Open standards and open source software in central government

2011

The Dutch House of Representatives

2

2010-2011 session

32 679 Open standards and open source software in central government

No. 1 LETTER FROM THE NETHERLANDS COURT OF AUDIT

To the Chairman of the Dutch House of Representatives

The Hague, March 15th 2011

We hereby present our report "Open standards and open source software in central government", constituted on March 10th 2011.

The Court of Audit

drs. Saskia J. Stuiveling,
president

dr. Ellen M.A. van Schoten RA,
secretary-general

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No. 2

REPORT -

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SUMMARY

Introduction

At the request of the House of Representatives, the Court of Audit has conducted an audit into open standards and open source software in central government.[1]The questions raised by the House of Representatives imply that the government wishes to make wider use of open technology (open standards and open source software). The Court of Audit does not a priori have an opinion regarding the use of open technology. Technological IT choices are strategic choices which must be made in line with the government's implementation processes which are supported by this technology. Technological parameters and cost considerations must be taken into account in the strategy and decision making process, but this should not be the only approach.

In line with the House of Representatives' request, we have verified whether a wider application of open standards and open source software would offer advantages in terms of cost savings for central government, and improved operation of market forces in the software sector.

We want this report to enable the involved parties to be well informed in order to enter a discussion regarding the advantages and disadvantages of the government's use of open standards and open source software. This in turn will enable us to contribute to the ministry's policy, ensuring that it is future-proof.

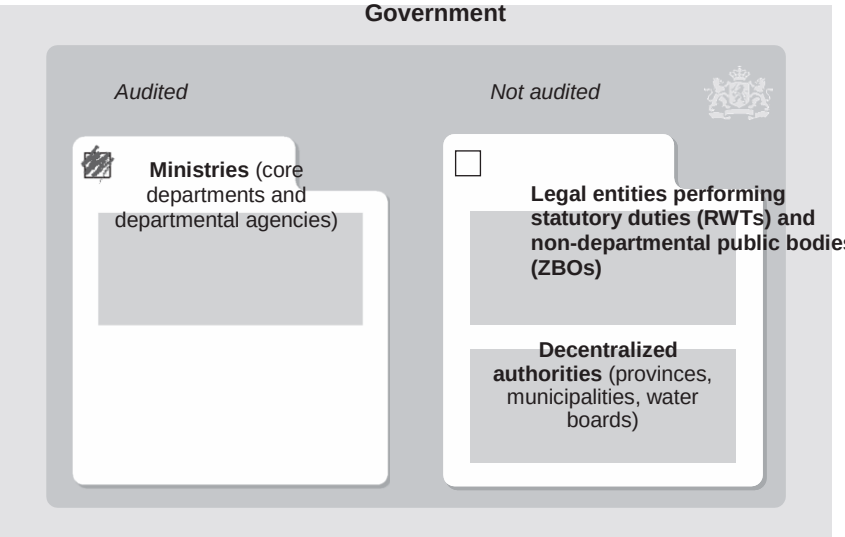
This audit is based on the questions raised by the House of Representatives. These questions can be summarized as follows:

1. Which opportunities and scenarios to reduce the use of closed standards and introduce open source software are there for the Ministries?
2. Which part of the closed standards and software can/cannot be replaced by open standards and open source solutions?
3. What are the current costs? What are the indicative initial and structural costs once the use of closed standards has been reduced and open source software has been introduced? Indicatively, what savings could be achieved by doing do?
4. What would the time frame be for reducing the use of closed standards and introducing open source software?
5. Besides the cost considerations, which advantages and disadvantages, opportunities and risks does the Court of Audit identify? Which requirements need to be met for open standards and open source software to be implementable?
6. What are the Court of Audit's recommendations, taking into account the relevant current national and international developments for government IT implementation?

[1] Proposal by Gerkens C.S. (House of Representatives, 2010b) and the resulting request by the House of Representatives to the Court of Audit (House of Representatives, 2010c).

The questions thus formulated by the House of Representatives also related to decentralized government bodies. We have not taken decentralized government bodies into account because we are not authorized to carry out audits for them. We have aimed our research at the ministries, including departmental agencies. The State's external independent departments such as legal entities performing statutory duties (RWTs) and non-departmental public bodies (ZBOs), have not been incorporated in the audit either. The scope of the audit is shown in the following figure.

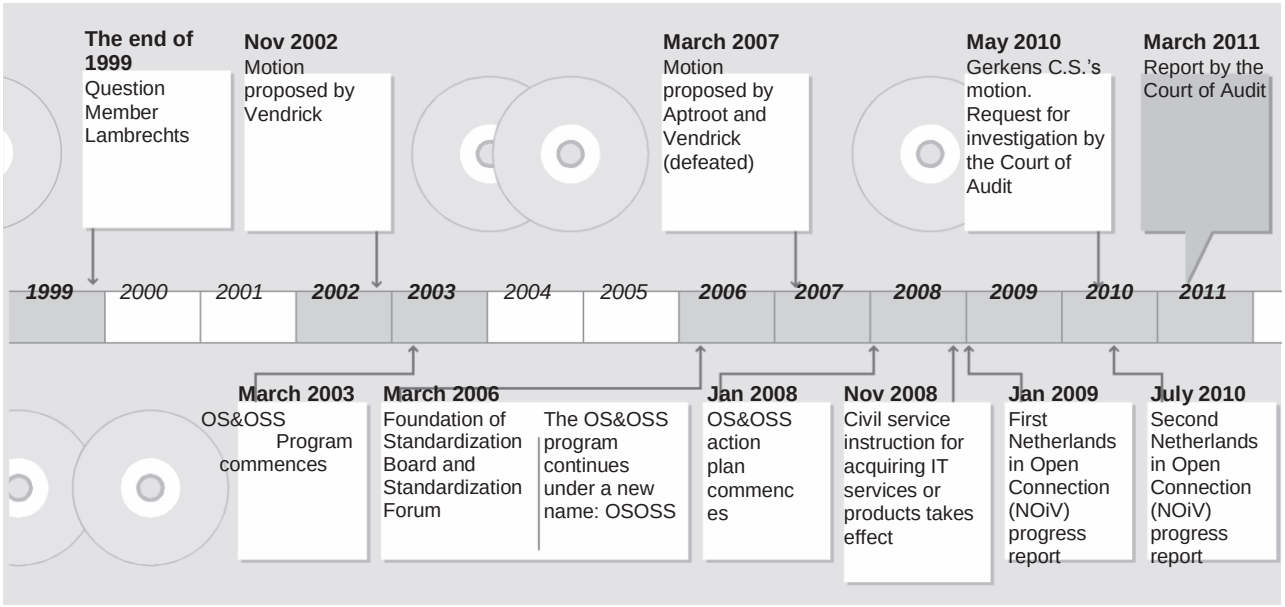
Scope of the audit



Ten years of policy and debate

In the past ten years, the House of Representatives has frequently called for "an increased" use of open standards and open source software. In response to this, the government has developed various policy and implementation programs.

The main milestones for open standards and open source software.



Just before and after the start of the new millennium several Members of the House of Representatives decide they will encourage the application of open standards and software, in government as well as in education.

On November 20th 2002, the House of Representatives accepts a motion proposed by Vendrik, one of its members, in which the government is requested to ensure that from 2006 all software used in the public sector complies with open standards, and that the use of open source software in the public sector should be encouraged.

In response to this, the government launches the *Open Standards and Open Source Software program* (OS&OSS) in March 2003. In the subsequent years, the government devises various action plans to distribute knowledge of open source applications within the public domain.

The *Standardization Board* and the *Standardization Forum* are founded in March 2006, following the decision made by the Minister of Economic Affairs (EZ). This incorporates the Open standards policy. Open Source Software Policy also proceeds, in a new program entitled *Open Source as a Software Strategy Component* (OSOSS).

In January 2008, the program office *'The Netherlands in Open Connection'* (NOiV) is set up by order of the Minister of Economic Affairs (EZ) and the Minister of the Interior and Kingdom Relations (BZK), in order to support the implementation of the government's policy. The Minister of Economic Affairs (EZ) and the Minister of the Interior and Kingdom Relations (BZK) also establish the so-called *'Comply or Explain and Commit'*rule for the application of open standards. Ministers must illustrate the extent to which this rule is adhered to in the 'management' section in the departmental annual report.

In May 2010 the House of Representatives discusses the progress of the Netherlands Open in Connection (NOiV) program. This leads to Gerkens C.S.'s proposal as well as placing a request with the Court of Audit.

Furthermore, the second Netherlands Open in Connection(NOiV) progress report is presented to the House of Representatives in 2010. One of the obstacles mentioned is the fact that by far not every functionality required by the government is available in open source software. The report also mentions that in users' experiences, the total costs of an open source solution are often high due to the costs incurred for the installation, transition, documentation, implementation, support and management of the software.

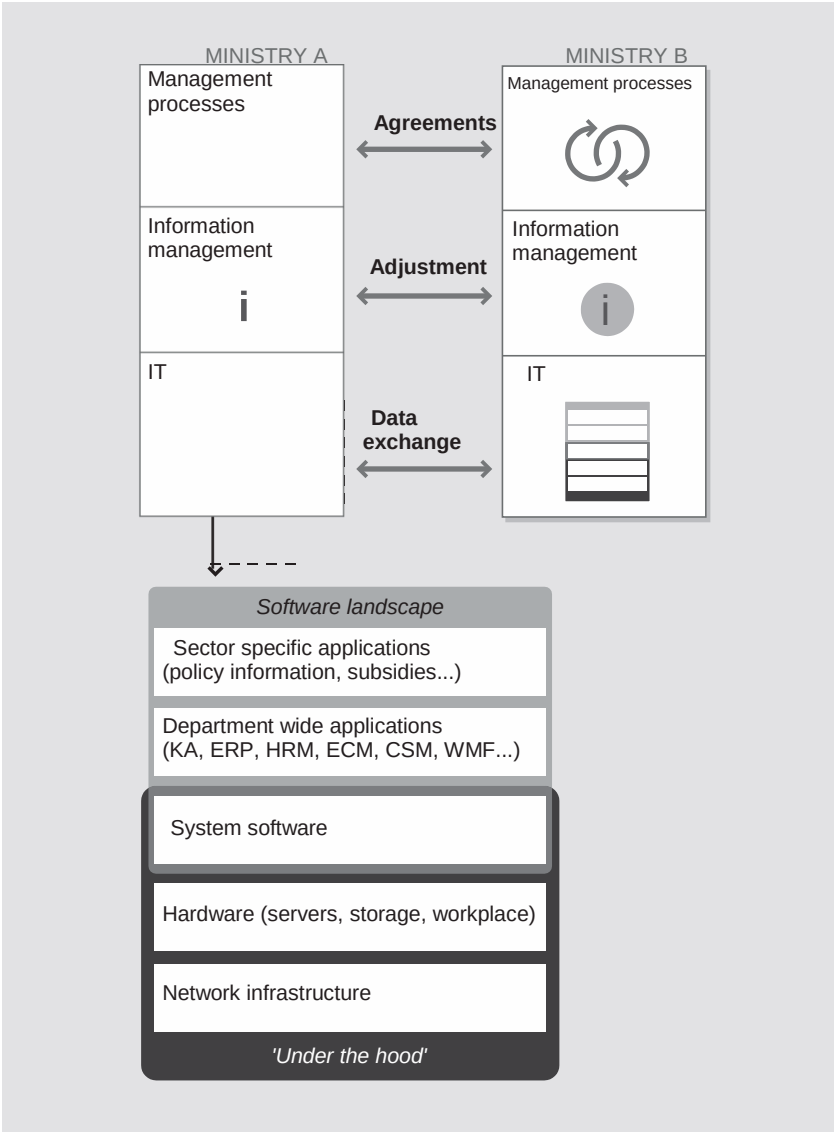
The "open" issue

As the questions raised by the House of Representatives imply that the government wishes to make wider use of open technology, this report will also focus on whether this would in fact entail any advantages and if so, what they are.

Government IT: information management and the software landscape

IT is indispensable for virtually any organization, including the Government. The Ministries have set up an information management system in order to execute their management processes, which is IT supported in terms of hardware, software, management and user support. A Ministry's software landscape (all software which is being used) has a layered structure: from the user applications to the system layers which are not visible to users. As the software landscape is a complex entity, with a multitude of underlying cohesions, it is not possible to merely replace just one of its components.

IT in conjunction with the government's management processes



Open and closed standards
A standard is merely a series of agreements which enables applications and other software landscape components to process each other's information. These agreements improve the collaboration between organizations (also known as interoperability). Standards can be either closed or open. A closed standard is a standard which is established and maintained by a natural person or a legal entity (usually a company or a group of companies). Many closed standards have components which have a patent, and for which users must pay a fee. Open standards may be used freely. The open and closed versions are the extremes; there are many intermediary versions and hybrid forms.

Frequently quoted advantages of open standards
Generally speaking, open standards cannot be considered better than closed standards or vice versa. However, open standards are often said to have a number of advantages:

- Quality: the process for creating open standards increases the chance of all relevant matters being incorporated.
- Cost saving: open standards may be used without any license fees.
- Supplier independence: with open standards, it is easier to migrate to another manufacturer and software product.
- Sustainability: the use of open standards means that it is more likely that the data will also be usable in the future.

There is no evidence for the general validity of these potential advantages.

Open source software and closed source software
In the case of open source software, the user can see and alter the source code. In the case of closed source software, the user is reliant on the original supplier for software modifications and connections with other computer programs. Another characteristic of open source software is that it is made by a community - often an informally organized group of programmers - and not a company, as in the case of closed source software.

As outlined by Intellectual Property Law, the intellectual property rights belong to the relevant manufacturer. The producer can however grant other parties the right to use the software. This occurs by means of a license agreement between the producer and the software user, i.e. the license. Software use is tied to the conditions stipulated in the license agreement. In general, the stipulations for closed source software licenses include that making copies of the software is prohibited, that the license may not be sold to third parties and that the use of the software is limited to a certain number of computers or (simultaneous) users.

Open source licenses essentially grant the user the right to use, copy, alter and distribute the source code
- in either its original format or an altered format. This right applies to all non-commercial use and (depending on the license type), often also to commercial use.

Furthermore, in the case of software too the open and closed versions are extremes, and there are many hybrid forms. For example, more and more closed source software has components with an open source code. Another hybrid form is *dual licensing* This entails that the software is distributed free of charge as well as in a paid version. The paid version will for example have extra functionality or a user friendly interface. A company will often only offer implementation support and a help desk service for the paid version of the software.

Open and closed software costs
It is often assumed that "open" also means "without costs". However, in a large organization such as a ministry, there are always costs attached to software use: for the procurement (including the license fee), implementation, exploitation (including management) and maintenance. This

applies to closed source software as well as open source software. The main difference lies in the software license fees (part of the procurement costs), which are initially zero for open source software. Nevertheless, this does not necessarily mean that open source software is the cheaper version, for the other costs may be higher than those for closed versions. Furthermore, termination costs will often be incurred when ending a supplier relationship.

Suppliers hold wide ranging theories with regard to where the difference lies between "open" and "closed". Sometimes companies produce open source software which was previously actually closed available to a community. The development costs for the software manufacturer hereby become lower. In other cases, a software supplier may sell a closed version of software which was originally open. These software money making methods (earnings models) are constantly in flux, due to ever changing markets.

When choosing a software application, other aspects besides merely the costs are relevant. The software also needs to be compatible with the information and IT architecture of the Dutch Government, and the consequences it will have for the various components of that government also need to be considered.

Frequently quoted advantages of open source software
As for open standards, the advantages of open source software are often put down to its positive characteristics:
- Software queries *are*answered quickly because there is always a community member who will have a solution to your problem.
- Open source software is *more sustainable than* closed source software as it has a longer guaranteed service life. Moreover, the software is not provided by just one supplier.
- The *software's technical reliability* is also often quoted as one of the advantages of open source software.

Just as open standards do not always "inherently" have certain advantages, open source software does not always have these positive characteristics. The main difference between open source software and closed source software lies in the license.

Government software costs and potential savings

Availability of details provided by the ministries
Software costs consist of:
- procurement costs (including license fees);
- implementation costs;
- utilization costs (including management);
- maintenance costs.

The work carried out by the ministries is to a large extent automated, and software is hereby an intrinsic component. In general, the various elements are not administered separately. This is also the case for software costs. The Ministries are not obliged to do so, and software costs cannot be directly derived from the Ministries' accounts. For example, *license fees*are often not registered separately or on a yearly basis as they are one off payments valid for several years, and often for

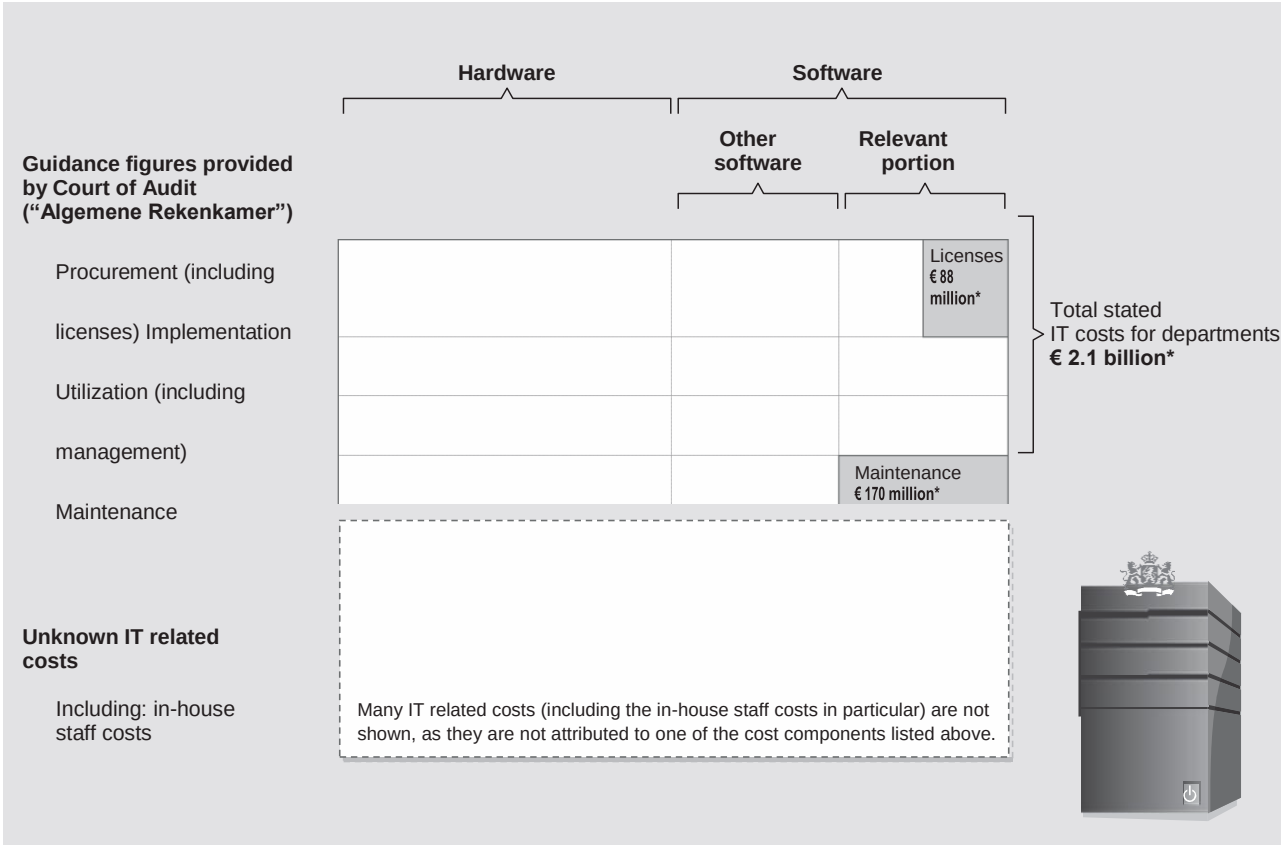
a number of different applications. Moreover, part of the IT of the various ministries is contracted out to external service providers who charge for the service they provide, but not for individual licenses or maintenance costs.

