to motivate the transaction costs involved in installing any of the other applications, although inertia cannot be ruled out as a contributing factor.

That the System was set up and implemented in such a way that the other applications function as extensions of the financial management applications means that part of the flexibility and adaptability of the underlying programme suite was lost. This has in my assessment increased the cost and efforts needed for adapting the other applications to the needs of the individual State institutions. This could in my assessment be remedied through a gradual re-configuring of the System, and by expanding the administrative services presently provided by the Fjársýsla ríkisins.

It should be understood that the acquisition and implementation of a digital back-office system normally involves a major transformation of the organisation's work processes and requires a build-up of new competences for both high and low-level users. It should also be underlined that the type of programme suite that the System is built on is not a static product. Programme design and development are dynamic processes, and updates continuously generate improved and increased functionality.

The acquisition and implementation of the System can therefore not be seen as a discrete event. Instead, it is a continuous process what will continue under the foreseeable future. The pace and extent of the implementation so far have to be seen against the limited capacity and competence available both within the Icelandic State administration and in the relevant Icelandic business sectors. A slower process may lead to lower annually costs for updates and maintenance, but also to a slower evolution of the System's functionality and qualities.

The future best practice will probably in my assessment be a combination of (i) a shared integration layer with a strictly enforced interaction standard, user identification functions and authority management functions, (b) a systematically structured set of shared data stores available to all State institutions on a need-to-know basis, and (c) a number of separate applications that supply the databases with new data and which when necessary for case handling and reporting withdraws information from them. It seems reasonable - based on the presently available information – to assume that the System could over time become a part of such an arrangement.

The optimal arrangements for operational management of the System depend on the future evolutionary path that the Government chooses; i.e. whether to continue along the present path with a relatively integrated System for shared back-office functions dominated by the financial management interests, or to move towards a broader open network for the State administration's back-office functions and information management. In the first case, it would in my assessment seem reasonable to task the Fjársýsla ríkisins with both the primary operational ownership and the secondary operational ownership of all four sets of application modules. In the latter case, it would in my assessment seem reasonable to task other State institutions than the Fjársýsla ríkisins with the secondary operational ownership of the human resource, the project portfolio and the purchase management sets of application modules.

In both cases, the Government would have to ensure that the concerned State institutions have sufficient authority, competence and capacity for executing their tasks in an adequate manner. More specifically, the primary operational owner should be authorised to adopt the regulations that are necessary for an optimal use of the System.

## **6 THE MAIN RECOMMENDATIONS**

The previous sections contained my assessments of the present state of affairs as concerns the System, with some retrospective comments on the acquisition and implementation of the System. In this section, I provide my concrete recommendations to the Government. I reiterate my

previous observation that the software used provides both an integration platform and a number of sets of application modules, and that the properties of the System do not only depend on the properties of the underlying software, but also how it is set up and managed.

My recommendations do not only concern the software used and the System as presently set up and implemented. They also concern the strategic governance of information systems in the State administration, the operative management of the System, and the support provided to the users of the System.

My recommendations are made against the background of the evolutionary trends in information management that have been clearly visible for quite some time. The legacy from systems run on large mainframe computers has given a structural bias for tightly integrated systems. Such systems may still be optimal for organisations operating real-time systems where the priority is for quick execution times. They come however at a price in the form of inertia and complex programming, and the present trend is towards a more modular architecture where single modules can be more easily adapted to the needs of each user and more easily replaced by updated modules.

## **6.1 The System as such**

This subsection contains my recommendations concerning the future use and development of the System, based on my assessment of the software used and of the System as set up and implemented.

### ***Recommendation 1:***

The System as set up and managed has in my assessment been reasonably successful. The integration platform that the underlying programme suite is based on satisfies in my assessment the needs of the State administration. I thus recommend that the State administration continue to use the System, at least in a medium-term perspective, in order to benefit from the investments already made in adapting the State institutions' procedures and work processes to the use of the System. Work should continue on exploiting the full potential of the underlying software. The State administration should base the continued development of its different administrative information systems on the same integration platform as the System.

### ***Recommendation 2:***

The System as designed and configured today should not be seen as the final answer to the needs of the State administration. I recommend that the Government map a path ahead, aiming to keep abreast of the evolution of generally acknowledged best practices in information management; not only in regard to back office administrative system but also for the global information management in the State administration. I also consider that it would be prudent to review the use and evolvability of the System every third to fifth year in the light of the development and competitiveness of the underlying software.

### ***Recommendation 3:***

The System is today configured in such a way that it appears to the users as a single application. The applications for human resource, project portfolio and purchase management function as extensions of the financial management applications. While this may have had advantages when seen in a financial management perspective, it has reduced

the adaptability of the System and reduced the potential benefits for small and medium-sized State institutions. I recommend that the Government initiate the development of a plan for a gradual unbundling of the different applications and for simplification of the use of the human resource, project portfolio and purchase management applications.

## **6.2 The strategic governance of the System**

This subsection contains my recommendations for the Government's strategic governance of the use, management and future evolution of the System. The State would in my assessment benefit from a more explicit strategic governance of the continued modernisation of the State administration. This should include how the continued evolution of the State administration's information management and back-office functions could contribute to a more efficient and responsive State administration, as well as how it could contribute to the realisation of the State's policy on the Information Society.

### ***Recommendation 4***

The present strategic governance of the System is in my assessment insufficient. I recommend that the Government provide a more explicit strategic governance of the System, designing policies, creating visions and setting goals for its further development and use. This strategic governance should include ensuring that State institutions make the necessary adjustments to their internal structures and processes.

