



NIFO GOVERNANCE

IN-DEPTH ANALYSIS OF THE STATE OF PLAY OF INTEROPERABILITY ALIGNMENT IN EUROPE



FINAL REPORT 2013

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1 Introduction

This chapter will present the general introduction to the report by describing the context and purpose of the document as well as the objectives and approach used.

1.1 Context and purpose of the document

The purpose of this document is to provide a short but exhaustive summary of the main findings from the analysis of the National Interoperability Frameworks across Europe within the context of the ISA programme of DG DIGIT. As such, Member States representatives in charge of interoperability programmes and projects are the main target of the document, as well as other officers working in related fields and other stakeholders working on interoperability and related fields in the private sector and international organisations.

The document provides an overview of the main developments in alignment of National Interoperability Frameworks across Europe with the European Interoperability Framework and paves the way for continued and enhanced monitoring and sharing of best practices and experiences.

As part of the ISA Programme accompanying measures or actions are implemented as a cluster of actions that are horizontal and aim to raise awareness and the recognition of interoperability as a cornerstone of public services and to ensure collaboration and communication amongst stakeholders. These actions include the sharing of best practices and supporting communities by providing the necessary tools, platforms and campaigns.

One of the actions is the National Interoperability Framework Observatory (NIFO) (action 4.2.3), which aims to achieve closer alignment of interoperability frameworks across Europe. Member States committed align their National Interoperability Frameworks (NIFs) to the European Interoperability Framework (EIF)¹ by 2013 under Action 26 of the Digital Agenda for Europe (DAE). To this end, under the NIFO action, a comparative model has been setup to analyse the alignment of NIFs in the Member States to the EIF. Furthermore, NIFO ensures regular contact with the Member States in order to remain up-to-date with the developments in the Member States and supports public administrations in the Member States.

The data gathering exercise was carried out during 2012 and the first months on 2013 in collaboration with Member States' representatives. Based on the information collected (relevant developments and documents) an alignment score was assigned to each of the elements included in the analytical model and validated with the Commission and Member States.

The request for information was sent to 32 countries. Of those, 19 countries replied and provided the necessary data. Therefore, the findings presented in this report refer to these 19 countries². The data

¹ European Interoperability Framework (EIF) Annex 2 to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions 'Towards interoperability for European public services' http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf

² Austria; Belgium; Bulgaria; Denmark; Estonia; Finland: France; Germany; Greece; Hungary; Italy; Latvia; The Netherlands; Malta; Norway; Poland; Portugal; Slovenia; Spain.

gathered via documents and interviews with Member State representatives are the main source for the analysis and findings of this report.

1.2 Objectives and approach

The objectives of the NIFO action are:

- ✔ revising the comparative model to take into account the new EIF and the DAE;
- ✔ providing support to EU public administrations to align their NIFs with the EIF;
- ✔ setting up a new maintenance process to provide the most up-to-date information possible;
- ✔ analysing the current national interoperability activities using the updated model and updating the respective factsheets with the results.

Within this context, this report provides an analysis of the NIFO comparative model in order to provide insights into trends, similarities, differences and enablers identifying driving factors in the process of NIF alignment across the EU. These insights should serve to provide support to the Member States in their NIF alignment.

Two key basic questions have been raised by interacting with Member States.

1. What should be included in a NIF?

The EIF defines an interoperability framework as:

“An agreed approach to interoperability for organisations that wish to work together towards the joint delivery of public services. Within its scope of applicability, it specifies a set of common elements such as vocabulary, concepts, principles, policies, guidelines, recommendations, standards, specifications and practices.”³

However, discussions that took place during the NIFO action revealed that the definition of a NIF is subject to debate. This report will look into this basic question and distil from the NIFO comparative model what similarities and differences can be found among NIFs and what the possible minimum common denominators are.

2. What should be included in a NIF in order to align with the EIF as much as possible?

Given that the overall objective of NIFO is to achieve a closer alignment, it is clear that Member States would like to know what to include in their NIF such that it is in alignment with the EIF. The EIF and the recommendations it puts forward on specific interoperability requirements provide guidelines in that respect.

The NIFO comparative model has been established in order to measure this alignment and therefore provides not only a model of alignment but also provides insight into the level of alignment and the factors that contribute to better alignment. Furthermore, the analysis carried out highlights best practices found in countries with respect to some of the elements of the NIF, which could inspire other Member States in their activities. Analysing the NIFO comparative model can provide insights in relation to the first question by identifying which elements among NIFs are minimum common denominators and can serve to define what should be included in a NIF.