Current costs

This means that government software costs cannot be accurately determined without conducting an extremely intensive investigation, involving a large number of assumptions. In particular, it is difficult to clearly determine implementation and exploitation costs (including management), as these costs also incur from time spent by (supporting) IT departments and end users.

The figure below shows the various components of the ministries' total IT costs. The figure is a schematic representation of the different cost components we distinguish between; it also shows which cost components we took into account specifically.

Components of the ministries' total IT costs



*2009 figures

The software costs have been portrayed based on the Ministries' general estimates and relevant discussions. We have thereby restricted ourselves to the software element for which there are in principle open source alternatives. This element is defined as the "relevant software element". It is not possible to accurately determine the exact portion of the relevant software element in relation to all of the software which is in use. We have focused on two of the software cost components, i.e. license fees and maintenance costs. In order to put these costs into perspective, we have also examined how much the ministries' total IT costs are. These are, as far as identifiable, the total costs for procurement, implementation, exploitation and all hardware *and* software maintenance. This means that the ministries have incorporated all external cost components which they are able to identify in the total IT amount, using estimates, if necessary.

We discussed with each ministry what would be the best way for them to supply the information required by us. Based on these agreements, the Chief Information officers (CIOs) supplied us with the information they were able to retrieve. We would like to emphasize that this is an indicative picture and furthermore a snap-shot (base year 2009). However, regardless of all the limitations this is the only picture available for this debate.

The indicative picture is as follows: in 2009, the Ministries' total IT costs (all hardware plus all software) were approximately € 2.1 billion. Approximately € 88 million (approximately 4% of the total IT costs) of these costs consisted of license fees for the relevant software element and approximately € 170 million (approximately 8% of the total IT costs) consisted of maintenance costs of the relevant software element.

Figures provided by different departments vary greatly. Depending on the department, the total IT costs stated varied between € 5.5 million and € 560 million. The license fees of the relevant software element which were stated varied between € 0.16 million and € 24 million. And finally, the license fees of the maintenance costs of the relevant software element which were stated varied between € 0.5 million and € 60 million.

Potential savings through greater use of open source software
The House of Representatives seems to be particularly interested in cost saving opportunities. There are a number of problems when calculating the theoretical cost saving potential:

- It appears that merely a certain portion of the current costs of the relevant software can be established.
- There are many hybrid forms, and applications are often made up of a combination of open and closed standards and software components.
- Besides procurement costs (including license fees) there are also implementation, utilization (including management) and maintenance costs. Furthermore, there are usually functional differences between closed source software and the open source version.
- The situation does not always remain the same.
- The value of the ministries' existing hardware and software must be taken into account *(installed base)*. An enforced transition to other hardware and software, instead of a natural transition, may lead to destruction of capital.
- When procuring software, some Ministries look beyond the question of whether the software is merely "open". In many cases, these types of choices, based on an IT strategy, lead to combining closed source and open source software in one system, also known as *best source*.

In our quest for reliable financial data, we came across several business cases involving a switch from closed to open technology (some implemented, some not). The number of cases described is too small and the cases too divergent (also in terms of financial relevance) to be able to draw firm conclusions. The picture presented by the cases is that sometimes considerable savings are anticipated, due to the possibilities offered by open source software. However in other situations, the savings, certainly in terms of percentage, may also be marginal. Moreover, there are also scenarios in which the use of open technology may result in higher costs. All in all, there appears to be a much wider ranging series of considerations to be taken into account besides merely the financial one.

Conclusions

Summary of the parliamentary debate
The parliamentary debate about open standards and open source software is going around in circles. The House of Representatives has called for the wider use of open standards and open source software. It claims that insufficient progress is being made, and the Cabinet declares that this policy is in fact being pursued. We can see that the debate is based on suppositions as opposed to concrete facts and figures. Both the House of Representatives and the Cabinet seem to share the thought that making the transition from closed to open technology as soon as possible will bring the management and organizational policy goals closer together.

Response to question 1 Possibilities and scenarios
Options and migration scenarios do not stand in isolation but depend on decisions made in the strategic planning process, which must be based on the organizational goals laid out. These goals will subsequently lead to the formation of the information strategy as well as the IT strategy. One of the issues of the IT strategy is which software functionality (software policy) is required and how this will be provided (procurement policy). Choices with regard to closed versus open standards can only be addressed within the framework of the procurement policy.

Response to question 2 Replacement potential
The choice between open source or closed source software is not black and white. The offer in today's software market is constantly changing and includes many hybrid forms of open and closed source. Ministries currently already use a lot of open source software. Furthermore, a Ministry's software landscape consists of a large number of components, which exchange information with each other and the outside world using many different standards. Therefore the choice of software cannot merely be based on the question "open or not?". The only way to handle this complex reality is by using a strategic approach. As a consequence, it is not possible to point in advance to a specific section of the software landscape that could be made “open,” let alone to assess the situation quantitatively. Moreover, a continuous stream of new versions and applications and everything in between are being offered.

Response to question 3 Software costs and potential savings License fees are only a very small part of the total software costs (see cost component figure). The potential software cost savings for the ministries can only be determined in concrete situations by conducting cost-effectiveness analyses within the software implementation framework and the relevant procurement strategy. Such cost-effectiveness analyses must be based on the *total*software costs. This means that besides the acquisition costs (including license fees) the implementation, utilization (including management) and maintenance costs must be taken into account.

Response to question 4 Introduction period
The transition from "closed" to "open" will not be fully completed overnight. There will be shifts toward less or more use of open standards and open source software. How these shifts will occur, as well as the time frame, depends on which information and IT strategy is used, the initial starting point(*installed base*) of the relevant Ministry, and developments in the software market.

Response to question 5 Advantages and disadvantages, opportunities and risks, and conditions for implementation.
A substantial part of this report covers advantages and disadvantages and opportunities and risks, however they are not universally valid. They depend to a large extent on the concrete situation, the standard in question and the specific software product. Whether there are certain advantages or disadvantages or opportunities or risks can only be certified by investigating the circumstances for a concrete situation and conducting specific market research aimed at the software products and services available for that situation.

Recommendations

Expectation management
The House of Representatives expects that broader use of open technologies (open standards and open source software) will lead to substantial savings. However, in our opinion the *quick win opportunities are limited* in terms of costs savings in relation to the government's total IT costs. All things considered, our recommendation is to not harbor any great expectations with respect to the potential savings to be achieved through broader application of open standards and open source software.

Policy goals
We recommend that a clear distinction be made between the policy goals to improve the ministries' operational management (improved public service and any inherent cost savings), a responsibility of the Minister of the Interior and Kingdom Relations (BZK), as well as the policy goals aimed at market organizational issues, a responsibility of the Minister of Economic Affairs, Agriculture and Innovation (EL&I). Clear aims should be formulated for both types of policy goals, so that the policies can be formed and implemented effectively and efficiently, and so that the Minister of the Interior and Kingdom Relations (BZK) as well as the Minister of Economic Affairs, Agriculture and Innovation (EL&I) can take responsibility for them.

Strategic approach
Our recommendation is for policy- coordinating ministers and specialist ministers to work with strategic goals in mind. Addressing IT issues purely from a cost saving approach is far too restrictive.

The role of CIOs
The government CIO and the departmental CIOs play a key role in this strategic decision making process. In order for there to be a consistent IT policy across central government, the government CIO government should play a key role and take on the relevant responsibilities in the inter departmental adjustment. This approach calls for feature-specific IT requirements, which may differ from application to application and from department to department, to be borne in mind at all times.

The role of the Minister of the Interior and Kingdom Relations (BZK)
Our audit does not focus on the extent to which the various ministries have formulated strategic IT goals which form the basis for technological decision making, including software choices.

We recommend that the Minister of BZK should look into the degree to which government departments choose their software based on strategic IT policy goals and explicitly cite their criteria in this regard. We likewise recommend that the Minister ensure that all government departments meet these criteria by mid-2012. As fulfilling the criteria is subject to constant changes in technological developments, we also recommend that the Minister periodically reviews the criteria and their use, and adjusts them if necessary. We believe that in order to meet these criteria, the government should also use the knowledge and expertise of persons from other sectors, outside the government.

Finally, we recommend that the Minister of the Interior and Kingdom Relations (BZK) keeps the House of Representatives up to date with regard to IT strategy and its progress.

Ministers' response
On March 9th 2011, the Minister of the Interior and Kingdom Relations (BZK), responded to our report, also on behalf of the Minister of Economic Affairs, Agriculture and Innovation (EL&I). The Minister agreed with our conclusions but made a number of comments. He noted, for example, that all ministries have had an information strategy and associated IT strategy since 2009. He also noted that although it is not possible to identify which specific part of the software landscape could be made "open" in advance, it would be possible to do so per organization. The Minister also believes that all in all, particularly in terms of quality, the advantages of open standards outweigh the disadvantages. Finally, the Minister said that he wants to minimize the complexity and intertwining of IT environments, and not just accept them as a given fact. In response to our recommendations, the Minister of the Interior and Kingdom Relations (BZK) stated that he would consult the Minister of Economic Affairs, Agriculture and Innovation (EL&I) with a view to how a sharper distinction between the policy goals for operational management and for market organization can be made in the future. The Minister also wrote that the position of the government CIO and the ministry CIOs had recently been strengthened.

We consider it to be particularly important that the discussion regarding the distinction between policy goals undertaken by the Minister of the Interior and Kingdom Relations (BZK) and the Minister of Economic Affairs, Agriculture and Innovation (EL&I), leads to a solid policy formation and corresponding approach. With regard to the Minister's aims to minimize the complexity and intertwining of IT environments, we are particularly keen to know what the concrete steps are, for in his response, the Minister does not react to our recommendations relating to his role as coordinating minister. Nor does he indicate whether and how he intends to keep the House of Representatives informed on IT strategies and their progress. Finally, we underline the importance of having a strategy which takes into consideration social and technical developments in the near future. There will hereby be less focus on IT resources (i.e. hardware and software) and the strategic decisions will be aimed more at defining the appropriate information and IT services.

1 INTRODUCTION

1.1 Re: Request from House of Representatives

Open standards and open source software have been discussed in the House of Representatives to great length in recent years. Standards are agreements about the way in which organizations, applications, software components and networks can collaborate with one another. An example is the document format in which text data are stored and transported. Besides*closed* standards, which are established by a supplier and which may only be used with his permission, there are also *open* standards which are publicly accessible and can freely be used by everyone (also see definition in appendix 4). Open standards strive to improve data exchange possibilities. Open source software [2] is software whereby the source code can freely be studied, [3] used, improved, altered and distributed (also see definition in appendix 5). In the case of closed (*proprietary*) software, by contrast, the user does not have permission to see the source code and only the original supplier has the right to alter the software and the connections with other computer programs. Open source software strives to improve easy access to this type of software for as many parties as possible.

House of Representatives' motion
In the Parliamentary Committee Meeting with the State Secretary of Interior and Kingdom Relations (BZK) on May 12th 2010, in which IT projects were also addressed (House of Representatives 2010a), the member Gerkens, IT spokesperson for the Socialist Party (SP) criticized the progress of the *Netherlands in Open Connection* (NOiV) Cabinet's action plan. This action plan claims that the exchange of information between government information systems is a prerequisite to ensure a sustainable development of government services and applications, made feasible in the broad sense using IT. In order to achieve this, the Cabinet wants to accelerate and encourage the use of open standards and open source software through the Netherlands in Open Connection (NOiV) action plan. The Socialist Party (SP) believes that the program is extremely rigid and fears that it is on its way out. This led to a motion being proposed (Gerkens CS's motion, House of Representatives, 2010b), for an audit to be conducted by the Court of Audit. This motion was accepted on May 20th 2010.
In this motion the House of Representatives requested the Court of Audit to analyze the reduction of the use of closed standards and the introduction of open source software in central government and decentralized authorities, thereby indicating the potential savings. The House of Representatives claims that the government can achieve considerable savings in IT expenditure if market forces are enhanced through market openness.

[2] Also known as "FLOSS": Free-/Libre-/ Open source software.
[3] In the source code, a programmer establishes the instructions which the computer must carry out. Source code can be read by a human being but it must be translated (compiled) into "machine language" in order for a computer to carry out the instructions.

Request to the Court*of Audit*

Once the House of Representatives of the Netherlands had accepted the motion regarding the request to the Court of Audit (House of Representatives, 2010b) on May 20th 2010, a preliminary meeting took place on July 6th 2010 between Court of Audit representatives and a member of the House of Representatives (Mrs Van der Burg, the People's Party for Freedom and Democracy, VVD) and two employees from the Office for Research and Expenditure (BOR). In this preliminary meeting an agreement was reached with regard to this issue as well as the desired time frame. In line with procedures, on July 12th 2010 the permanent committee for Government expenditure wrote a letter to the permanent committee for Interior and Kingdom Relations (BZK), approving the request to the Court of Audit (House of Representatives of the Netherlands, 2010c). On July 22nd 2010 we received a treatise of the request from the House of Representatives, as per Gerkens C.S.'s motion. Due to the tight time frame, on July 22nd 2010 we informed the House of Representatives in writing that the audit should be carried out without any further delay. On September 9th 2010, we received the official request from the House of Representatives, upon which we confirmed in writing that the audit would be carried out (Court of Audit 2010b).

1.2 The actors involved

The following actors are relevant when carrying out this audit:

- *The Minister of Economic Affairs, Agriculture and Innovation (EL&I* [4]*),* who is responsible for IT market organization.
- *The Minister of the Interior and Kingdom Relations (BZK)*, who is responsible for the quality of central government's information provision, including departmental agencies and non departmental public bodies (ZBOs).
- *The Netherlands in Open Connection (NOiV) program office* , which aims to keep government organizations abreast of open standards and open source software opportunities, and encourage them to use them in their information systems whenever possible, in line with the *Netherlands in Open Connection (NOiV) action plan*. The program office is one of the ICTU foundation's programs. (ICTU is the IT implementation organization)[5]
- *Standardization Board and Standardization Forum*
  The *Standardization Board* advises the Minister of Economic Affairs, Agriculture and Innovation (EL&I) and the Minister of the Interior and Kingdom Relations (BZK) with regard to open standards for electronic exchange between government agencies and companies, government agencies and citizens and also between the various government agencies themselves, thus promoting the use of open standards. In order to do so, the Board administers a list of open standards to which a *"comply or explain and commit"* principle applies for central government departments, see chapter 2 (the Standardization Board calls this "comply or explain", also see appendix 2), as well as a list of currently used open standards (see appendix 3).
  The *Standardization Forum* prepares the Board's tasks and also offers the Board relevant advice.
- *Market parties and sector organizations:* software manufacturers and suppliers; companies which implement, manage and maintain software; companies which offer IT services, plus their sector organizations.

- *Community*: a group of persons who work together either formally or informally, and who develop, adapt and maintain open standards or open source software, and make them available.

[4] Up until October 14th 2010: the Minister of Economic Affairs.
[5] ICTU (ICT Uitvoeringsorganisatie) stands for IT implementation organization; this organization was established on April 11th 2001 by the Ministry of the Interior and Kingdom Relations (BZK) and the Association of Netherlands Municipalities (VNG). ICTU's area of work is the electronic government (source: www.ictu.nl).

1.3 Outline of the audit

1.3.1 Goal

With this audit we want to present a well informed debate about what is feasible/unfeasible in terms of an increased use of open standards and open source software by the government, and thereby also contribute to the Cabinet's sustainability policy for this area.

1.3.2. The issue

This audit examines whether a wider application of open standards and open source software would offer advantages in terms of cost savings for the government, and improved operation of market forces in the software sector. The audit is based on the questions raised by the House of Representatives, on the understanding that the implicit underlying assumptions (see § 1.3.3) were not used as a basis but have been included in the areas to be analyzed.

Open standards and open source software are often mentioned in a single breath. However, these are actually two different topics which are sometimes linked with one another. In this report we will explain the difference and keep indicating which of the two topics are being discussed.

1.3.3 The questions raised by the House of Representatives

The issues analyzed in this audit are based on the questions raised by the House of Representatives of the Netherlands; summarized as follows:[6]

1. Which opportunities and scenarios to reduce the use of closed standards and introduce open source software are there for the Ministries?
2. Which part of the closed standards and software can/cannot be replaced by open standards and open source solutions?
3. What are the current costs? What are the indicative initial and structural costs once the use of closed standards has been reduced and open source software has been introduced? Indicatively, what savings could be achieved by doing do?
4. What would the time frame be for reducing the use of closed standards and introducing open source software?
5. Besides the cost considerations, which advantages and disadvantages, opportunities and risks does the Court of Audit identify? Which requirements need to be met for open standards and open source software to be implementable?
6. What are the Court of Audit's recommendations, taking into account the relevant current national and international developments for government IT implementation?

The questions imply that the House of Representatives wishes to increase the use of open technology (open standards and open source software). This aspiration had already become apparent in earlier debates in the House of Representatives. Furthermore, we sense that the questions raised imply the following hypotheses:

- the government currently uses very little open technology, or none at all;
- open technology offers the same level of functionality;
- a concrete, demonstrable part of the standards and software being used can clearly be replaced by open versions;
- The Government 's accounts can offer an insight into the costs of the various standards and software;

[6] These questions relate to the ministries. The questions thus formulated by the House of Representatives also related to decentralized government bodies. As outlined in § 1.3.4, we have not been able to take decentralized government bodies into account, and our audit focuses on the ministries.

- open technology is cheaper than closed technology.

The Court of Audit does not a priori hold an opinion regarding the preference for open technology. Technological IT choices are strategic choices which must be made in line with

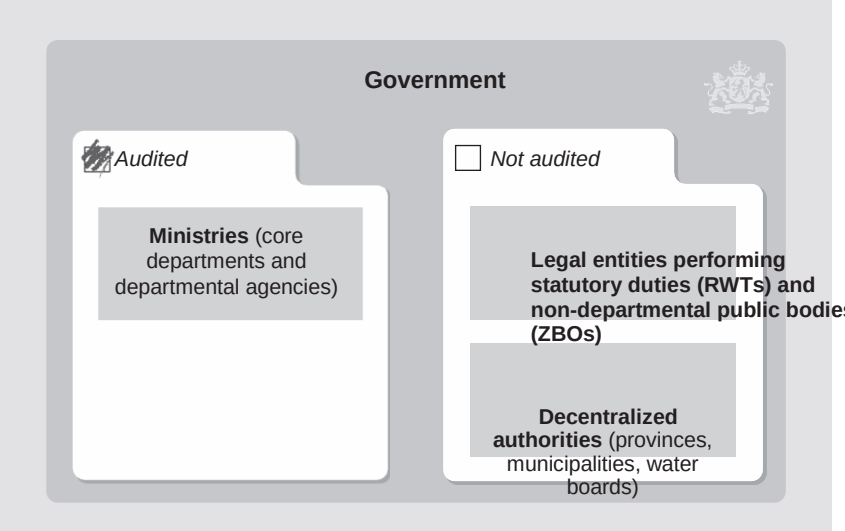
the government's processes which are supported by this technology. Technological parameters and cost considerations must be taken into account in the strategy and decision making process, but this should not be the only approach.

The implicit assumptions we have listed have therefore not been confirmed beforehand.