### ***Recommendation 5***

An adequate strategic governance of the System requires in my assessment a generally recognised strategic owner of the System. I recommend that the Government designate an entity at ministerial level as the strategic owner. This could be the Fjármála- og efnahagsráðuneytið, which today is the implicit strategic owner of the System. There is however a need for a coherent strategic governance of all of the State's information management development, and the same Ministry should be responsible for the government's information society and e-Government policies and for the back-office administrative systems. The Government should also consider naming a State CIO with a global responsibility for promoting an efficient information management in the State administration.

### ***Recommendation 6:***

There is a substantial potential for increased efficiency and reduced costs through the use of e-purchasing and e-invoicing functions. I recommend that the Government take action to ensure an adequate development and take-up of these functions, while ensuring that they are compatible with integration platform used by the System and interact adequately with the System's financial management application. It might with this in view be appropriate to designate the Ríkiskaup as the secondary operational owner of the purchase management application.

### **6.3 The operational management of the System**

This subsection contains my recommendations concerning the operational management of the System. The operational management needs in my assessment to be strengthened, and the roles and responsibilities of different institutions need to be clarified. I make as indicated by the definitions of terms in chapter 2 a distinction between the primary and the secondary operational owners.

#### ***Recommendation 7:***

I recommend that Government formally designate a State institution as the primary operational owner of the System, and ensure that it has a sufficient statutory authority and sufficient resources for the task. This role can be assigned to the Fjársýsla ríkisins that is the implicit primary operational owner today, but it should then be given a clearer mandate, the sufficient authority, and more manpower. It must then also build a broader competency base. The role could also be given to a new State institution or State CIO with a broader mandate in relation to State's information management systems than just the System.

#### ***Recommendation 8***

The roles and responsibilities of the primary operational owner should be defined in a statute or similar standing document. I recommend that the primary operational owner be responsible for implementing policies determined by the strategic owner, for implementing updates and extensions as appropriate, and for promoting the System's value generation. It should be State's representative relative to the supplier of the software and relative to the contractor providing the hardware environment in which the System is running, and be responsible towards users for the System's technical functionality.

#### ***Recommendation 9***

I recommend that Government formally designate an entity as the secondary operational owner for each of the sets of applications modules in the System, and ensure that it has a sufficient statutory authority and sufficient resources for the task. This entity could either be a State institution or a part of the government offices.

Which entities that should be designated as secondary operational owners would in my assessment depend on the Government's choice of preferred evolutionary path. If the Government wishes to continue with a System that is configured as a single application it would be logical to design the Fjársýsla ríkisins as the secondary operational owner of more than just the financial management application. If it wishes to see an evolution towards more clearly separated applications, it should instead consider designating separate secondary operational owners for each application.

#### ***Recommendation 10***

The roles and responsibilities of the secondary operational owners should be defined in a statute or similar standing document. I recommend that the secondary operational owners exercise their functions within a framework provided by primary operational owner in order to protect the integrity of the State administration's accounting and reporting functions. The secondary operational owners should be tasked with promoting an appropriate development and an as broad use of the concerned application as possible. They should provide expertise

within their areas of responsibility and function as a knowledge centre making codified knowledge available to State institutions using the concerned application, and should provide collective support in the form of i.a. guidelines, training materials and courses within its area of responsibility.

## **6.4 Using the System**

This subsection contains my recommendations concerning the use of the System. The return on the investment made in acquiring and implementing the underlying software depends on the State institutions actually using it. At present, there are many State institutions that do not use all the applications enabled by the System, and some that use software applications provided by other vendors instead. The latter is, as noted in subsection 5.4 on Adaptability not necessarily negative, and can sometimes even be advantageous. It is however not optimal to leave it to each State institutions to choose completely freely.

### ***Recommendation 11***

I recommend that the Government develop, adopt, communicate and enforce an explicit usage policy. This usage policy should focus on functionality rather than on form or solution. It should prescribe the data that all State institutions have to provide to the State administration's shared databases, and the periodicity with which it should be done. State institutions wanting to use other applications than those included in the System should be required to ensure that their applications can provide the required data inputs to the State administration's shared databases. They should also ensure that their applications are designed and configured in such a way that they are compatible with the System's integration platform.

### ***Recommendation 12***

I recommend that the Government take appropriate steps to ensure that all State institutions use the System for their financial accounts and financial reporting. This would according to my assessment require that State institutions that have special needs have appropriate possibilities to adapt the System. Care should however be taken so that the integrity and correctness of the State's accounts are not endangered. This would be facilitated by an explicit policy on accounting practices, defining i.a. what is mandatory, what is recommended and what is merely optional.

## **6.5 Establishing a Shared Service Centre**

This subsection contains my recommendations concerning the provisions of shared services within the State administration. They are given against the background of the number of Icelandic State institutions, which is relatively large even when seen in a Nordic context. Many Icelandic State institutions are thus relatively small, and normally have limited capacity and competence for implementing and using modern information management systems.

### ***Recommendation 13***

I recommend that the Government expand the present provision of shared administrative services managed by the Fjárfýsla ríkisins into a broader State Service Centre, in line with the reforms of other Nordic countries. A State Service Centre could, as in Finland and Sweden, be set up as a separate State institution, or be entrusted to an existing State institution, as in Denmark. In the latter case, it should be adequately separated from that institution's other functions.

### ***Recommendation 14***

I recommend that all State institutions within the core public administration (category A) be required to use the State Service Centre, unless they can provide a convincing written business case for an alternative arrangement. The services should be adapted to the needs of each State institution, be provided on a contractual basis and could be financed by fees from the State institutions serviced.