³ European Interoperability Framework (EIF) Annex 2 to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions 'Towards interoperability for European public services' http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf

Therefore, the approach followed in this report is to provide first an in-depth analysis of the NIFO comparative model and the information contained in it in order to investigate NIF-EIF alignment.

In addition, based on the information collected under NIFO and the regular contact with Member States, a number of possible challenges concerning establishing and implementing their NIF are described. These identified challenges may also serve as reference points for Member States when they face similar challenges and could share experiences with other Member States in order to overcome these.

Based on the analysis a number of recommendations are provided including:

- ✔ Guidelines for Member States on the factors that contribute to better alignment of a NIF;
- ✔ Guidelines on the elements that should be part of NIF;
- ✔ Recommendations for Member States to overcome challenges in establishing and implementing a NIF;
- ✔ Examples of good practices collected during the monitoring.

Ultimately, this report is an input for MS in order to support the NIFO action to:

- ✔ Raise awareness and engage those actors in MS that are currently in development;
- ✔ Provide the MS with support by means of bringing them into contact with others that have a similar approach;
- ✔ Establish a common basis on which the NIFs can be further developed

1.3 Structure of the report

After this introduction, Chapter 2 presents the overall findings and recommendations for the EIF and NIFO formulated at the end of the monitoring exercise. Chapter 3 provides the analysis of common denominators of a NIF as emerged from the analysis and the related debate. Chapter 4 reports the findings on the alignment between the EIF and the 19 NIFs analysed. Chapter 5 provides the overview of the main challenges encountered by Member States in developing and implementing their NIFs. Finally, the annexes in Chapter 6 contain more detailed information about the model and methodology used for analysing NIFs, and the full list of good practices identified. Whenever relevant, good practices are presented in the main report.

Note that the findings presented in this report are based on the alignment of NIFs with the EIF at the time of the analysis. The most recent alignment results can be found on the NIFO Community on Joinup in the NIFO factsheets (see https://joinup.ec.europa.eu/community/nifo/og_page/nifo-factsheets) and under the 'Compare NIFs' menu option (see <https://joinup.ec.europa.eu/community/nifo/analytical>). The latter also provides the more detailed evidence of the approach followed by individual countries for each of the elements of the EIF.

2 Main findings and recommendations

The analysis presented in this report of the information gathered by the NIFO, in its analytical model and through hands-on collaboration with the countries, points out a number of insights that allow establishing guidelines and recommendations for the countries, the EIF as well as the NIFO. A summary of these is provided here the remainder of this report provides more detailed analysis and information.

The NIFO analytical model allows for comparing the different countries and identifying the factors that contribute to the alignment of NIFs with the EIF, to highlight trends and to identify common denominators across the countries. This provides answers to the basic research questions: **What should be included in a NIF?** and **What should be included in a NIF in order to align with the EIF as much as possible?** Based on the findings a set of guidelines is presented here:

- Guidelines on the contents of a NIF;
- Guidelines for better NIF-EIF alignment.

In addition, the report has gathered, based on the experience within NIFO and contacts with the country representatives, what specific challenges countries face in the establishment and implementation of a NIF. In addition, feedback from the countries on the EIF is also gathered and analysed. The findings lead to specific recommendations concerning:

- Recommendations to overcome challenges to establishing, developing and implementing a NIF;
- Recommendations for the EIF;
- Recommendations for the NIFO.

The following sections provide these guidelines and recommendations.

2.1 Guidelines on the content of a NIF

In chapter 3, the alignment of NIFs with the elements of the EIF is analysed to come to a concise list of those elements that could be considered as common denominators included in the NIFs across countries.

This list of common denominators is based on the actual elements implemented in the countries. For this a list is constructed of elements that are implemented in at least 65% of all countries. In addition, the element of multilingualism is added (which is observed in nearly half of the countries) as a crucial part of EIF for the implementation of European Public Services as well as the preference for open specifications which emerged as important from the analysis. The resulting list is presented in Table 1 below.