1.3.4 Scope

This report has been drafted using the Government's standpoint. The request submitted by the House of Representatives also related to decentralized government bodies (provinces, municipalities and water boards). However, the Court of Audit is not authorized to carry out audits for decentralized government bodies. In official discussions, the Ministry of the Interior and Kingdom Relations (BZK) informed us that they do not have this kind of authority either, and that they will not obtain the necessary details from the decentralized government bodies in any other kind of way. We have therefore not been able to take decentralized government bodies into account, and have focused our audit on central government. In the audit we have only included those elements of central government whereby one of the ministers is directly responsible for the operational management. These are the ministries themselves, along with the departmental agencies. The government's external independent divisions, such as legal entities performing statutory duties (RWTs) and independent government bodies (ZBOs), have not been incorporated in this audit. The scope is shown in figure 1.

Figure 1. **Scope of the audit**



1.3.5 Approach

We conducted various types of analyses in order to respond to the questions raised by the House of Representatives of the Netherlands.

Cost audit across the ministries
The cost audit across the ministries had three goals. The main goal was to determine the magnitude of current software and application costs. Furthermore, we wanted to obtain an indication as to how much open source software is currently being used. Finally, the purpose of the cost audit was to gain a general insight into the ministries' software landscape, thus forming the context for the audit, i.e. which types of software are being used by the different ministries and which similarities and differences are there in the software landscape across the various ministries?

As outlined in § 4.1, software costs cannot be directly deduced from the ministries' accounts. The software costs we have taken into account are therefore based on the ministries' general estimates. In order to do this, we have drafted a "format" (see appendix 6) based on the main cost structure differences between closed source software [7] and open source software. While drafting this format, we used the*Guide to cost-benefit analysis for IT projects* (Ecorys, 2007). The format should be regarded as a simplified version of a *Total Cost of Ownership* (TCO) model[8]. We discussed this format with the Government Chief Information Officer (CIO), the CIOs of several ministries and three internal IT service provider managers [9] who have based their financial accounting systems on the cost-benefit structure.[10] Furthermore, we consulted various external experts from the areas of consultancy, audit and science. The unanimous feedback was that although our format could be used on an analytical level, on the basis of the ministries' accounting information it would in practice not be possible to fully apply it.

We employed a two-way approach. We carried out the cost audit with the ministries using our format, aiming to obtain from each ministry *at least the details* they were able to provide, and using estimates when necessary. In addition, we have analyzed the way in which the above mentioned internal IT service providers manage their software and the inherent costs. We merged the details from both approaches in order to get an indicative overall picture, which we verified with the ministries' Chief Information Officers.

The picture is certainly not based on underlying detailed accounting details and the analysis thereof, and thus differs from our usual method of approach. Nevertheless we believe that our indicative picture will enable the House of Representatives and the relevant ministers to be sufficiently informed in order to conduct a debate about what is feasible/unfeasible in terms of an increased use of open standards and open source software.

Expert consultation
We have consulted a number of external experts in order to gain an insight into the possibilities and limitations, problems and methods of approach with regard to questions regarding open standards and open source software. We spoke with a great many people who have expertise in this area, in terms of either policy, science, or in a practical sense. We did this by conducting individual one on one meetings, and an expert meeting whereby we pooled and compared the knowledge, experience and opinions of the various external experts.

[7] Closed source software is also called proprietary software. The closed source software concept is examined in § 3.3.
[8] TCO (Total Cost of Ownership) is a cost definition entailing all of the direct and indirect costs of a product throughout its entire life cycle, from procurement to disposal.
[9] These are organizations (which are sometimes not internally independent) which offer IT services to one or several ministries.
[10] These were: GDI (Ministry of Security and Justice, from October 14th 2010: Ministry of Security and Justice), Ivent (Ministry of Defense), SSO-IT (Ministry of Transport, Public Works and Water Management), from October 14th 2010: Ministry of Infrastructure and the Environment).

Appendix 7 offers an overview of the external experts who were consulted.

Examination of literature
We studied and analyzed relevant literature about open standards and open source software, including Internet sources. We used this examination to validate and supplement the information obtained from other sources.

Discussion group on LinkedIn.
In a discussion group on the business networking website Linkedln, we launched a discussion about the pros and cons of open standards and open source software, which ran for two weeks. The aim was to gain knowledge from a wide ranging array of insights and experiences. Whenever possible, the main consideration was to identify legitimate cases and business cases whereby the introduction of open source software had on balance demonstrably saved costs.

Analysis of the parliamentary debate
We analyzed the parliamentary debates about open standards and open source software which had been held over the last ten years. The aim was to examine which topics had been discussed in the debates, the view points which arose from the discussions, and the outcome of the debates.

Analysis of business cases
In various discussions held within the framework of this audit, we were presented with different business cases, which had been drafted because an organization had considered making a transition to open standards or open source software, or a combination thereof. We studied four business cases regarding open source software, as well as three business cases regarding open standards. In principle, a business case is drafted prior to a project. We are not aware of any evaluations of completed projects in which a switch was made from "closed" to "open".

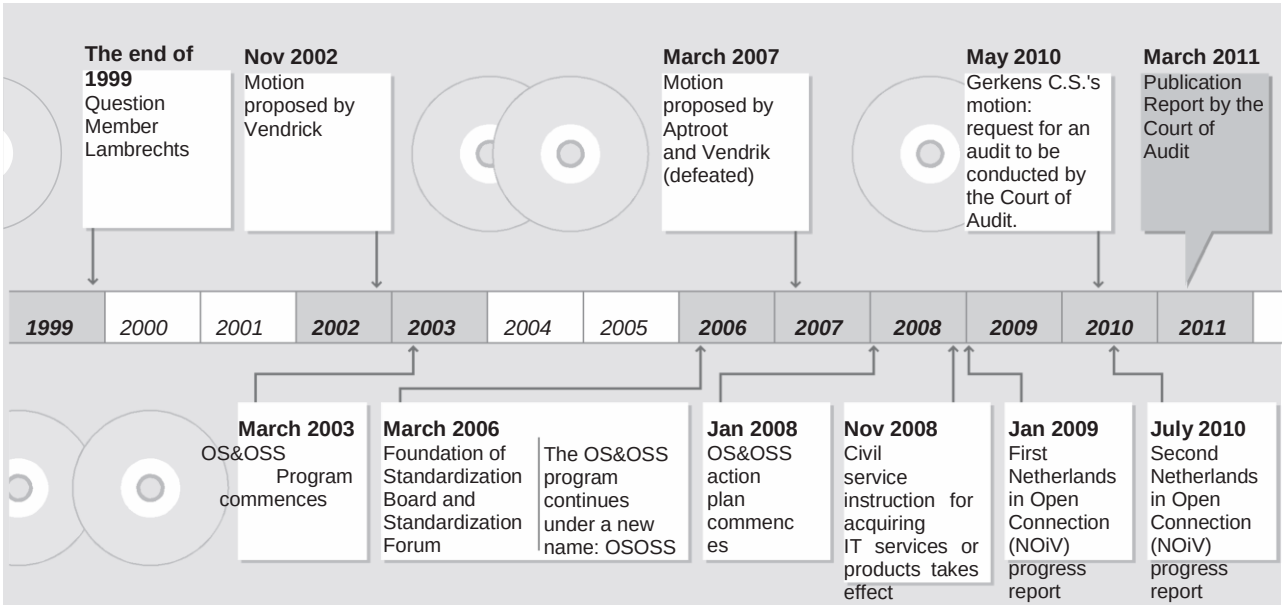
1.4 Chapter guide

In chapter 2, we outline a brief historical summary of the debates and policy development for open standards and open source software in government.
In chapter 3 we will examine the issue of openness. What are open standards and what is open source software? We will explain these concepts and place them in the context of the goals which central government wants to achieve in terms of IT. We will thereby indicate the various types of open and closed standards and software, as well as the different hybrid forms. We will also examine the cost structure of the different types of software for the government as user thereof, and the earnings models which market parties and communities apply, or are able to apply, when offering software licenses and software related services.
In chapter 4, we will examine central government's software costs and the potential savings which are to be made in this area, as well as the inherent opportunities, risks and constraints. In chapter 5, we will present our response to the questions raised by the House of Representatives, along with our recommendations.
The government's reaction to our report, followed by our after word are in chapter 6.

2 TEN YEARS OF POLICY AND DEBATES

The House of Representatives has conducted many debates about open standards and open source software in the last decade. In this chapter we will give a brief historical summary of those debates and of the policy development for open standards and open source software
in government. Figure 2 indicates the main milestones in the debates and in policy development. A more detailed account of the parliamentary debate can be found on the Court of Audit's website: www.rekenkamer.nl.

Figure 2 **The main milestones for open standards and open source software.**



Around the start of the new millennium, [11] several Members of the House of Representatives decide to encourage the application of open standards and software, in government as well as in education. In response to this, the Minister of Education, Culture and Science and the Minister for Urban Policy and Integration announce that they will examine what would be the best way to promote this, and that they will come up with some plans (House of Representatives 1999; House of Representatives 2001). On November 20th 2002, the member Vendrik proposesa motion in which he requests the government to ensure that as from 2006 all software used in the public sector complies with open standards, and to encourage the use of open source software in the public sector (House of Representatives, 2002). This motion is accepted.

In March 2003, the Cabinet launches the program *Open standards and open source software* (OS&OSS), based on this motion and implemented by the ICTU foundation (Ministry of the Interior and Kingdom Relations, BZK, and Ministry of Economic Affairs, EZ, 2003). The question of what the government should strive for also comes up in the debate conducted by the Minister and the House of Representatives. The goals are: to improve data exchange (interoperability) between government domains, as well as data accessibility, and bring about independence from suppliers. The intention is not to impose an obligation to use open source software, nor will any quantitative goals be established for or by the Cabinet.

[11] Lambrechts and Bakker, Democrats 66 (D66) and Voûte- Droste, the People's Party for Freedom and Democracy (VVD).

Over the subsequent years, the Cabinet devised several campaigns aimed at broadening the knowledge about open source applications across the public domain. They included an awareness raising program, a catalog, a tender handbook and the foundation of the *Standardization Board* and the *Standardization Forum* (the House of Representatives, 2004a). Members of the House of Representatives of the Netherlands asked the government about potential cost savings (House of Representatives, 2004b) in the use of open source software, and about the government's "mega contract" with Microsoft (House of Representatives, 2005). According to the Minister, the last time software needed to be replaced in order to update the office computer system, no fully fledged open source alternatives were available. In August 2005, the Minister of Economic Affairs (EZ) and the Minister of Administrative Reform and Kingdom Relations (BVK) reacted to the implementation of Vendrik's November 2002 motion so far. They declared that the government will start using the XML format (an open standard) for the exchange of financial data, which the Cabinet believes will lead to a considerable reduction in expenditure (Minister of Economic Affairs, EZ, and the Minister for Administrative Reform and Kingdom Relations, BVK, 2005).

In March 2006, the *Standardization Board* and the *Standardization Forum* are founded, following the decision made by the Minister of Economic Affairs (EZ, 2006a). It is also decided that the open standards policy should be incorporated in the Standardization Board and Forum. The open source software policy also proceeds in a new program entitled *Open Source as a Software Strategy Component* (OSOSS).

The government pursues its stimulation policy (Ministry of Economic Affairs, EZ), by setting up an expertise center at the ICTU foundation and a so-called Taxonomy Project[12] and by introducing the Open Document Format (ODF), a standard for revisable documents (Ministry of Economic Affairs, EZ, 2006c).

In 2007, the Members Aptroot and Vendrik propose a motion requesting the government to ensure that without any further delay, and no later than January 1st 2009, all software used by the public and semi public sectors adheres to open standards, and that thus all e-government provisions such as electronic forms, are based on open standards (House of Representatives, 2007). These members were very disappointed by the implementation of Vendrik's 2002 resolution so far. The proposed motion is defeated.

In autumn 2007, the House of Representatives receives the action plan *Netherlands in Open Connection* (NOiV) from the Minister of Economic Affairs (EZ) and the Minister of the Interior and Kingdom Relations (BZK). The goals of the 2003 OS&OSS program are relaunched, and with the Netherlands in Open Connection (NOiV) actions an accelerated implementation from mid-2008 is planned (Minister of Economic Affairs (EZ, 2007). In January 2008, the Netherlands in Open Connection (NOiV) program office is set up
by order of the Minister of Economic Affairs (EZ) and the Minister of the Interior and Kingdom Relations (BZK), in order to actively support the implementation of the Cabinet's action lines. The Minister of Economic Affairs (EZ) and the Minister of the Interior and Kingdom Relations (BZK) also start using the so-called *"comply or explain and commit"* principle for the use of open standards, which entails the following:

- *Comply*: Apply established open standards to IT orders for new systems or rebuilds and IT contract extension.
- *Explain*: Or explain why you cannot use them, the exception criteria being:
  - No open standard is available for the desired functionality.
  - The open standard is not supported by multiple suppliers and on several platforms.

[12] The Dutch Taxonomy Project is an initiative set up by the former Ministry of Justice and Ministry of Finance, aimed at simplifying electronic financial data exchange between businesses and the Chambers of Commerce (KvKs), the Tax Authorities and the Central Statistics Office (CBS), through the use of XBRL in financial reports. This project was subsequently succeeded by the SBR (Standard Business Reporting) Program.

- Conduct of business and/or service provision would be unacceptably jeopardized, including in terms of security.
- Agreements made internationally would be broken.

- *Commit*: Give preference to the application of open standards so that an exception criteria is no longer applicable.

As from April 2008 this principle will apply to a basic list of open standards which will be drafted by the Standardization Forum in January 2008. The constituent instrument for the Standardization Board and Forum which was renewed in 2010, does not explicitly outline whether or by whom the basic list of open standards is established.

At the start of 2008, an emergency debate was held in the House of Representatives about the tender for the project for the joint development of a uniform government desktop (GOUD). The contra-expertise carried out in the tender process indicated that not everything had been done to fulfill the wishes of the House of Representatives, or the commitment made by the State Secretary for Economic Affairs (EZ) with regard to the use of open standards and open source software (Finance, 2008). The House of Representatives receives a number of motions, including the member Aptroot's motion (House of Representatives, 2008a) and Member Vos's motion (House of Representatives, 2008b). Aptroot's motion requests for the tender to be reconsidered and Vos's motion requests the government tenders to more emphatically demand the use of open standards. In response to these motions, the Cabinet declares that where not already the case, all of the 'wishes' regarding open standards in the tender document will be changed to 'requirements' (Finance, 2008b).

On November 23rd 2008, the Civil service *instruction for acquiring IT services or products* takes effect. Article 3 of the appendix of this Instruction outlines that the *"comply or explain and commit"* principle is mandatory and article 4 states that the extent to which this principle is adhered to must be demonstrated in the 'operational management' section in the departmental annual report.

In 2010, the House of Representatives accepted a motion to switch over to the IPv6 standard [13] (House of Representatives, 2010d), and discussed a proposal requesting for an audit to be carried out by the Court of Audit (House of Representatives, 2010a). This proposal led to the motion proposed by Gerkens C.S., and the request which led to our audit.
Furthermore, in 2010 the second Netherlands in Open Connection(NOiV) progress report was presented to the House of Representatives (Ministry of Economic Affairs, EZ, 2010). This report repeats the progress which had already been cited in 2009. The report states that over 200 different open source software packages are in use. One of the obstacles mentioned is the fact that by far not every functionality required by the government is available in open source software. The report also states that users experience that the total costs of an open source solution are often high due to the costs incurred for the installation, transition, documentation, implementation, support and management of the software.

[13] IPv6 stands for Internet Protocol version 6 and is the successor to version 4 (IPv4). The main reason IPv6 started to be used was the impending shortage of available IP addresses. An IP address is a unique identifiable Internet address for a computer which is connected to the Internet or to a network. IPv4 and IPv6 are both open standards.

3 THE ISSUE OF OPENNESS

Open standards and open source software are topics which, besides for a relatively small group of people who deal with it on a professional level, generate a lot of complexity and misunderstanding. In this chapter, we will explore these concepts and establish what the relationship between them is, as well as the costs inherent in software.
By defining the concepts "open standards" and "open source software", we answer many of the questions raised by the House of Representatives. As the questions raised by the House of Representatives imply that the government wishes to make wider use of open technology, this chapter will also focus on whether this would in fact entail any advantages and if so, what they are.

Appendix 4 of this report outlines the definition of an open standard according to the Standardization Forum. Appendix 5 outlines the definition of *open source software according to the Open Source Initiative* (OSI).

3.1 IT in central government

IT is indispensable for virtually any organization, including the Government. In a previous audit, we stated that IT no longer merely has a supporting role, but that it "greatly affects the government" (Court of Audit, 2010a). IT should not be considered as a separate entity, but must be regarded within the context of the government's management processes. See figure 3 on the following page.

The figure represents a very simplified version [14] of two ministries who have set up an information management system for the execution of their management processes. The IT which supports the information management system is layered. Each layer contains hardware as well as software. The top layer contains the applications used for specific areas within a ministry, such as policy information systems and subsidy systems. The next layer contains applications used department wide. They include for example office computerization (such as word processing, spreadsheets and e-mail), operational management systems (such as ERP packages[15] and HRM systems), work flow management systems, document management systems, and website content management systems. The following layers constitute the technical software and hardware infrastructure, which is required in order for the applications to run. They are the system software (operating control systems, database management systems and data storage software), the hardware layer (network servers and work place computers), and the network infrastructure (the switch points and the wiring). As the end users of the IT provisions do not see these three bottom layers, we refer to them in this report as being "under the hood". We refer to all software collectively as the "software landscape".

[14] For example, the various ministries not only exchange information with each other, but also do so with numerous other organizations. Furthermore, many ministries have contracted (parts of) their IT out to an external service provider, and developments toward collective IT provisions for all of the ministries are underway.

[15] ERP packages are software packages with a strongly integrated functionality, which in principle can support the entire operational management system. It is easier to connect financial resources to other operational management aspects using this kind of system, as opposed to using 'separate' systems. ERP stands for Enterprise Resource Planning.

Figure 3 **IT within the context of the government's management processes**

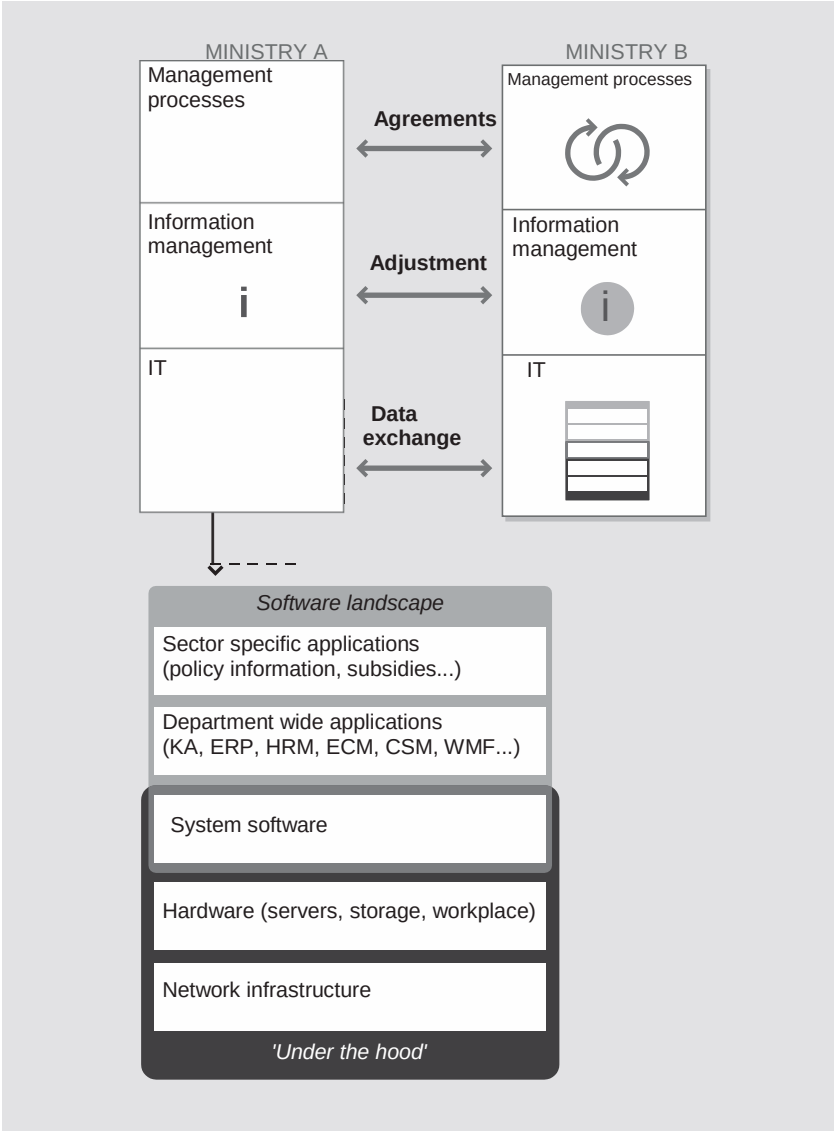


Table 1 outlines a general classification of a number of software categories which are relevant to central government, along with some examples.

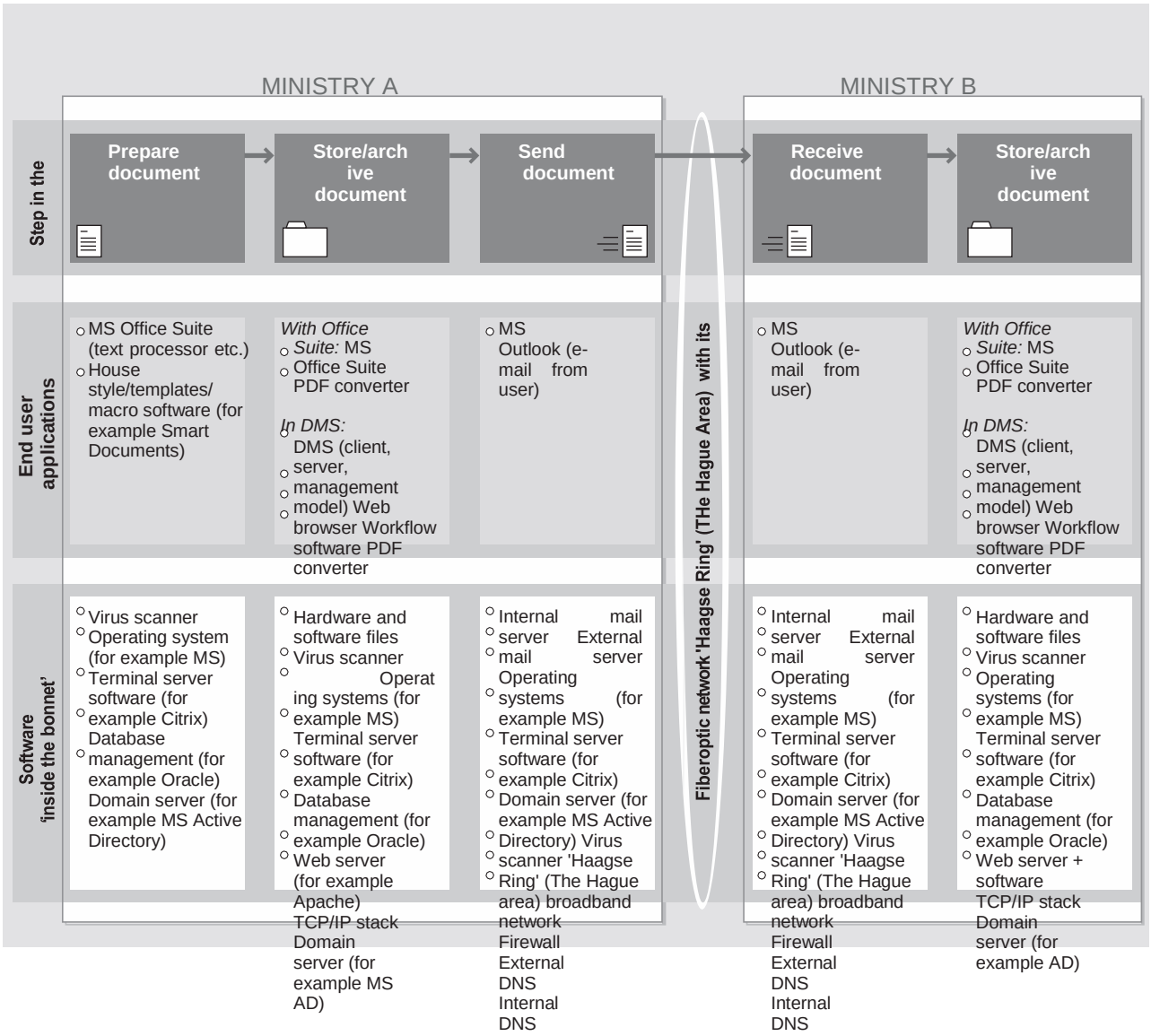
Table 1 Software categories with examples

Category	Description	Examples
Office computerization	Software for the average end user, also known as "desktop" applications	- E-mail - Word processing - Spreadsheets - Document management
Specific end user applications	Applications for policy directives and supporting departments	- Policy information systems - Subsidy systems - Geographical information systems - Financial systems - HRM systems[1] - ERP packages
Website and intranet software[2]	Software for internal and external communication	- Web servers[3] - Web content management applications - Web development applications - Web browsers
Technical information systems	Systems which are predefined in technical equipment	- Variable message sign systems - Speed cameras which use automatic license plate recognition - Water board management - Public transportation pricing (Public transportation chip cards - OV-chipkaart)
IT infrastructure and development and management software	Software for IT departments	- Operating systems - Database management systems - Network management tools - Application servers[4] - File servers - Security software - Software development tools and applications

[1] HRM: Human Resource Management.
[2] An intranet is the internal version of an external website.
[3] The intranet and Internet traffic are provided by web servers.
[4] An application server is a provisioning system made up of software and hardware, which makes the applications available to the end user.

The various parts of the software landscape collaborate with each other in numerous ways. To give an insight into this, we demonstrate in figure 4 (on the next page) which software landscape elements must collaborate with one another when executing a simple process in central government: An employee in Ministry A creates a document which must subsequently be processed by an employee in Ministry B.

Figure 4 **The software landscape elements which are involved in a simple process.**



This example demonstrates that even in a simple process a large number of applications and system programs are involved, which must collaborate with each other in order to obtain the desired result. In order to collaborate, these applications and system programs must be able to process each other's data. In order to achieve this, technical agreements, i.e. technical standards are necessary (see § 3.2.2).

A ministry's software landscape is thus an extremely complex entity and it is not possible to merely replace just one of its elements. One must always take into account the position of the element within the ministry's software landscape as a whole, and the way in which it relates to the other software elements, as well as the technical standards which ensure that these elements connect with one another.

3.2 Open and closed standards

A standard is merely a set of agreements. An example of a standard in the physical world is the International System of Units, [16] which enables a given measurement to be defined exactly the same worldwide: for example, a meter has the same length anywhere in the world.
Standards in the software world ensure that applications or other software components are able to fully and correctly process each other's data. This enables systems to communicate with one another.

3.2.1 Distinction between closed and open

Standards can be either closed or open. A *closed* standard is a standard which is established and maintained by a natural person or a legal entity (usually a company or a group of companies). Standards are not protected by intellectual property law. Patents are therefore applied, in order to regulate the use of the standard and generate income from it. Many closed standards, but in particular the closed technical standards, have components which are protected by patents. For example, the GSM cellular phone standard has around 2000 patents, which are owned by approximately 20 companies (Paapst 2010). Owning a patent involves a fee, which is incorporated in the hardware and software the standard is applied to, in the form of royalties. This means that the consumer pays for it. An example of a semi-closed standard for reproducing graphic documents is TIFF. In multimedia (sound and image), a well-known example of a closed standard is the MPEG-4 format (see box on page 29).

Open *standards* either have*no* patents, *or* in the event that they do, they are made available free of charge, i.e. the user does not pay any royalties. The latter situation has certain conditions. An example is the *RTLinuxFree Open Patent License*[17], which makes a certain patent available without charging royalties, provided it is used in open source software.[18]
Other characteristics of an open standard are:
- it is maintained by a non-profit organization;
- the specification document for the standard is public domain and can be used freely.

Well known examples of open standards are:
- *W3C Consortium's Hypertext Markup Language* (HTML) and *Cascading Style sheets* (CSS), [19] used to structure web page content and also to add styles to web pages;
- *eXtensible Business Reporting Language* (XBRL),[20] used to exchange financial data and other company data via the Internet;
- *Open Document Format* (ODF), a standard for the exchange of revisable documents;
- *Portable Document Format Archive* (PDF/A), a standard for the exchange of non-revisable documents.

[16] Système International d'Unités (The International System of Units).
[17] See RTLinux (2007). It is a patent which makes the open source management system Linux suitable for use in "real time" (i.e. time critical) environments, such as the processing industry and aviation.
[18] To be precise: If the software is made available in under the GPL license, a license format which has copyleft provisions, see § 3.3.2.
[19] Approximately 330 companies and other organizations, such as universities, are members of the W3C Consortium The consortium develops and manages web standards. It currently manages around 650 (concept) standards.
[20] XBRL is based on XML (see below).

Examples of closed standards and their open counterparts

Exchange formats in the NL Patent Office
Open and closed standards are also used in the patent application process. The *"Patent Regulation 2009 - Patent Act 1995"* gives a choice of three standards for filing applications, i.e. *PDF*, *TIFF* and *JPEG*. If the party applying for a patent uses one of these three standards, he or she can rest assured that the NL Patent Office can read the application. TIFF is a semi-closed standard under the control of the company*Adobe*. PDF and JPEG on the other hand, are open standards.

Multimedia formats
MPEG-4[21] is a closed standard for multimedia storage and transportation (audio and visual, such as video). This standard has over 1000 patent licenses, assigned to over 25 different parties, including companies such as Philips, Mitsubishi and Sony. These parties have pooled their interests in the company *MPEG LA, LLC*[22]. This company licenses the patents to companies who use the standard as a "patent pool".

One of the counterparts of the MPEG-4 is the OGG *format*. This is an open standard for audio and video which can be used freely, without the limitations which software patents have. OGG is managed by the *Xiph.Org Foundation*[23], a non-profit organization which develops open multimedia file formats and software.

The open and closed standards we have distinguished above are extremes. In practice, the situation is much more complex: there are many intermediary versions and hybrid forms. An example is Microsoft's *OOXML* document format (also called *docx*). This format was devised on the basis of the open standardized "language" XML[24] and is freely available. However, the format also recognizes Microsoft's own (closed) standards, for example for using mathematical formulas and *vector graphics,*[25] and does not hereby use the existing open standards (i.e. *MathML* and *SVG)*.

3.2.2 Interoperability

Standards facilitate collaboration within and between organizations. In software terms this collaboration is called "interoperability".
The following three levels of interoperability are usually identified:

- organizational interoperability;
- semantic interoperability;
- technical interoperability.

Organizational standardization generally needs to be more closely defined in terms of semantic standards, which then need to be standardized on a technical level.

[21] This standard is related to the well known MP3 audio format.
[22] www.mpegla.com
[23] www.xiph.org
[24] The XML standard is a set of rules for encoding data unambiguously, thus enabling applications to process the data correctly.
[25] Vector graphics is a set of techniques which use certain applications to represent images, such as technical drawings.

Organizational interoperability

Organizational interoperability means that organizations are capable of working with each other efficiently and effectively. This is enabled by properly synchronizing the relevant processes of the organizations in the sector. The advantages which can be brought about when introducing an organizational standard, often transcend beyond the organization itself and relate for example to a social sector. For example, within the framework of a more efficient disposal of household garbage, agreements are established between the garbage disposal companies of a number of municipalities regarding matters such as where the garbage collection data [26] is stored, who manages it, how access to the data is regulated, and which citizens privacy protection regulations are applied.

Semantic interoperability

Semantic interoperability entails that organizations are able to process one another's information. Semantic standardization is hereby required, which ensures that the exact content of the information exchanged is interpreted unambiguously by all parties. For example: how should a "person" be defined? Should we use gender, prefixes, initials, and date of birth? Or the BSN (National identification number)? Or else the A number identification (A-nummer)? [27]

Technical interoperability

Technical interoperability is the ability of software components to work together, to "communicate" with one another. This is enabled by technical standards. Examples include standards for exchanging written text (for example the Microsoft Office Suite closed standards which came out prior to the Office 2007 version (*.doc*), the semi-open standard *OOXML,*the open standard *ODF,* and the w3c-consortium's open web standards). The middle layer (the software layer in between the application layer and the operating layer) has many standards which enable technical interoperability. An example is the «TCP/IP-stack»,[28] a set of standards which enables applications to exchange information via a data communication connection. This standard was originally developed for Internet traffic, but has become the most common standard for network traffic, and as such organizations also use it in
their internal networks.
In the box below, an example of a standard which is introduced to improve interoperability is described.

The Aquo standard

The Aquo standard is a semantic standard which enables water management authorities to register their data in one and the same way. The standard enables the different water management organizations, such as water boards, provinces and the Rijkswaterstaat water service, to exchange measurement data and analyses in a uniform way, Elements of the AQUO standard regarding the exchange of geographic and measurement data, conform to the European guideline INSPIRE, which enables information to be more easily shared on a European level. On November 4th 2010, the Aquo standard was added to the Standardization Board's "comply or explain and commit" list for open standards.[29]

[26] They are details such as the number of garbage cans per household, container volume, container weight, or a combination thereof.

[27] Citizen service number (previously the 'Sofi number'): the personal identification number which is used in the implementation of social security and taxation legislation. The A number (A-nummer): the personal identification number used by municipals in basic administration processes.

[28] This abbreviation stands for *«Transmission Control Protocol/Internet Protocol»*. Development and maintenance of the TCP/IP standards are financed by *The Internet Engineering Task Force* (IETF). This is a non-profit organization which has 90 institutional members (companies and other organizations), and 26,000 individual members (www.ietf.org).

[29] Source: Standardization Forum, http://www.open-standaarden.nl/actueel/news items and press releases. See news item November 4th 2010

3.2.3 Frequently quoted advantages of open standards

Generally speaking, open standards cannot be considered better than closed standards or vice versa. However, a number of advantages are usually attributed to open standards, mainly in terms of quality, cost savings, supplier independence and sustainability. In this paragraph we will discuss these potential advantages and the underlying principles. As there is no sound evidence that these advantages are actually valid, we do not examine the question of whether or not they are indeed genuine. The business cases we have studied do not always explicitly indicate the criteria for choosing *open* standards *as opposed to closed* standards. It is therefore unclear whether the following advantages have played a role thereby.

Quality standards
When a standard is established in an open process, all familiar or unfamiliar parties involved in the collaboration have the opportunity to contribute to the standardization process, in line with their own specific interests. In theory, this increases the chance that all relevant interest are taken into consideration. This supposed advantage is often worded as " open standards are better in terms of quality". We have not found any grounds for this argument, or anything to the contrary for that matter. In our opinion, standardization in the form of an open process may enhance the quality, but it does not guarantee it. Whether quality is indeed better, and if so to what degree, depends on the circumstances and must be examined on a case by case basis.

Cost savings
Open standards can be used without paying fees for any patents which may be incorporated in the standard. The use of closed standards on the other hand, do generally *incur* these charges. For example royalties, which must be paid in order to be granted permission to implement a standard in an application. See text box below. Or maybe other fees also have to be paid, for example transaction fees.
However, royalties and other fees are not the only costs linked to standards. The implementation, maintenance and support of a standard also incurs costs, regardless of whether that standard is open or closed. Whether the use of open standards leads to cost savings on balance, and if so to what degree, will depend on the circumstances and will need to be examined on a case by case basis.

Example of closed standards royalties

MPEG-4 is a closed standard for multimedia storage and transportation (see § 3.2.1). Various parties, including *Mozilla*, *Opera* and *Wikipedia*[30] do not wish to use MPEG-4 because of its royalties and conditions. Mozilla estimates that it would have to pay approximately € 4 million in royalties each year, but also objects because the conditions and royalties impose thresholds for innovation and re-usage (The Netherlands in Open Connection, NOiV, 2010).

[30] The Mozilla community and the company Opera produce, amongst other things, web browsers (Firefox and Opera respectively), the former being open source software and the latter closed source software. They are both free of charge Wikipedia is an online encyclopedia, based on the open source software *MediaWiki.*

Supplier-independence
Open standards make it easier for the user to switch over to a different producer and software product, for example because the product is more appropriate for his requirements, is cheaper, or involves better service. In certain cases, closed standards more or less oblige the software user to use several different applications from the same producer. This is known as *vendor lock-in*. For example, someone who uses MS Word for text processing should in theory be able to use a spread sheet by a different software producer. However, the user will usually choose a product by the same producer, in this case MS Excel, as this minimizes any potential data exchange problems.

Sustainability
The use of open standards entails that it is more likely that the data will also be usable in the future, for each (version of an) application is only supported by the producer for a limited amount of time. Moreover, organizations also spontaneously migrate from one application to another. If the old application is based on a closed standard, it is the supplier who determines whether data inherent to a certain application will also be usable in the future. With an open standard, the software user is in principle not dependent on a specific software supplier, which may increase the chance of data availability inherent to that application being more sustainable.
For that matter, the use of open standards also entails dependence, for the user is dependent on the organization or community which maintains the standard. And the maintenance of a closed standard can in theory be taken over by other parties, for example if the original supplier is no longer able/no longer wants to continue maintaining the standard.

3.3 Open source software and closed source software

Open source software is a set of computer programs whereby the user can see and alter the source code. In the case of closed software, by contrast, the user does not have permission to see the source code and only the original supplier has the right to alter the software and the connections with other computer programs.
Another characteristic of open source software is that it is produced by a community - often an informally organized group of programmers who work together on a certain software project - and not a company, as is the case for closed source software.

3.3.1 The distinction is vague: there are many hybrid forms

Like open and closed standards, there are a lot of hybrid forms mixing open source software and closed source software. For example, more and more closed source software has elements which have an open source code, and it is expected that by 2012 approximately 80% of commercial software will use open source technology (Gartner, 2008).
And in terms of production, the distinction is not black and white either. There is a great deal of cooperation between communities and companies and there are communities which are financially, or by means of programming work, supported by one or more companies.

Casadesus-Masanell and Llanes (2010) make a distinction between the basic functionality of a program and the functional extras. An example is a program which has e-mail and diary management as a basic functionality. Functional extras would then be advanced mailbox search functions and synchronization of the mailbox and diary with a *smartphone*.[31] The basic functionality as well as the functional extras could be either open or closed. Casadesus-Masanell and Llanes thus identify four software types (see table 2): a fully open version (*open source*, top left hand corner), a fully closed version (*proprietary*, bottom right hand corner) and two hybrid forms. The basic functionality of one of the hybrid forms (*open core*, top right hand corner) is open source and all of the functional extras are closed, whereas the opposite is the case for the other hybrid form (*open edge*, bottom left hand corner): the basic functionality is closed and the extras are open. Each of the sections in table 2 has some examples. [32]

Table 2: Open source software and closed source software and two hybrid forms

		Extensions	
		Open	**Closed**
Base	**Open**	**Open source** – My SQL – Red Hat Linux – Open Solaris – Eclipse	**Open core** – Sugar CRM – JasperSoft – Zimbra – Mac Os X
	Closed Open edge	– MSFT.Net – Stata – Mathematica – Facebook	**Proprietary** – MS Windows – MS Office – Oracle 11 g – SAP

Source: Casadesus-Masanell and Llanes (2010)

"Dual licensing" is another type of hybrid form (see § 3.3.2).

Market parties may act as financial backers for communities. An example is outlined in the following text box.

Example of financial association between a community and the business world

The American firm *Alfresco* offers the "enterprise content manage- ment system" (ECM)[33]. One of the founders of Alfresco, back in 2005, was the former *Chief Operations Officer* (and co-founder) of the company *Business Objects*, which in 2007 was acquired by *SAP AG*, the producer of the ERP software package SAP. SAP Ventures, *a subsidiary of SAP AG,* is Alfresco's co-financier. We do not know what the exact considerations hereby are, but these kinds of associations are generally created out of mutual interest. The Alfresco community offers a higher level of production and the Alfresco enterprise may contribute to the development of an open source product which in the future could (also) be put on the market in a commercial version (also see the "Dual licensing" text box in § 3.3.2).

[31] A smartphone is a cellular phone which offers Internet access and has applications for functions such as e-mail and diary management. Examples are the *Blackberry* by the company Research in Motion or *Apple's* iPhone.

[32] *MySQL* and *Oracle 11g* are database management systems, *Red Hat Linux*, *Open Solaris*, *Mac OSX* and *MS (Microsoft) Windows* are operating systems. *MSFT (Micro- soft).Net* and *Eclipse* are software development tools. *Stata* and *Mathematica* are mathematical programs (used for statistic as well as technical calculations). *SugerCRM* is a client management program. *Jaspersoft* is a program which generates reports based on database information. *Zimbra* is e-mail and diary management software. *Facebook* is the software with the social networking website of the same name. *MS Office* is Microsoft's office application suite. *SAP* is an ERP package.

[33] ECM basically entails the management and delivery of an organization's unstructured information, such as documents and other content formats, including video material.

3.3.2. Software licenses

As outlined by copyright law, the software's copyrights belong to the relevant producer.[34] The producer can however grant other parties the right to use the software.[35] This occurs by means of a license agreement between the producer and the software user, i.e. the license. The software license regulates the way in which the purchaser may use the software. The license does not grant the right of ownership of the software, but offers the purchaser the non-exclusive right [36] for its use. This use is tied to the conditions outlined in the license agreement.

Closed source software licenses

In general, the stipulations for closed source software licenses state that making copies of the software is prohibited (apart from *a backup* for personal use),[37] that the license may not be sold to third parties, that the use of the software is limited to a certain number of computers or (multiple) users, and that "reverse engineering"[38] is not permitted. In the license agreement, the software producer's liability for product defects or ensuing damage is usually limited or not included.

Open source software licenses

The three core principles of open source software are that the open source licenses grant the user the right to (Laurent, 2004):

1. use the software non-exclusively, [39] however not commercially - although the latter depends on the specific license type, see hereafter;
2. use the software's source code free of charge;
3. modify the source code and produce a new source code, based on the source code as described in the license.

This means that an open source license offers the user the right to implement, copy, modify and distribute the source code - either in its original format or in a modified format. This right applies to all non-commercial use and (depending on the license type), often also to commercial use of the software.

A company can generate income from software which it has constructed using open source software, by combining the open source software with closed source software, and selling this entity as closed source software. Some open source licenses exclude this possibility by means of a "*copyleft*provision". This provision stipulates that if a modified version of a given source code is distributed, whether or not in combination with closed source software, the user must in turn do so under the same license. In the case of licenses which do not have a *copyleft* provision, modifying the source code as well as creating a bundle with a closed source code, and subsequently giving the entity closed source software status is permitted.[40]

The European standard for open source licenses: EUPL

The European Union Public License (EUPL)*was created by order of the European Commission*. It was originally intended to be used to regulate the distribution user rights of open source software constructed by order of the European Commission. To this end the EUPL license has

[34] Article 1 and article 10, paragraph 1, point 12.
[35] Article 12, paragraph 3, in connection with paragraph 2.
[36] This means that the software producer may sell the license to third parties.
[37] The Copyright Act does not consider making a back up copy to be a copyright violation. (article 45k). The European Software Guideline (article 5, paragraph 2) states that the act of making a (crucial) back up copy by a legitimate program user cannot be impeded in an agreement.
[38] Reverse engineering is the process of deriving the source code from the compiled version of a computer program. The Copyright Act does permit reverse engineering if it is performed in order to achieve interoperability between programs, but only if the information required for the interoperability cannot "be obtained fast and efficiently in another manner" (Copyright Act, article 45m, paragraph 1b).
[39] The license can thus be sold to different people.
[40] Some examples of commonly used license types which contain a (strong) copyleft provision are: *GNU General Public License* (GPL) and *Affero GNU Public License* (AGPL). Some examples of license types which contain either no copyleft provision, or have a weak copyleft provision are: *Lesser GNU General Public License* (LGPL), *Berkeley Software Distribution License* (BSD), *Apache License* and*Mozilla Public License* (MPL).

been translated into 22 out of the 23 official languages of the European Union, whereby all linguistic versions have the same validity in each country. [41] This license can thus be applied to open source software which by order of the government is either produced by a supplier or constructed in-house. [42] The license has a *copyleft* provision.[43] Furthermore, the EUPL has conditions which explicitly exclude any warranty or indemnity for the license granting body. The license also adds - albeit surplus to requirements - that these additional matters, as well as support and advice, can be arranged in a separate agreement, for a fee. The license also has a note outlining that the contractual regulation of warranty and liability implies that the supplier is responsible for safeguarding all parties in the source code production chain with regard to debt liability. The EUPL states that this risk for the supplier will obviously be reflected in the supplier fee.

Dual licensing

Licenses also have a mix of open and closed approaches: *Dual licensing*. This entails that the software is distributed free of charge as well as in a paid version. The paid version will for example have extra functionality or a user friendly interface. A company will often only offer services, such as implementation support and a help desk service, for the paid version of the software. In § 3.3.4, which discusses supplier earnings models, this will be examined in further detail.

Dual licensing

The American firm *Alfresco* offers the "enterprise content management system" (ECM). Alfresco has released this with dual licensing. This means that Alfresco offers its software free of charge as an open source software format under the name *Alfresco Community,* and also sells it bundled with its own software as a closed version, *under the name Alfresco Enterprise*. This is feasible due to the nature of the license for the open source version, for it does not contain a "strong" *copyleft* provision. The commercial version not only has increased functionality, but also comes with additional services and assurance. In terms of services, the firm for example offers implementation support and assistance with problem fixing. The additional assurances include the possibility to close service agreements regarding matters such as trouble shooting and recovery procedures (Alfresco, s.a.).

3.3.3 Software costs

It is often assumed that "open" also means "without costs". This is not true, however, since there are always costs associated with the use of software, particularly whenever that use is business-related.

In an at-home situation, people can freely and easily install open-source applications and operating systems themselves.[44] People who start up a small business or a small- to medium-sized non-profit organization can also go a long way using only free-of-charge open source software.[45]

[41] The EUPL has not been translated into Gaelic, one of Ireland's official languages.
[42] Source: http://www.osor.eu/eupl.
[43] When the copyleft provision applies to *open source software,* the user must use the same license to distribute the modified source code, either in combination with closed source software or not.
[44] For example the *Ubuntu*version of the open source management system *Linux* (an alternative to MS Windows), and a series of applications such as *OpenOffice* (office software, an alternative to MS Office), *FireFox* (Internet browser, an alternative to MS Internet Explorer), *Thunderbird* (e-mail, an alternative to MS Outlook), *GIMP* (a graphics program, an alternative to Adobe Photoshop). This open source software is available on the Internet free of charge, either in source code form or as installable programs.
[45] The range for use in the home environment which we mentioned can easily be complemented by for example *Apache* (Webserver, an alternative to MS Internet Information Services), *Joomla!* (Web content management, an alternative to Green Valley of Tridion) and*Compiere* (ERP, an alternative to SAP or Oracle), etc.

This makes it easy for the notion to take root that open source software is "therefore" free. This is a misconception, however. The license for open source software is free, but, under certain licenses, products created based on the source code may indeed be sold. Moreover, licensing costs constitute only a part of the total costs associated with software: The costs of implementing, maintaining and managing the software used must also be taken into account. In the case of a large organization like a government department, software always costs money.

In this paragraph, we provide an overview of the most significant costs associated with the use of software. We distinguish between:
- purchasing costs (including licensing costs);
- implementation costs;
- operating costs (including management);
- maintenance costs.

These costs are associated with open and closed source software alike. The main difference lies in the fact that the software licensing costs (see purchasing costs) for open source software are basically zero. Nevertheless, open source software is not necessarily the cheaper option.

Purchasing costs
In the case of closed source software, this mainly comprises the costs of software licenses. In theory, these costs do not exist for open source software. This does not mean, however, that there are no purchasing costs associated with open source software. This is because the source code has to be converted into a computer program the organization can actually use. This can be done by the vendor, which leads to (palpable) external costs, but can also be done by an in-house IT department at the organization, which is associated with (often hidden) internal staff costs. It also costs money to secure things like confidentiality, data protection, the availability of periodic updates, and the safeguarding of intellectual property rights.[46] In replacing Windows with the open source operating system Linux, an organization can, for example, opt for *enterprise* versions. These are provided by commercial firms that supply open source software and charge for services related to it. Such extra assurances are then charged as part of the purchasing costs.

The availability of periodic updates is often governed by service contracts. See operating costs. Often, terminating a relationship with a vendor also entails severance costs.

This can lead to additional costs, where discounts on software provided by the same vendor are no longer available. (When one acquires the licenses to different products, vendors will often give discounts.)

[46] There is much legal dispute over copyright infringements in the area of software development. This is true for both closed source software and open source software. Open source software, however, comes under fire relatively often, which is not that surprising, since the source code is after all open and possible violations are hence easier to discover and prove.

Implementation costs
Software often has to be specially configured for employees to be able to use it properly. These kinds of costs are often incurred every time a switch is made, for example when switching from one closed source application to another. The extent of the costs will of course vary from case to case.

Operating costs
The most significant operating costs for open source software are the costs of service contracts. Among other things, these contracts might concern the delivery of periodic updates, user support, and troubleshooting.

Maintenance costs
When new software (often custom software) is used for a time, users tend to come up with additional requirements, for example for a new feature, or for an existing one to be improved. In the case of closed source software, these kinds of modifications are often expensive, since there is only one party the customer can turn to get the modifications made, namely the maker of the software, who is often the dominant vendor of that type of software. This is known as *vendor lock-in*: The user grows dependent on the producer of the software, by virtue of the fact that large outlays are needed to switch to the software of a different producer or to a different company that makes open source software with the same features.

The rate at which an organization introduces new versions of the software is likewise often determined to a large extent by software makers who will only provide support for older versions for a limited time.

3.3.4 Supplier earnings models

In the Netherlands, software falls under the legal protection of copyrights under the Dutch Copyright Act. This protection is governed by Article 1, which states that the copyright is the exclusive property of the creator of a “work” for the purpose of publishing and duplicating it. Article 10 refers to “computer programs and preparatory materials” as works according to the Copyright Act. Companies that develop software under closed licenses, derive “market power” from this copyright protection. This is because this protection also affords them the exclusive right to bring their products to market by selling their copyrights or by releasing their products for others to use under licenses (CPB, 2009). The extent of this market power depends on the degree to which the software is unique, the availability of alternatives, and the quality of the software as perceived by users.
In § 3.1, we distinguished between a number of software categories (office automation, specific end-user applications, software for websites and intranets, technical information systems, IT infrastructure, and development and management software). Comparable alternatives in the form of open source software are not available for all these different categories of software. Thus, there is not really a single software market, but rather a large number of different sub-markets, which moreover are not static but in a constant process of evolution.
Some sub-markets of the software market are said to have a high degree of market concentration. In desktop software/office automation, there is a single dominant company worldwide (Microsoft), in the sub-market for ERP packages two dominant firms are active (SAP and Oracle), and around 60% of the database management systems market is in the hands of two companies (Microsoft and Oracle, see Database Magazine, 2010). In other sub-markets, many different companies offer software. For content management systems for websites, for example, one has a choice among many different software packages, both open and closed.

Vendors pursue various different strategies in terms of the distinction between "open" and "closed." This gives rise to different business models. These models change in reaction to shifting relationships in the market. Sometimes at a certain moment in time a company will make hitherto closed source software available as open source software to a certain community, whether that community was organized by that company or not. In so doing, part of the development activities are transferred to the community, which results in lower development costs for the software maker itself. One example is the company *Apple*, which released part of its operating system OSX under the name *Darwin* under an open source license. Sometimes, a company will also release closed source software, because it seeks to specialize in consultancy, implementation and maintenance and is counting on attracting new customers in the absence of licensing costs. In other cases, a software vendor will offer closed source software that used to be open source. A lot of commercial software came about in this way (see for example the text box titled *"The difference between open source and closed source software lies mainly the type of license"* in § 3.3.5). This happens, for example when open source components are combined with closed source components, or when open source components are packaged under a closed source license, converting them into a user friendly package. This is only legal where no *copyleft* provision is included in the license. See § 3.3.2.

3.3.5 Frequently cited advantages of open source software

Just as open standards are not "intrinsically" advantageous (see § 3.2.3), not in all open source software automatically entails the beneficial characteristics often cited as being the advantages of that kind of software.

For example, open source software is often credited with *technical superiority* , on account of the potential knowledge available in the community. However, a community does not deliver technically sound software per se (and the opposite is not a foregone conclusion either). Because open source software is programmed in communities, and given that no two communities are alike, the quality of the software will vary from case to case. In answering the question as to whether a serious alternative exists for closed source software, the quality of the open source alternative is of course an important factor. The quality of software is, however, difficult to measure. A number of projects have been carried out toward developing models to do just that, such as the *Open Source Maturity Model.*[47] It is furthermore often assumed that the quality of open source software improves through use. Applications that are used a lot are thought to benefit from a larger community, or even from the professional support of a company. In theory, this is beneficial in terms of quality.

Various reports are available on the technical quality of open source software. There are, for example, claims that the technical quality of programming in open source software has improved in recent years.[48] This stands in stark contrast to the fact that the Software Improvement Group (SIG) organization, which specializes in making the characteristics of software measurable, claims that open source software is often quite disappointing as far as technical quality is concerned. By way of example, SIG cites the use of code duplication, which means that identical lines of code are repeated several times throughout the source code. In and of itself, code duplication need not have any consequences in terms of whether the software works or not, but it does make maintenance of the software more complicated and prone to error. What it means is that changes have to be implemented in several different places in the source code.

[47] Source: http://www.nl.capgemini.com/expertise/publicaties/open-source-maturity-model-een-selectie-voor-een-open-wereld/ or http://sourceforge.net/projects/qualipso-omm/.

[48] http://www.coverity.com/html/press/coverity_open_source_integrity.html.

Another advantage often cited in the context of open source software is that one is able to get faster *responses to questions* about the software. Because an entire community possesses the knowledge of software, rather than only the maker, it is thought that there will always be a member of that community who will come along practically immediately with the solution to your problem. The argument is only true, however, if is there is an active community with enough members behind the software.
Open source software is also considered to be *longer-lasting* than closed source software, since its continuity is thought to be more assured. The software, after all, does not come from a single vendor, who might go bankrupt, might be taken over, or might decide, for example, to withdraw the product from the market, or not to provide support for older versions. But this too is conditional on the existence of an sufficiently large and active community. In addition, companies can also "take over" communities (financially or by introducing source code support) or shut them down. Finally, it needs to be borne in mind that the main difference between open source and closed source software lies in the type of license used (see text box.). In terms of the quality of the software itself, it makes no difference whether it bears the label "open" or "closed."

mainly in the type of license

nothing to do with in differences in the software but in differences in the way the software is delivered. These differences manifest themselves in the type of license under which the software is made available. In practice, it is a regular occurrence that software that one moment was available free of charge under an open source license is released under a closed license the next day and now costs money, or vice-versa. A good illustration of this is the database management system *MaxDB*. The development of this software began in the 1970s of the previous century as a university research project at the Berlin Technical University. In the 1980s it was then further developed by the company *Nixdorf Computer AG* and marketed as closed source software under the product name *DDB/4*. After that company merged with the *Data Information Services* division of *Siemens* into a new company, *Software AG,* the software was marketed (as closed source software) under the name *AdabasD*. In 1997, the software was sold to *SAP AG*, who renamed the product *SAP DB*. In 2000, SAP AG made the commercial product available as open source software under a type of license that prohibited its commercial use by means of a strong *copyleft* provision, while SAP continued to develop the software. In 2004, SAP AG resold the product to *MySQL AB* (which was later taken over by Sun Microsystems, which in turn was subsequently acquired by Oracle). Then it fell back into the hands of SAP AG, who released it as open source software under the name MaxDB (Source: German Federal Ministry of the Interior, 2008).

3.3.6 Software as a component of information and IT architecture

The question of whether to opt for open or closed depends on the goals that need to be achieved. When choosing a software application, the costs are not the only relevant factor. The software also needs to be compatible with the information and IT architecture of the Dutch Government, and the consequences it will have for the various components of that government also need to be considered.

In the case of a governmental department, achieving policy goals is the key to how a work process is set up. An IT-supported information management system based on a sound strategy is a part of that. In the last ten years the notion has become increasingly widespread that the best way to set up an information management system plus IT support is by working "under architecture." This makes it possible to manage many, often simultaneous change processes in terms of content (cf. Berg and Steenbergen, 2004). Specifically, with regard to the subject of this report, the advantage here lies in the fact that the software selected, along with the attendant standards, can be optimally aligned with the goals of the organization.

The Dutch Government (in the broadest sense) uses the *Dutch Government Reference Architecture* (Dutch acronym: NORA). The current version of NORA is 2.0 (Source: Kenniscentrum e-overheid, 2007). NORA, version 3.0 is under development. Parts of it have already been completed. NORA is furthermore concretely tailored to various administrative levels, and at the central government level, the standard is the *Government agency architecture model* (Dutch: MARIJ, Model Architectuur Rijksdienst),[49] , which is used by key departments. The following four key concepts have been formulated for MARIJ (Kenniscentrum e-overheid, 2008):

1. Government shall be a single unit;
2. Government shall be effective;
3. Government shall be efficient;
4. Government shall be transparent.

These four basic concepts underpin all discussion on how information management and IT architecture are to be set up.

The words "Reference" in the acronym NORA, and "Model" in MARIJ express the fact that these are abstract models that lay down the main outlines for the entire set up. In order to actually be able to use them as management instruments in setting up IT, they have to be concretely tailored to specific departments and sub-departments of the Government.

[49] The ICBR conference of September 22, 2008. ICBR is the Dutch acronym for "Interdepartmental Commission on Operational Management of Government Departments (Dutch: Interdepartementale Commissie Bedrijfsvoering Rijksdienst"), chaired by the Director-General of Organizational and Operational Management of Government Departments (Dutch: "Organisatie en Bedrijfsvoering Rijk").

4 DUTCH CENTRAL GOVERNMENT SOFTWARE: COSTS AND POTENTIAL SAVINGS

In this chapter we deal with questions on the part of the Dutch House of Representatives ("Tweede Kamer") concerning the costs and cost saving options related to software used by departments. Since software and organizational procedures include the implementation of standards, we do not cover the costs associated with standards separately. These costs are included in software costs.

4.1 Availability of data for Government departments

The costs of software can be broken down into purchasing costs, including licensing costs; implementation costs; and operating costs, including management and maintenance costs. The work processes of departments are to a large extent automated, and software forms an inextricable part of these processes. Components are generally not administrated separately, which means that software costs are not administrated separately either. Departments are under no obligation to do so, and software costs are not directly attributable to their administrations. For example, annual *licensing costs* are often not accounted for separately, because they are settled in a single payment for a number of years, often simultaneously for a variety of different applications. Therefore, cash accounting methods cannot be used to determine the licensing costs for a specific application in a given year. In addition, some IT services are outsourced to external service providers by various departments. These service providers charge rates based on the type and extent of service provided, without specifying licensing or maintenance costs in the process. An agreement is signed for the availability of software in combination with services like management and maintenance and making a help desk available for the software in question. In such cases, the department focuses on the quality and costs of the service.

What this means is that the costs of software being used by various departments cannot be determined with any great accuracy without conducting a very intensive study, which moreover would have to be based on a great number of underlying assumptions. The costs of implementation and operation (including management) are particularly hard to ascertain, since these costs are also a function of time spent by IT (support) departments and end users of the software. Not only would a study be very time-consuming and still only be able to arrive at an approximation, it could also turn into a costly enterprise for the department itself. One government department carried out a project aimed at mapping out all the software in use, which ran for about one year. The department estimated the costs associated with the work at € 400 000.

We therefore felt compelled to do without gaining insight into costs through the accounts, and instead decided to opt for getting as good an idea as possible based on the total estimates of government departments and interviews conducted on the subject.

4.2 Present costs

4.2.1 Approach and line of reasoning

Due to the large number of applications used by government departments, we narrowed down the focus of our study of their software costs to software that is immediately relevant in the context of the study, namely software for which open source alternatives are available. The exact software in question will vary from department to department, but generally we are talking about software like:

- operating systems;
- office automation (word processing, spreadsheets, etc.);
- email applications;
- web browsers;
- geographic information systems;
- content management systems;
- web development applications;
- database management systems.

This study therefore does not concern all software, but only software for which open source alternatives exist. We refer to this portion of the software as “the relevant portion” of the software. (See Figure 5 in § 4.2.2.) On the basis of our study, it is not possible to state with sufficient accuracy what percentage of the total software in use this portion comprises. Nor did we find a satisfactory answer on this point in the technical literature on the subject.

Software costs consist of the costs associated with:

- purchasing (including licensing costs);
- implementation;
- operating (including management);
- maintenance.

The distribution of costs for the relevant portion of the software over the items in the breakdown above cannot be ascertained based on the data available to the departments. We are primarily concerned with licensing costs in the context of this study, since they can be avoided by using open source software. We therefore asked the departments to indicate in each instance the total licensing costs for the relevant portion of the software.
In addition we looked into which other items in the breakdown of software costs the departments could give us useable figures for. These turned out to be maintenance costs. We therefore did not consider all software costs separately in the study, but only licensing and maintenance costs, and these only to the extent that they concern the relevant portion of software. Other cost components (other purchasing costs besides licensing, implementation and maintenance costs) and the costs of alternative software have therefore not been taken into account.

In order to put the licensing and maintenance costs of the relevant portion of the software into perspective, we also looked into what the departments’ total annual IT costs are. To the extent ascertainable, these are the total costs of procurement, implementation/installation, operation and maintenance of both hardware and software. The IT costs include the total hardware costs and total software costs. This means that the departments have included all external cost components in their figures for IT, to the extent the departments can ascertain them, which necessarily involved the use of estimates.

4.2.2 Results

Figure 5 shows a breakdown of total IT costs for government departments. The figure is a schematic representation of the different cost components we distinguish between; it also shows which cost components we took into account specifically. In the diagram, the different cost components are separated by dotted lines since the relative proportions of the separate components are not known. Furthermore, the proportion of each cost

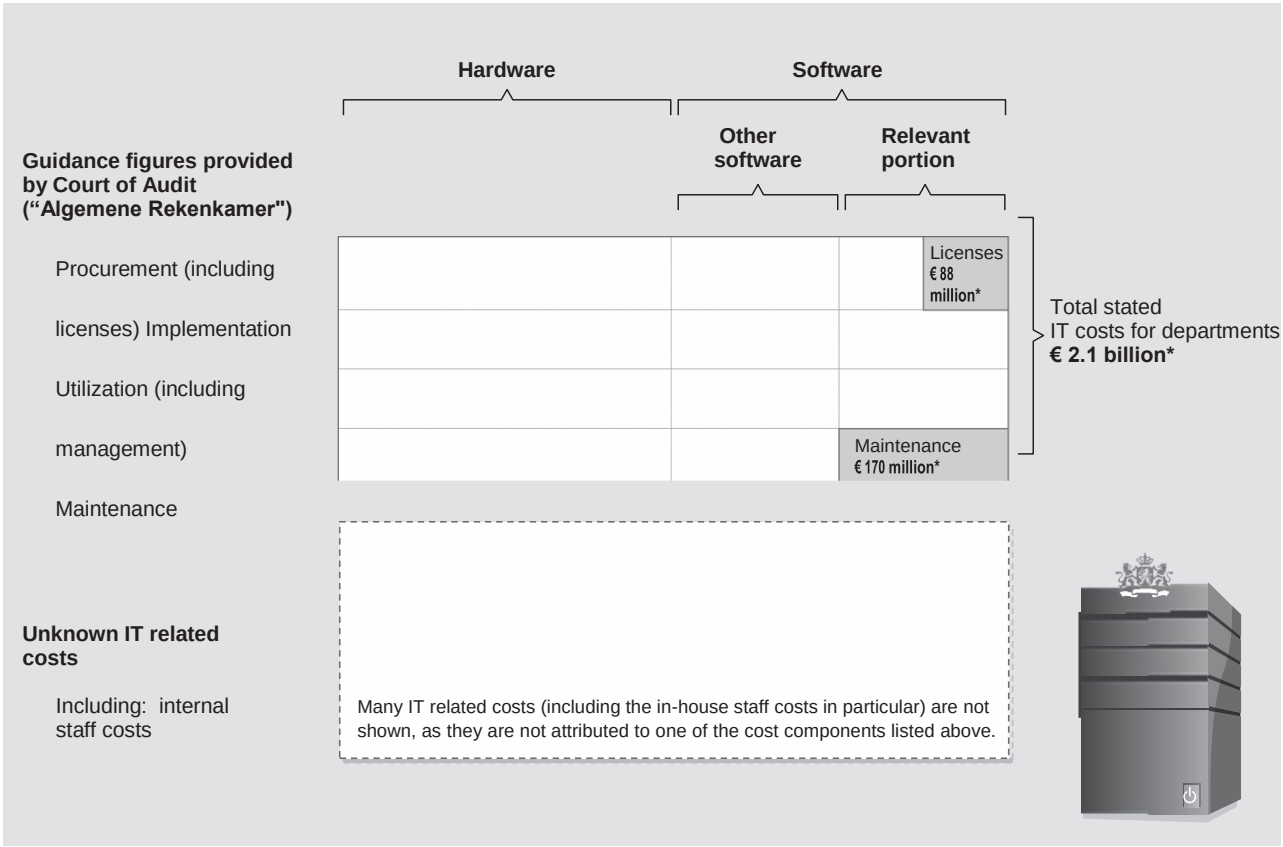
component may change when switching from closed source to open source software. Thus, for example, purchasing costs can go down or they may even go up: they may go down due to the absence of licensing costs, or they may go up due to severance costs associated with terminating the relationship with the closed source software vendor. (See § 3.3.3.) The same applies to implementation costs and maintenance costs: They may go down, since the user is not dependent on the vendor (*vendor lock-in*, see § 3.3.3), or they may go up, if, for example, the department has to hire expertise on the open source product externally, because its own internal people are not knowledgeable enough in that area. Operating costs (including management) may likewise decrease or increase. These costs may go down if, for example a switch is made to an open source operating system that places less stringent demands on the hardware than its closed source equivalent. But they can also go up, for example if parts of the department cannot do without the closed source alternative, so that the IT department not only has to run the new, open source alternative but the extant closed source systems as well. Finally there is the issue of cost evolution over time. For example, costs may initially rise, because in-house staff require additional training, or because the existing closed source software has to remain in operation temporarily alongside the open source alternative.

Total IT costs

Figure 5 shows that total IT costs for all Dutch government departments combined amount to approximately € 2.1 billion. Our sample year was 2009. As already pointed out, this total represents the combined software costs (licensing and other purchasing costs, implementation, operating and maintenance costs) for both the relevant software and all other software, plus all hardware costs (procurement, installation, operation, and maintenance), as stated by the departments.

Due to the subject of this report, of the total IT costs, we specifically considered the licensing costs and maintenance costs of the relevant portion of the software. See below. We did not include other cost components in our research.

Figure 5 **Breakdown of total IT costs of government departments**



*2009 figures

Software licensing costs

Total licensing costs for the relevant portion of the software in 2009, according to figures provided by the departments, ran to approximately € 88 million (approximately 4% of the total IT costs for all departments combined). Based on remarks made concerning the data available to the departments, we assume this figure to be an understatement rather than an overestimate of the actual percentage. Some licensing costs are possibly subsumed under agreements with IT service providers, and hence not discernable as such.

Software maintenance costs

Total annual maintenance costs for the relevant portion of the software in 2009, according to figures provided by the departments, ran to approximately € 170 million (approximately 8% of the total IT costs for all departments combined). Based on interviews conducted at the departments, we learned that it is often difficult to separate IT service costs into services provided as part of application maintenance and other types of services. On the other hand, we know from previous studies that that time spent by internal personnel is often not (fully) attributed to specific IT projects or activities. The maintenance costs stated by the departments may therefore entail both under- and/or overestimates.

Differences between departments
Figures provided by different departments vary greatly. Depending on the department, the total IT costs stated varied between € 5.5 million and € 560 million. Depending on the department, the stated licensing costs for the relevant software varied between € 0.16 million and € 24 million. Depending on the department, the stated maintenance costs for the relevant software varied between € 0.5 million and € 60 million. We cite these figures exclusively for the purpose of illustrating the differences between departments; it is not our intention to single out individual departments. No conclusions may be drawn as to whether a department is "doing the right thing" merely based on the fact of a given figure's being large or small. This is because the figures are not mutually comparable. Moreover, different departments have different operating processes, which also results in differences in the software landscape.

In sum, the following approximate picture emerges: For the sample year 2009, total IT costs (all hardware and all software combined) ran to around € 2.1 billion. Of which approximately € 88 million (about 4% of total IT costs) went toward licensing costs for the relevant software, and approximately € 170 million (around 8% of total IT costs) went toward maintenance costs for same.

4.3 Possible cost-cuts through wider use of open source software

4.3.1 Approach: not a simple calculation

The House of Representatives seems to be particularly interested in cost saving opportunities. In theory, savings potential can be determined by calculating the difference between current costs and the costs of using software, were all closed source software to be replaced with open alternatives, wherever possible. However, calculating this theoretical cost saving potential is fraught with a number of problems.

First of all, it turns out that the current costs associated with the relevant software can only be very partially ascertained. This is the picture that emerges from our research into the costs of government departments.
Secondly, only very rarely is it a matter of considering (purely) open source software over (purely) closed source software. There are many hybrid forms, with applications often consisting of open and closed standards and software components.
Thirdly, it cannot be asserted in a general way that the total costs associated with open source software are lower than the total costs associated with closed source software. In addition to procurement costs (including licensing costs, which are usually zero for open source software), there are additional implementation, operating (including management) and maintenance costs associated with using software. In addition, the features of an open source alternative for a given application are often not exactly the same for its closed counterpart.

[50] Combination of existing technical infrastructure and the existing software landscape.

Fourthly, experts in the literature we consulted stress that situations are never static, and that the value of the *installed base*[50] of existing hard- and software has to be taken into account, and that forcing a switch may cause destruction of capital Such destruction of capital may be prevented when a “natural” moment for switching over is chosen for each situation. A natural moment might be, for, example, the expiry date of extant licenses. We have determined that most government departments do not separately administrate the applications they use in this respect.
Finally, our research shows that, in a number of cases, departments make a conscious decision to purchase (a set of) applications based on a given IT strategy. In these cases, considerations are much broader than the issue of whether open source software is available. In many instances, this leads to the combined use of closed and open source software in a single system, which is also referred to as *best source*.

In our quest for reliable financial data, we came across several business cases involving a switch from closed to open technology (some implemented, some not). Moreover, these business cases differ in approach and argumentation, and sometimes they involve cost-benefit analysis. The business cases serve by way of illustration of how organizations expect to be able to cut costs in concrete situations.

4.3.2 Practical examples

Four practical examples involving open source software
In the course of interviews conducted with government departments, various departments provided examples of situations where certain closed source software applications were replaced with open source software or replacement was being considered. We studied the argumentation of three such business cases in order to provide some indication of the potential savings involved.

Open source software: “Veilig Internet”

The Dutch Ministry of Defense has strict requirements when it comes to the security of its information and systems. One consequence of this policy is that, at a standard workspace, employees cannot simply use the Internet as they please, but instead must use a special facility to do so. The existing facility for accessing the internet was not always stable and could only be used by a limited number of users at any given time. In 2010 “Secure Internet” (Dutch: “Veilig Internet”), an internet facility based on open source software, was brought into operation. This made Internet access stable, secure, fast, scalable, in short qualitatively cheaper and better. A license allows the Ministry of Defense to provide for an unlimited number of employees (in theory). The Ministry of Defense estimates that Secure Internet is some 42% cheaper than the current (closed source) facility. This implies potential savings of approximately € 1 million per year.[51] We did not look into whether the figures are factual or not.

[51] Expected savings are based on the costs of service providers, but do not include investment costs and the attendant “adoption costs,” which include training for end users. Net savings will therefore ultimately be lower.

Open source software: Telestick

In 2010, the Dutch Ministry of Defense started with the “Telestick” pilot project.[52] Telestick is a USB drive used in combination with an ID card reader. This enables Ministry of Defense employees to gain secure access to the MoD network from locations other than the MoD, with the identity of the employee being verified via his/her personal ID badge (a secured access card also used to gain entry to MoD buildings). The Telestick offers an alternative to the current arrangement involving a Department laptop and a personal access code. The Telestick can be plugged into any PC, after which the employee logs into the MoD network. Compared to the laptop, the Telestick combined with the ID reader is a cheaper way to provide employees with external access to the Ministry of Defense network. Based on estimates, the Ministry of Defense expects the Telestick to be 80% cheaper than the existing arrangement. This amounts to expected savings to the tune of around € 0.5 million per year.[53] We did not look into whether the figures are factual or not.

open source. In the ECM software category itself, open source software is used predominantly. For this software category, GDI, the Department’s internal IT service provider, informed us on its estimates for how much is saved through the use of open source software. Licensing costs are zero for the open source alternative. In terms of operating costs, barely any differences are perceivable. No net savings of a substantial nature result. According to the departments own estimates, the savings amount to only € 60 000 (about 2% of the costs of a closed source solution).

In addition, in the course of various interviews we conducted in the context of the present study, we were handed several business cases that were prepared because an organization was considering switching to open standards or open source software or a combination of both. One of these cases involves open source software as do the previous three.

[52] Dutch Ministry of Defense, “Telestick Pilot Project,” in: *In Touch*, 2010, #, 3, p. 14.

[53] This sum is based on the costs that Ivent passes on to the user organization as an internal IT service provider, but does not include investment costs and the attendant costs for the user organization such as end-user training. Net savings will therefore ultimately be lower.

[54] The software is used for document management.

Open source software: The municipality of Amsterdam[55]

In 2006, at the request of the municipal council, the municipality of Amsterdam had a business case prepared on how to proceed with regard to its office automation contract with Microsoft, which was due to expire in 2008. The business case was aimed at providing insight into the conditions under which it would be possible for the municipality of Amsterdam to opt for software that was non-vendor-dependent. The business case is premised on a number of cited strategic software goals, such as interoperability, diminished dependence on vendors, continuity of operational management, and cost-neutrality. These goals are mainly qualitative in nature. The fact that the implementation of one or the other option had to be as cost neutral as possible, shows that the main goal of the project was not to cut costs. The business case shows that strategic software goals can be achieved through broader use of open standards and/or open source software, whether in combination with closed source software or not.[56]

Based on the price quotes of three vendors, the business case states that, once all 16,000 work spaces were in operation, the expected annual savings would amount to between € 1.5 and € 6 million.

Three practical examples concerning open standards

The remaining three business cases we received concerned open standards. What typifies these business cases is that they mainly provide insight into a project's expected (social) benefits. The projects consist of both organizing and setting up data exchange combined with standards-related activities aimed at achieving or improving interoperability. The business cases do not reveal what benefits can be obtained specifically by choosing open standards. The business cases for open-standards are described in the three text boxes below.

In the Netherlands, a process has been initiated to introduce the INSPIRE *(Infrastructure for Spatial Information in the European Community)*

2006 the impact and costs and benefits of the introduction of this directive were analyzed. In the business case, it was estimated that, according to the base model, the annual benefits of introducing INSPIRE would run to between approximately € 0.5 million and € 8.6 million euros in the period through 2024.[58] The greatest benefit is expected to lie in greater efficiency among users. The efficiency benefit will be limited for data vendors. The net balance of costs and benefits of introducing INSPIRE show that that over the total time horizon of the cost/benefit analysis, the benefits are expected to exceed the costs by € 34.0 million (NPV).

[55] DCE Consultants B.V., *Business case: Open software strategy for the Municipality of Amsterdam*, 2006.

[56] In 2009, it was nonetheless decided to sign another contract with Microsoft in order to bridge the period until the standard open workspace has been made suitable for the entire municipal government (College van B&W Gemeente Amsterdam, *Agenda item, March 27, 2009*. *Subject: Microsoft contracts,* Amsterdam, 2009.)

[57] ECORYS Nederland BV and Grontmij Nederland BV, INSPIRE cost-benefit analysis: Final report, Rotterdam, 2009.

[58] These are the expected savings according to the "base model" (whereby introduction would entail minimum costs and maximum effect), which means that the government will pass the directive into Dutch law, while striving toward minimum impact on organizations that manage geoinformation to which the INSPIRE will be applicable. Only a few (the "best-fitting") datasets were released and harmonized.

Open standards: WelstandTransparant[59]

The WelstandTransparant project is intended to provide fast and easy access to municipal notices of conformity with building regulations concerning esthetics (Dutch: welstandsnota's). Prior to making the decision to implement the project at the national level, research was conducted in 2009 on the social costs and benefits of WelstandTransparant. A business case was prepared in the process. The financial benefits of the project quantified in the business case mainly consist of improved efficiency, the lightening of administrative burdens, and the avoidance of costs. The introduction of WelstandTransparant at the national level will lead to an estimated total savings of € 17.2 million in the period through 2015. Over the full time horizon of the social cost/benefit analysis (15 years) the business case shows a total financial benefit of € 1.8 million (NPV).

Open standards: System of basic information records (Dutch: basisregistraties)[60]

The cabinet has made the use of basic information records mandatory by law with the aim of promoting one-time registration and multiple use of data. According to the business case *Stelsel van basisregistraties (System of basic information records)* the joint development of facilities for (the use of) such records will be more efficient and more effective than would be the development of such facilities separately and for each adopter. This is because redundant investments and costs can be avoided. The benefits cited in the business case are avoided costs and investments, plus synergy benefits with respect to the base case. According to the external agency, in the most favorable model, the expected total benefits over the 2010–2020 period run to € 918 million, with the net expected cost/benefit balance for the same period running to around € 720 million (present value).

We are not aware of any evaluations of completed projects in which a switch was made from "closed" to "open". We therefore do not have any information on hand, based on which reliable assertions can be made concerning the degree to which the aforementioned savings cited in the business cases have actually been achieved. We are still considering further researching such assessments, since recalculations would naturally be of great importance to the House of Representatives.

The authors of the business cases worked with certain a priori assumptions in their cost/benefit analysis. The expected costs and benefits (and hence net savings) are estimated based on a priori assumptions. The quality of the assumptions used for argumentation varies greatly. In some business cases, for example, sensitivity analysis was used that provides insight into the consequences of adjusting a number of assumptions, on which the cost/analysis analysis is based. In those cases, the business case also provides insight into the ranges within which costs and benefits are expected to lie. The various business cases at the same time also provide
an estimate of the pay-back timeframe for alternative projects.

[59] ECORYS Nederland BV, *Maatschappelijke kosten-batenanalyse WelstandTransparant (Social cost/benefit analysis of WelstandTransparant),* Rotterdam, 2009.

[60] PricewaterhouseCoopers, *Verfijning en herijking kosten-batenanalyse voor investe- ringen in gemeenschappelijke voorzieningen in het stelsel van basisregistraties (Refinement and reassessment of cost/benefit analysis for investment in communal facilities within the system of basic information records): Grip op centrale en decentrale investeringen en kosten maximeert de businesscase (Control of central and decentralized investments and costs maximizes business case).* Reference: 2010–0430/ADB/mh/ms/wb, February 23, 2010.

The number of cases described is too small and the cases too divergent (also in terms of financial relevance) to be able to draw firm conclusions. The picture that emerges is that sometimes significant savings are expected to result from the use of open source software options, but that in other situations the savings, expressed as percentages at any rate, may also be negligible. It also becomes apparent that a range of considerations is called for that goes far beyond purely and exclusively financial ones.

In closing, we would like to comment on a possible bias in the picture that emerges from the business cases under study. Business cases are generally prepared once preliminary research has revealed that the costs of a project will likely be balanced by the benefits of that project. It is therefore also conceivable that in other situations, not described in business cases, the use of open standards and/or open source software might even lead to higher costs.

The business cases in the area of open standards deal with projects that entail a great deal more than merely standardization by means of open standards. The business cases make clear that standardization is a necessary condition for the success of the project, but not what specific share of the expected cost benefits is attributable to the standardization. Nor is it clear whether in order to achieve the targeted savings, it is of any significance that standards used for standardization be open ones.

All the business cases state that the aim of switching to open standards and/or open source software is to create qualitative benefits. These targeted benefits are summarized in table 3.

Table 3: Summary of targeted qualitative benefits in business cases for (open) standardization and open source software

Project	Possible qualitative benefits
(Open) standardization	
INSPIRE	• reinforcing policy in the area of online-government (Dutch: e-Overheid) and geoinformation • obtaining better and more open services from providers • more efficient policy formation and project management on the part of users (particularly in transboundary areas) • enhanced knowledge on the part of data providers and users • enhanced innovation
WelstandTransparant	• improved information facility • help create greater trust in government/improved image of same • qualitative improvement of esthetic construction requirements (Dutch: “welstand”) policy • possibilities for new applications and services • hook-up with other digital systems (zoning planning, among others)
System of basic information records	• increased efficiency in initial process of adoption • cheaper data obtainable through one-stop-shop • enhanced data quality • greater use of basic information records • broader application of facilities

Project	Possible qualitative benefits
Open source software	
Municipality of Amsterdam	• independence from vendors • improved interoperability • operational continuity (through shared services concept, among other things) • concessions to political preferences • digital longevity • image of Amsterdam – the IT center of the Netherlands
"Veilig Internet" (Dutch Ministry of Defense)	• independence from vendors • improved interoperability • improved performance • more (simultaneous) users • reusable features • stability
Telestick (Dutch Ministry of Defense)	• greater security • economies of scale (use by large numbers of employees) • interoperability (through use of MoD ID)

5 CONCLUSIONS AND RECOMMENDATIONS

In this chapter, we present our conclusions. We would like to start with some general observations on the Dutch parliamentary debate that has taken place over the last ten years, which we present below in the form of our responses to questions put to us by the Dutch House of Representatives ("Tweede Kamer"). We conclude the chapter with some recommendations.

5.1 Observations on parliamentary debate

Over the past ten years, the House of Representatives has called for "more" use of open standards and open source software. The Cabinet has responded by developing policy and implementation programs aimed at three different policy goals:

- improving public services;
- enhanced market forces in the IT sector;
- government cost-cuts.

The idea seems to be that replacing closed source standards with open ones and closed source software with open source software will bring these three policy goals within better reach. We feel, however, that these policy goals are not comparable to one another and that they call for two different types of actions:

- Better public services and possible cost savings are goals that may be achieved by working on better cooperation between government organizations and more effective operational management, where such is needed. There is a primary relationship between cooperation and standards, and software plays and exceedingly important part in operational management.
- The targeted improvement concerning market forces in the IT sector is a goal within the area of market organization. Legislation and government regulation on competition and the supervision thereof would be suitable means for achieving that goal.

We would also like to point out that discussions between the Cabinet and the House of Representatives are primarily conducted on the basis of outlook rather than being based on concrete facts and figures. One reason for this is the fact that responsibility for the implementation of cabinet policy is not always assumed. For example, in the annual reports for 2009, Dutch ministers have not provided accountability for the *comply or explain and commit* policy regarding open standards, even though it has been mandatory to do so since April 2008.

This has led to an air of "running around in circles" in the debate, with the House of Representatives never failing to point to insufficient progress, and the Cabinet always claiming that it is in fact pursuing its policies.

5.2 Responses to questions posed by the House of Representatives

5.2.1 Options and scenarios

Question 1: *What are the existing options and scenario for reducing the use of closed standards and introducing open source software at governmental departments?*

Options and migration scenarios do not stand in isolation but depend on decisions made in the strategic planning process. Such decisions should be based on the goals of the organization. Strategy concerning information management and IT is then predicated on these goals. Among other things, IT strategy concerns the question of what software features are needed – an organization's software policy – and how these should be provided – its purchasing policy. The choice between closed or open standards and software is called for only at the purchasing policy level.

The number of options and scenarios is vast, and to a significant extent, these

derive from an organization's software and purchasing policies. An exhaustive treatment of the full range of scenarios is beyond the scope of the present report. Instead, we provide an overview of the most significant issues that in our view should be incorporated in software and purchasing policies.

- The Why? With what goal in mind is a given set of software features needed? The answers to this question need to be based on the policy goals and operational management goals of the department.
- The What? Which segments of the software landscape will be affected? This is covered in our response to Question 2 (§ 5.2.2).
- The When? According to what schedule are the required software features to be made available? This is covered in our response to Question 4 (§ 5.2.4).
- The How? In which way are the required software features to be made available? Should this be done internally or outsourced ("make or buy?"), should software be custom or standard ("off the shelf?"), should open or closed source software be used, should the software be managed internally or its management outsourced?
- The business case : What options are available for achieving the software goals (including the "zero option," i.e. not to take any actions)? Why is the chosen option superior? What are the expected quantitative, qualitative, financial, and non-financial costs and benefits? What are the most significant risks? How are costs expected to evolve? Financial considerations are covered in our response to Question 3 (§ 5.2.3).
- The general conditions that need to be fulfilled in terms of time available; financial, human and other resources needed for the software's implementation; and management and maintenance. This is covered in our recommendations (§ 5.3).

5.2.2 Potential replacement

Question 2: *Which closed standards and closed source software items can be replaced by open standards and open source solutions, and which cannot?*

As pointed out in the previous paragraph, the choice between open and closed source software is not a black-and-white affair, but rather a choice involving far wider considerations. At present, the Dutch Government already uses open source software to a great extent. Open and closed alternatives with comparable features are also found running side-by-side in its offices. In addition, our research has revealed that all kinds of open and closed source hybrids are also currently available on the software market. This results from the fact that the software landscape in use at a government department consists of a great many components that exchange information with each other and with the outside world using many different standards. This is the complex reality departments must confront, and the only way to come to grips with it is by means of a strategic approach. As a consequence, it is not possible to point in advance to a specific section of the software landscape that could be made "open," let alone to assess the situation quantitatively. In addition, the whole is not static: The world of software is evolving fast and is characterized by the continuous creation of new versions and applications: open, closed, and everything in between.

5.2.3 Software costs and potential cost-savings

Question 3: *What are the costs at the present time? In indicative terms, what would the introduction costs and structural costs be, were the use of closed standards to be reduced and open source software to be introduced? Indicatively, what savings could be achieved by doing do?*

The costs of software being used by various departments cannot be determined with any great accuracy without conducting a very intensive study, which moreover would have to be based on a great number of a priori assumptions. We therefore have provided an indicative idea of the Dutch Government's software costs, based on the estimated totals supplied by its departments. In doing do, we only considered that portion of the software for which open source alternatives exist (the "relevant portion" of the software). It

is not possible to say with sufficient accuracy what percentage of the total software in use this portion comprises.

The relative distribution of costs for the relevant portion of the software over the cost component categories we distinguish between - i.e. purchasing (including licensing costs), implementation, operating (including management) and maintenance - cannot be ascertained on the basis of departments' administrative data. Of the total IT costs for all hardware and all software of approximately € 2.1 billion in 2009, we have been able to establish the amounts that went toward licensing costs and maintenance costs. They were € 88 million (licensing) and € 170 million (maintenance) respectively. This shows that that the combined total of licensing and maintenance costs for the relevant portion of the software constitutes only a small percentage (12%) of the total IT costs. Licensing costs in turn constitute only a small percentage of the software costs. Based on the data provided by the departments, however, it is not possible to determine what percentage of the total software costs consists of licensing costs for the relevant portion of the software.

Potential cost savings in terms of departmental software costs may only be determined for concrete situations by means of cost/benefit analyses performed in the context of implementing a department's software policy and attendant purchasing strategy. Such cost/benefit analyses should not be based solely on purchasing costs, which include licensing costs, but on the total costs, while also taking the software's implementation and operating (including maintenance) costs into account.

5.2.4 Introduction timeframe

Question 4: *What is the desired timeframe for reducing the use of closed standards and introducing open source software?*

The switch from "closed" to "open" will never be "completed" at any given point in time. Shifts toward more or less use of open standards and open source software are possible, however. The extent to which such shifts take place and the timeframes within which they can be carried out will depend on a department's IT strategy, the initial set-up (*installed base*) at that department, as well as on any relevant developments in the software market.

As we pointed out in our response to the first question, the choice in favor of a given solution hinges on a department's strategy for IT and information. The abovementioned (external) developments are factors that need to be taken into account as general conditions in the formulation of such a strategy.

5.2.5 Pros and cons, opportunities and risks, and implementation requirements

Question 5: *Besides cost considerations, what are the pros and cons, the opportunities and risks, that the Court of Audit discerns? Which requirements need to be met for open standards and open source software to be implementable?*

We discussed pros and cons, opportunities and risks, and implementation requirements in chapters 3 and 4. We wish to stress that none of these factors are primarily a matter of open standards or open source software. Rather, they are highly variable, depending on the concrete situation, the standard in question, and the specific software product under scrutiny. The question as to whether there are pros and cons/opportunities and risks attached to a concrete case can only be answered by investigating the circumstances of that specific situation, as well as by conducting market research on available software products and services.

5.3 *Recommendations*

5.3.1 Managing expectations

The House of Representatives expects that broader use of open technologies (open standards and open source software) will lead to substantial *savings*. We are under the impression, however, that in cases where open IT technologies are the obvious choice, the switch has often already been made. We are referring to cases where there are adequate open alternatives supported by active communities, and where there are few barriers in the form of dependency on certain software. Where open technologies are less of an issue, this is chiefly owed to the fact that there are fewer directly applicable open alternatives available. Licensing costs, moreover, constitute only a small percentage of the Government's total IT costs. For this reason, we believe that the possibilities for *quick wins* in terms of cost savings, while far from exhausted, are nonetheless limited with regard to the Dutch Government's total IT costs. In stating that the possibilities are "far from exhausted," we are referring, among other things, to the dynamics of a situation where new opportunities are constantly emerging. All things considered, our recommendation is to not harbor any great expectations with respect to the potential savings to be achieved through broader application of open standards and open source software.

5.3.2 Separate policy goals

Our recommendation is to make a clear distinction between policy goals aimed at better operational management of government departments (better public services and potential *cost savings*), which falls under the responsibility of the Minister of the Interior and Kingdom Relations (Dutch acronym for his department: BZK), and policy goals concerning market organization issues, for which the Minister for Economic Affairs, Agriculture, and Innovation is responsible (dept. acronym: EL&I). Unambiguous goals need to be formulated for both types of policy goals, in order for policy to be able to be shaped and implemented efficiently and effectively, and for the ministers for BZK and EL&I to be able to assume responsibility respectively.

5.3.3 Working from a strategic perspective

Our recommendation is for policy- coordinating ministers and specialist ministers to work with *strategic* goals in mind. Approaching IT issues purely from a desire to cut costs is too limited a perspective, particularly if this is to be achieved merely through broader application of open standards and open source software. The Dutch Government commits large funds to IT, which makes cost-awareness an essential requirement, yet cost is particularly inadequate as the sole consideration for choosing software.

5.3.4 The role of CIOs

The government CIO *and* the departmental CIOs play a key role in this strategic decision making process. A CIO, after all, acts as a kind of bridge between policy and operational management directorates on the one hand, and IT on the other.[61] We recommend for the CIO of the Central Government to be explicitly given a key role in interdepartmental coordination, along with the requisite competences, with a view to fostering the development of a consistent IT policy at the central government level
. This approach calls for feature-specific IT requirements, which may differ from application to application and from department to department, to be borne in mind at all times.

5.3.5 The role of the Minister of BZK

Our research did not cover the extent to which the *various* departments have formulated strategic policy goals, as discussed in § 5.3.3, on the basis of which technological decisions are made, including choice of software.

We recommend that the Minister of BZK should look into the degree to which *government departments* choose their software based on strategic IT policy goals and explicitly cite their criteria in this regard. We likewise recommend that the Minister ensure that all government departments meet these criteria by mid-2012. Since the criteria to be met are subject to constant change due to new technological developments, we also recommend for the Minister to periodically review these criteria and their operational implementation and to adjust them as

necessary. We believe that in order to meet these criteria, the government should also use the knowledge and expertise of persons from other sectors, outside the government.

In *conclusion,* we recommend that the Minister of BZK regularly keep the House of Representatives informed on the Ministry's IT strategy and its progress.

[61] See our reports on government IT projects (Algemene Rekenkamer, 2007b and 2008).

6 RESPONSE OF MINISTERS AND ADDITIONAL REMARKS OF THE COURT OF AUDIT

We sent a draft of this report to all ministers, while specifically addressing the Ministers of BZK and EL&I as policy coordinators. On March 9, 2011 we received a response from the Minister of BZK to our report, which was also made on behalf of the Minister of EL&I. A summary of this response is given below. The unabridged response is posted on our website www.rekenka-mer.nl. This response prompted some brief additional remarks on our part.

6.1 Ministers' response

The Minister wrote that the draft report provides an informed and nuanced view of the subject of open standards and open source software, and that our conclusions endorse the way in which policy on open standards and open source software within the Dutch central government is being implemented.

The minister agrees with our conclusions, but also wished to add some remarks on the side. For example, he noted that all Dutch ministries have had their own information management strategy and associated IT strategy (also in connection with the NOiV action plan) since 2009. He also commented that, while it is indeed impossible to point in advance to any particular portion of the software landscape that could be made "open," it is nonetheless possible to do so within a specific organization. Regarding pros and cons, the Minister believes that, in terms of interoperability, the qualitative benefits of open standards prominently outweigh the disadvantages on average. The minister also noted that we describe the complexity and the interwovenness of IT environments in our report as a given, but that he intends precisely to reduce this. The policy of the Cabinet therefore views switching to open standards and/or open source software primarily in light of the long-term advantages and the socio-economic benefits of improved cooperation and more efficient data exchange within and between organizations, according to the Minister.

The Minister also discussed our recommendations in his response. He endorsed our recommendation not to harbor any great expectations, but he did also note that the market is continuously evolving. Regarding the issue of making a clear distinction between policy goals for operational management and policy goals for market organization, the Minister of BZK stated that he would confer with the Minister of EL&I on how this distinction might be handled with greater precision going forward. In response to our recommendation to base choice of software on a strategic approach, the Minister informed us that the competences of the CIO of the Dutch Central Government and of departmental CIOs have recently been expanded.

6.2 Additional remarks on the part of the Court of Audit

If, as the Minister states, adequate information management and IT strategies have indeed been established and are being carried out, this will provide a sound basis for well-considered choice of software. We did not investigate whether this is actually the case. An adequate strategy will be attuned to social and technical developments in the near future, by virtue of which IT resources (like hardware and software) will play a less central role and strategic decisions will primarily be concerned with defining the right information

management and IT services needed. Regarding the clear distinction between policy goals aimed at operational management (Minister of BZK), and those concerning market organization (Minister of EL&I), we feel it to be of great importance that the outcome of discussions between the two policy-coordinating ministers be defined in the form of a concretely formulated policy and an approach thereto. The minister states that he intends to reduce the complexity and interwovenness of IT environments, along with dependency on vendors. However, he does not make it clear how and within which timeframe he intends to fulfill these ambitions. The Minister makes no mention of our concrete recommendations concerning his role as a policy coordinating minister (i.e. to look into whether choice of software on the part of government departments is made based on strategic considerations, to explicitly formulate the relevant criteria, to ensure that all ministries are in compliance by mid-2012, to periodically review these criteria, and to make use of knowledge and expertise from other employment sectors). Nor does he indicate whether and how he intends to keep the House of Representatives informed on IT strategies and their progress.

APPENDIX 1: SUMMARY OF ANSWERS, CONCLUSIONS, RECOMMENDATIONS, ADMINISTRATIVE RESPONSE AND ADDITIONAL REMARKS

For more info, see Conclusions of the Algemene Rekenkamer		Recommendations of the Algemene Rekenkamer	Minister's response	Additional remarks of Court of Audit
General reflections on parliamentary debate concerning open standards and open source software				
Chapter 2	The House of Representatives and Cabinet appear to be under the impression that switching from closed to open technology as soon as possible will bring operational management and market organization policy goals within better reach. The parliamentary debate is primarily conducted on the basis of outlook rather than concrete facts and figures. As a result, the debate has deteriorated into "repeated chess moves".	All things considered, our recommendation is to not harbor any great expectations with respect to the potential savings to be achieved through broader application of open standards and open source software.		
	Operational management policy goals (better public services and potential cost savings) and market organization policy goals (enhanced market forces) issues concerning different types of actions: • better public services and cost savings: choice of standards or software respectively; • market organization: laws on competition and supervision thereof.	The Ministers of BZK and EL&I need to make a clear distinction between policy goals aimed at better operational management of government departments (better public services and potential cost savings) and policy goals concerning market organization. Unambiguous goals need to be formulated for both types of policy.	Minister of BZK will confer with Minister of EL&I on how sharper distinction can be made between policy goals in the future.	Highly important that outcome is defined in the form of concretely formulated policy and approach thereto.
Answers given to questions posed by the House of Representatives				
Question 1: Options and scenarios for reducing the use of closed standards and introducing open alternatives				
§ 3.1 and § 3.3.6	The information management strategy and the associated IT strategy determine software features required. Only then is the choice between closed or open technology (standards or software) called for. Options and migration scenarios depend on strategic decisions derived from an organization's goals.		All departments have their own information management strategy and associated IT strategy.	We did not look into whether adequate information management and IT strategies have been established and are being implemented in the case of all departments. IT resources will not be so central to an adequate strategy, which will be primarily concerned with information management and IT services.

For more info, see Conclusions of the Algemene Rekenkamer		Recommendations of the Algemene Rekenkamer	Minister's response	Additional remarks of Court of Audit
Question 2: Potential replacement				
Chapter 3	The software landscape forms a complex whole involving many components that exchange information with each other and with the outside world. Government departments already use open technology to a great extent. Choice between open and closed technology not black-and-white. Software market offers many hybrid forms. Moreover, new versions and applications are continuously being created: open, closed, and everything in between. It is therefore not possible to point to a specific portion of the software landscape that needs to be made "open". Choice of software entails much more than merely the choice between open and closed technology.		Within a given organization it is possible to point to specific portions of software in use that could be made "open." Minister intends to reduce complexity, interwovenness and vendor dependency of IT environment. Cabinet policy therefore focuses on the long-term benefits of improved cooperation and more efficient data exchange.	Minister does not make clear how and in which time frame he intends to fulfill his ambitions. In this context, we again refer to our concrete recommendation concerning his role as a policy coordinating minister.
Question 3: Software costs and potential cost savings				
§ 3.3.3 and Chapter 4	Licensing costs constitute only a small part of total software costs. Potential cuts in departmental software costs may only be determined for concrete situations by means of cost/benefit analyses performed in the context of implementing a department's software policy and attendant purchasing strategy. Such analyses need to be based on total costs, while also taking purchasing costs (which include the costs of licensing, implementation, and operating (including maintenance)) into account.			

For more info, see Conclusions of the Algemene Rekenkamer	Recommendations of the Algemene Rekenkamer	Minister's response	Additional remarks Court of Audit
Question 4: Introduction timeframe			
§ 3.2.1, § 3.3.1, § 3.3.4 and § 3.3.6	The switch from closed to open technology is never "completed" at any given moment. But shifts from closed to open technology are possible. These shifts and the timeframes in which they can take place depend on: • information management strategy and IT strategy; • initial situation ("installed base"); • new developments in software market.		
Question 5: Pros and cons, opportunities and risks, and implementation requirements			
Chapters 3 and 4	Pros and cons, opportunities and risks, and implementation requirements should not be associated with open standards or open source software per se; instead, they greatly vary depending on the concrete situation, the standard in question and the specific software product. The question of whether open alternatives exist can only be answered by investigating the specific circumstances in concrete situations, and by conducting market research on available software products and services.		

For more info, see Conclusions of the Algemene Rekenkamer	Recommendations of the Algemene Rekenkamer	Minister's response	Additional remarks Court of Audit
Question 6: What are the recommendations of the Court of Audit?			
Chapter 5	BZK and EL&I and specialist ministers should work with strategic goals in mind, taking the *installed base* and market developments into account. It is too restrictive to approach IT issues purely in terms of cost cutting. Cost awareness is needed but inadequate by itself.		
	The Central Government CIO and departmental CIOs should play a key role in the strategic process. The CIO needs to be assigned the relevant tasks and competences, in order for a consistent Central Government IT policy to be feasible. This approach calls for feature-specific IT requirements, which may differ from application to application and from department to department, to be borne in mind at all times.	The competences of Central Government CIO and of departmental CIOs have recently been expanded.	
	The Minister of BZK should look into the degree to which government departments choose their software based on strategic IT policy goals and explicitly cite their criteria in this regard. He also needs to ensure that all ministries satisfy these criteria by mid-2012. In addition, the Minister should periodically review these criteria and their operational implementation, adjusting them as necessary. In order to satisfy these criteria, government should also avail itself of the knowledge and expertise of persons working outside the government. The Minister of BZK should regularly keep the House of Representatives informed on IT strategies and their progress.		We note that the Minister makes no mention of our concrete recommendations concerning his role as a policy-coordinating minister. Nor does he indicate whether and how he intends to keep the House of Representatives informed on IT strategies and their progress.

APPENDIX 2 LIST OF OPEN STANDARDS FOR "APPLY OR EXPLAIN" POLICY

The list of open standards to which the "apply or explain" principle applies, which was compiled by the December 16, 2010 Standardization Forum, is given below.

- NEN-ISO/IEC 27001:2005 nl
- NEN-ISO/IEC 27002:2007 nl
- SETU standard
- Standard Exchange Format (StUF)
- eXtensible Business Reporting Language (XBRL) v2.1
- Aquo standard
- Dimensions v1.0
- (IPv4)
- (IPv6)
- ebMS and WUS
- ebMS and WUS as further specified within OSB
- Internet Protocol version 6 and Internet Protocol version 4
- ISO 32000–1:2008 Part 1: PDF 1.7
- ISO/IEC 15948:2003, Portable Network Graphics (PNG) Specification (Second Edition)
- ISO/IEC 10918:-1, Portable Network Graphics (PNG) Specification
- NEN-ISO 19005:2005 nl
- NTA 2035:2009 E-portfolio NL
- Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH)
- Open Document Format ISO 26 300
- Security Assertion Markup Language (SAML)
- Web Services for Remote Portlets (WSRP)
- Website guidelines as set forth in the "Ruling on the Quality of Government Websites" (Dutch: Besluit kwaliteit Rijksoverheids websites), Council of Ministers of the Netherlands, June 30, 2006[62]

[62] In addition to technical sections, the website guidelines also contain sections dealing with issues like accessibility and user-friendliness.

APPENDIX 3 LIST OF COMMON OPEN STANDARDS

The list of common open standards compiled by the December 16, 2010 Standardization Forum is given below.

- EI standards
- Information Publication Model for Permits (IPM)
- Internet Calendaring and Scheduling Core Object Specification (iCalendar)
- vCard (VCF)
- Cascading Style Sheets (CSS)
- Comma-Separated Values (CSV)
- Domain Name System (DNS)
- Dynamic Host Configuration Protocol (DHCP)
- Extensible Stylesheet Language Transformations (XSLT)
- File Transfer Protocol (FTP)
- HTTP over TLS (HTTPS)
- HyperText Markup Language (HTML)
- Hypertext Transfer Protocol (HTTP)
- Internet Message Access Protocol (IMAP)
- Internet Printing Protocol (IPP)
- ISO 8601:2004 (date and time)
- Lightweight Directory Access Protocol (LDAP)
- MD5 message-digest algorithm (MD5)
- Network News Transfer Protocol (NNTP)
- Network Time Protocol (NTP)
- Post Office Protocol version 3 (POP3)
- Real-time Transport Protocol (RTP)
- Scalable Vector Graphics (SVG)
- Security Architecture for the Internet Protocol (IPsec)
- Session Initiation Protocol (SIP)
- Simple Mail Transfer Protocol (SMTP)
- Simple Network Management Protocol (SNMP)
- Simple Object Access Protocol (SOAP)
- Structured Query Language (SQL)
- Styles Layer Descriptor (SLD)
- Transmission Control Protocol / Internetprotocol (TCP/IP)
- Transport Layer Security (TLS)
- Uniform Resource Identifier (URI)
- Uniform Resource Locator (URL)
- Uniform Resource Names (URN)
- Universal Description Discovery Integration (UDDI)
- User Datagram Protocol (UDP) / Internet Protocol (IP)
- UTF-8
- Web Services Description Language (WSDL)
- XML

APPENDIX 4 DEFINITION OF OPEN STANDARD

According to the *Standardization Forum,* a standard is fully "open" if:[63]

1. the standard has been approved and will be maintained by a non-profit organization, and ongoing development will be on the basis of an open decision-making process that is accessible for all interested parties (consensus or majority decision, etc.);
2. the standard has been published and the specification document for the standard is freely available or can be obtained for a nominal[64] contribution. It must be possible for everyone to copy it, make it available and use it, free or for a nominal price;
3. the intellectual property – regarding any patents that may be present – of the standard or parts thereof is irrevocably [65] made available on a royalty-free basis;
4. there are no restrictions on reuse of the standard.

[63] Source: http://www.open-standaarden.nl/open-standaarden/wat-zijn-open-standaarden/ (accessed August 2, 2010).

[64] We take this to mean: reasonable compenzation for costs incurred on account of making the standard available. Costs incurred through developing the standard are thereby not included.

[65] The making available on a royalty-free basis cannot therefore be reversed.

APPENDIX 5 DEFINITION OF OPEN SOURCE SOFTWARE

One well-known definition of the term “open source software” is the one given by the *Open Source Initiative* (OSI). This definition comprises ten criteria (OSI, 2010b).

1 Free Redistribution
The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale.

2 Source code must be included.
The software must include source code, or the source code must be downloadable free-of-charge. The software must be distributable both as an executable program and in the form of source code.

3 Derivative Works Permitted
The license must allow for modifications of the source code and the creation of works derived therefrom, and must allow them to be distributed under the same terms as the license of the original software.

4 Integrity of Original Source Code may be imposed as a condition
Licenses may contain the provision that only the compiled version of the software may be modified. In such a case, modifications may only be made in the form of “patch files.” This means that the original source code is always left intact (cf: http://en.wikipedia.org/wiki/Open_source_definition).

5 No Discrimination Against Persons or Groups
The license must not discriminate against any person or group of persons.

6 No Discrimination Against Fields of Endeavor
The license must not restrIT anyone from making use of the program in a specific field of endeavor.

7 Universal Distribution of License
The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.

8 License Must Not Be Specific to a Product

9 License Must Not Restrict Other Software
The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programs distributed on the same medium must be open-source software.

10 Technology-Neutral
No provision of the license may be predicated on any individual technology or style of interface.

OSI is a non-profit organization[66] that has assumed the task of certifying that software licenses meet “OSI Certified Open Source” criteria. This certification is widely accepted. The OSI has approved 67 open source licenses (as of December 2010). Only a limited number of these are used in practice, however. Widely used licenses include: GNU General Public License (GPL), Lesser GNU General Public License (LGPL), Affero GNU Public License (AGPL), Artistic License, Berkeley Software Distribution (BSD), Apache License, and Mozilla Public License (MPL). In the European context, the European Union Public License (EUPL) has been developed.

[66] OSI is a public benefit corporation, with registered seat in California, USA. See OSI (2010a).

Table 4 shows which of the above licenses allow for open source software to be distributed in combination with closed source software.[67] Licenses marked “No” include a *copyleft* provision. To be precise: Licenses marked “No” contain a strong *copyleft* provision, those marked “Yes” are either *non-copyleft* licenses or contain a weak *copyleft* provision.[68]

Table 4 Which licenses allow for combinations of open and closed source and which do not?

License	Combine open and closed source?
GPL, AGPL, EUPL	No
LGPL	Yes
MPL	Yes
BSD	Yes
Apache License	Yes

[67] http://inventarisoss.smals.be/nl/112-rch.html.

[68] Regarding this distinction, see Aimé (2010).

APPENDIX 6 FORMAT OF COST SURVEY

Introduction

Our cost-analysis model is intended to provide a basis for gathering information toward determining the current costs of existing software applications for which, in theory, OSS alternatives are available. The cost-analysis model consists of a general section surveying information on the organization as a whole, and a software-specific section surveying information on each software application.

For the sake of keeping the information to be provided for each software application clear and concise, we stay within certain categories. Among other things, the process involves the use of NOiV inventories[69]. Only information on software, both custom and standard, belonging to one of the categories listed need be provided in the context of this survey. How to categorize software may not be that obvious in the case of your government department. Should this be the case, we would be happy to advise you on alternative categorizations, on which practical cost analysis could be based. The table below lists the general and software-specific information surveyed. The individual survey questions are explained further down.

Information to be provided

General information	**Answer**
Size of IT budget	
Total staffing (entire organization)	
Extent of OSS use	
Total software licensing costs in the previous five years	

Information for each software application	**Answer**
Name of software application	
Software category	
Name of vendor	
Number of licenses	
Annual costs per license	
Annual costs of maintenance contract	
open source/closed source ratio	
In use since (date)	
In use until (date)	
Comments	

[69] Source: https://wiki.noiv.nl/xwiki/bin/view/NOiV/OSS%20Apps%20List en https://www.noiv.nl/files/2009/12/Implementatiestrategie_cover.pdf, both accessed September 14, 2010.

Explanation of items in the survey

General information	**Explanation**
Size of IT budget	All central and de-centralized expenses in 2009, at least including: • investments in and operation of hardware and software • internal and external IT infrastructure, IT projects and IT support staff • outsourced IT services • consulting on IT
Total staffing (entire organization)	Staffing in FTE for entire organization, including any operationally independent internal units.
Extent of OSS use	Here, we distinguish between the following four degrees of usage: • negligible • limited • intensive • predominant
Total software licensing costs in the previous five years	Total amount spent on software licensing in the previous five years. This includes costs invoiced to you via third parties.

Information for each software application	**Explanation**
Name of software application	Product name plus version number of software package. If the software comes as a custom package, please indicate this with the word “custom.”
Software category	Please choose a category from: among the following: • Operating systems • Office applications (word processors, spreadsheets, etc.) • Email • Web browsers • ERP • CRM • Geographic information systems • Content management systems • website development • Database management systems
Name of vendor	The name the vendor of the software application.

Number of user licenses	The total number of user licenses the organization possesses for the software application.
Annual costs per license	The annual costs per user license; if more than one type of license is owned, and the costs vary for these types, please indicate the costs for each type of license. Examples of different types of licenses include concurrent-user licenses, named-user licenses, or licenses per device.
Annual costs of maintenance contract	Annual costs of the contract, or of a service level agreement (SLA) signed with an (external) service provider. Maintenance contracts usually cover items like software management and modification. Please indicate any arrangement whereby the user licenses form part of the maintenance contract.
open source/closed source ratio	Some software is partially closed source and partially open source. Where this is the case, please specify the proportion of open to closed source expressed as a percentage.
In use since (date)	Date on which software was put into operation.
In use until (date)	Date on which software is expected to be taken out of operation.
Comments	It may not be possible to provide unequivocal information for certain items. Please explain any such issues here.

APPENDIX 7 EXPERTS CONSULTED

Conference of experts

J. D. Bos	National Technology Officer, Microsoft Nederland
J. Flippo	Program Manager of “I-aanbod Rijk” program, Ministry of the Interior and Kingdom Relations
Dr. C. Franke	General Director, Franke Interim Management BV
Dr.-Ing. B. Van Graft,	Ministry of Security and Justice
Dr. A. Kamphuis CISA CISM	Holland Open
B. Linders	IT˜Office
W. Schop	Program Manager of “Nederland Open in Verbinding” program.
Prof. C. Verhoef	Professor of Information Technology, Vrije Universiteit Amsterdam
M.P.F. Vloemans, Ing.	Chair Open Source Software Vendors Association (Dutch: Open Source Software Leveranciers Organisatie)
Dr. N.J. Westpalm	Chair of the Van Hoorn Forum on Standardization

Individual interviews

Dr. J. Attema	ECP EPN Consultant
Dr. M. Chen Amsterdam	Administrative Consultant to the Municipality of
A.A.J. Dijkhuijs	Ministry of Security and Justice
F.R. Groustra, MSc	Ministry of Security and Justice
M. W. I. Hillenaar	Director of National Information Management Policy, Ministry of the Interior and Kingdom Relations/CIO of the Netherlands
Dr. W. van Holst	Legal Advisor, Nederland Open in Verbinding program
J. Korpel	Researcher, Nederland Open in Verbinding program
H.M. Leether	Legal Council, Ministry of Justice Operational Management Ministry of Security and Justice
Dr. B. van Lier MCM CMC	Account Director Government, Centric IT Solutions
P.H. Minnecré, Ing. program	Project Manager, Nederland Open in Verbinding
S.A. Mittertreiner, Ing.	Head of I&A for Netherlands Patent Office
F. Mous, Ing.	Ictivity
J. Mulder	IT˜Office
Dr. B. L. E. van Oranje	Levi 9 Global Sourcing
M.H. Paapst	Lecturer/Legal Researcher University of Groningen
A. van Polen	Head of IT Management (former) Ministry of Housing, Spatial Planning and the Environment
B. Prehn	Policy Officer, Municipality of Amsterdam
Dr. A. Reinders	Senior Policy Officer, Ministry of Interior and
Kingdom Relations Dr. D. van Roode	Manager Public Affairs IT˜Office
S.J. Rozema	Ministry of Finance, Tax and Revenue Service
P.C. van Schelven	Legal Advisor IT˜Office
Dr.-Ing. J. Visser	Software Improvement Group
M.J. Wildvank	Software Improvement Group

APPENDIX 8 TERMS AND ABBREVIATIONS

.doc	A closed standard belonging to Microsoft Office for editable documents (Office 2003 and older)
.docx	A standard belonging to Microsoft Office based on open standards for editable documents (Office 2007 and newer)
”Under architecture”	Based on architecture
Application server	An application server is a set of software and hardware components for making applications available to end users.
Architecture	The set of principles and models as a whole that inform the design and execution of an organization’s processes, organizational set-up, information management facilities, and technical infrastructure. (Berg and Steenbergen, 2004)
BOR	House of Representatives Bureau of Government Expenditure (Bureau Onderzoek Rijksuitgaven van de House of Representatives)
Business case	A set of arguments from a business standpoint concerning (for example) a project
BZK	Ministry of Interior and Kingdom Relations (Binnenlandse Zaken en Koninkrijksrelaties)
CIO	Chief Information Officer
Community	In this report, a community refers to a group of people who collaborate in a more or less formally organized manner and who develop, modify, and maintain open standards or open source software and make them available.
Copyleft provision	This provision stipulates that if a modified version of a given source code is distributed, whether or not in combination with closed source software, the user must in turn do so under the same license.
CTO	Chief Technology Officer A senior position at the strategic level of an organization The CTO is responsible for technical aspects in connection with decision making concerning the use of technology (in this report, the use of IT).
DMS	Document management system
ECM	In brief, ECM amounts to the means by which to manage and make available collected and unstructured information within an organization, such as documents and other forms of content, including video materials.
EL&I	Ministry of Economic Affairs, Agriculture, and Innovation (Economische Zaken, Landbouw en Innovatie)
ERP	ERP packages are software packages with highly integrated features, with which, in theory, an organization’s entire operational management may be supported. This kind of system is a simpler way to associate financial means with other aspects of operational management than is possible using “casual” systems. ERP stands for Electronic Resources Planning
EZ	Ministry of Economic Affairs (Economische Zaken) (as of October 14, 2010, referred to as EL&I)
GSM	Global System for Mobile communications
HRM	Human Resource Management
HTML	Hypertext Markup Language
Intranet	An intranet is the internal equivalent of an external website.
IP	Internet Protocol

JPEG	JPEG is an open standard for saving images. JPEG stands for Joint Photographic Experts Group
LinkedIn	Social networking website mainly used in the business sphere.
Middleware	General term describing software that interconnects different applications and/or system software.
MPEG-1 layer 3	MPEG-1 layer 3 is a closed standard used to compress audio data. The most commonly used abbreviation for it is MP3.
MPEG-4	MPEG-4 layer 3 is a closed standard used to compress video data.
NOiV	Nederland Open in Verbinding program (toward Government use of open technologies)
OA	Office Automation
ODF	Open Document Format is an open standard for storing and/or exchanging text files, spreadsheets, charts, and presentations.
OGG	OGG is an open standard for audio and video files.
OOXML	Office Open XML is an open standard file format for Office documents.
OSOR.eu	OSOR.eu is a platform intended to support the development and exchange of OSS applications for use in the public sector. OSOR stands for Open Source Observatory and Repository.
OSS	Open source software
OSSLO	Open Source Software Vendors Association (Open Source Software Leveranciers Organisatie)
Patch	A patch is a modification to a program that is distributed in between regular updates. Patches generally serve to solve security issues (security patches) or to correct errors in the program (bug fixes).
PDF	PDF is a standard for exchanging non-editable electronic documents. PDF stands for Portable Document Format.
RWT	A Dutch acronym used to denote a non-governmental legal entity that performs some legal function (Rechtspersoon met een wettelijke taak)
SAP	SAP stands for Systems, Applications, and Products in Data Processing and is an ERP system.
Source code	A set of instructions, assembled by a computer programmer, for a machine to carry out. People can read and write source code, but it has to be translated (“compiled”) into “machine language” in order for a computer to be able to carry out the instructions.
System software	Software that enables a computer to run applications. Among other things, this includes operating systems, database management systems, and software that enables data to be stored.
TCO	TCO (Total Cost of Ownership) is a definition of costs comprising all direct and indirect costs of a product over the entire lifespan of the product from acquisition to disposal.
TIFF	TIFF is an open standard for storing images. TIFF stands for Tagged Image File Format TCP/IP. Transmission Control Protocol / Internet Protocol is a set of “network protocols” (networking standards), which support internet data traffic, among other things.
Web server	Servers that enable data traffic over intranets and the internet.

XML	Extensible Markup Language is a standard consisting of a set of rules that can be used for describing data according to an unambiguous system, in order for application to be able to process them correctly.
zbo	Non-departmental public body (Dutch: zelfstandig bestuursorgaan)

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