Table 1 – Minimum common denominators

Elaborated common denominators
• PR 2, user-centricity
• PR 3, inclusion and accessibility
• PR 4, the security and privacy principle
• PR 5, multilingualism
• PR 9, the principle of openness
• PR 10, reusability
• CM 1, the fact that the NIF contains a conceptual model
• CM 2, that the conceptual model is a component based service model
• CM 4, the set-up of infrastructure to connect loosely coupled service components
• CM 5, making the authentic sources of information available to others
• CM 6, access and control mechanisms to ensure compliance to security and privacy legislation
• CM 7, development of interfaces to authentic sources
• IOPL 1, the fact that the four levels of interoperability are described
• IOPL 2, the careful consideration of all the relevant legislation related to data exchange
• IOPL 9, the encouragement to agree on the formalised specification to ensure technical interoperability when establishing European public services,
• IOPA 2, the existence of a structured, transparent and objective approach to assess and select formalised specifications
• IOPA 3, preference for open specifications
• IOPG 1, interoperability governance

This minimal set of common denominators contains at least one element from each EIF category (i.e. principles, conceptual model, interoperability levels, interoperability agreements and interoperability governance). The elements part of this minimal list present a number of elements that can be considered basic elements for interoperability based on the fact that at least 65% of the countries have implemented these (apart from multilingualism which is observed in nearly half of the countries and the preference for open specifications). First, the most common elements in this minimal list refer to interoperability levels including:

- ☑ the fact that the four levels of interoperability are described (IOPL 1);
- ☑ the careful consideration of all the relevant legislation related to data exchange (IOPL 2);
- ☑ the encouragement to agree on the formalised specifications to ensure technical interoperability when establishing European public services (IOPL 9).

Indeed, these elements can be considered as starting points for establishing interoperability. In addition, the elements of interoperability agreements (related to a structured, transparent and objective approach to assess and select on formalised specifications (IOPA 2)) and interoperability governance (IOPG 1) appear on the list. Further, a number of basic elements, including security and privacy (PR 4) and openness (PR 9) as well as making the authentic sources of information available to others (CM 5) are included. Clearly, this list of minimal elements is key to establishing the basics of interoperability.

When looking at the elements that contribute mostly to the alignment of a NIF with the EIF a number of essential elements come into play that are identified as the most highly contributing factors to EIF alignment.

The principle on reusability (PR 10) is one of the elements contributing most to EIF alignment. This principle is an essential part of interoperability and is closely linked to the conceptual model as a component based service model (CM 2), the set-up of infrastructure to connect loosely coupled service components (CM 4), access and control mechanisms to ensure compliance to security and privacy legislation (CM6) and interfaces to the authentic sources (CM 7). Clearly, reusability and the elements of the conceptual model are key for interoperability and the provision of European public services.

Of course, the approach taken here to identify a set of common denominators is a pragmatic approach to establishing what should be considered as commonly established elements as part of existing NIFs. A more theoretical discussion is taking place on how to define a NIF. Different related definitions exist and are briefly discussed in the analysis in Chapter 3. Although the aim here is not to provide a definition of a NIF as such, this is subject to on-going debate⁴.

For example, a study conducted for The Netherlands⁵ concluded that an interoperability framework should describe three levels for which it should provide guidance, namely on the Governance, System and Implementation levels. The report furthermore proposes four steps that lead to a NIF and lists several detailed elements that should be included in an interoperability framework. Likewise, the UNDP⁶ has also produced a report on interoperability that may contain useful additions to the elements of the EIF.

The elements from both studies were mapped on a high level and revealed three categories proposed by both studies that do not appear in the EIF. These are the following⁷ :

- Implementation
- Compliance regime
- Development process

These categories should be considered in detail when updating the EIF and when providing advice to countries on additional categories to take into consideration for their NIF.

The definition of an interoperability framework according to the EIF was the basis to start the discussion⁸. There are comments that relate to phrasing of the definition, one of the participants states that interoperability framework does not necessarily include agreement of the relevant organisations that have to implement it. Furthermore, the term "public services" may be too narrow as a definition, as there could be interoperability frameworks (ifs) within organisations or between organisations for services that are not 'public'.

A recommendation made by the participants is that one should take into account the level for which the NIF is applicable (general, central, national, regional, local, and organisational) and between a NIF and its components (one of the components could be for example a list of standards). This is currently not taken up in the EIF.

⁴See also discussion on the JoinUp NIFO community: <https://joinup.ec.europa.eu/community/nifo/topic/nif-definition-not-suited-its-purpose>, accessed 12/02/2013

⁵ http://www.forumstandaardisatie.nl/fileadmin/os/documenten/RAND_rapport_def.pdf, accessed 12/02/2013

⁶ UNDP, e-Government Interoperability: Guide; United Nations Development Programme, 2007

⁷ Naming convention taken from the UNDP study

⁸ Interoperability Framework as stated in the EIF v2: "An interoperability framework is an agreed approach to interoperability for organisations that wish to work together towards the joint delivery of public services. Within its scope of applicability, it specifies a set of common elements such as vocabulary, concepts, principles, policies, guidelines, recommendations, standards, specifications and practices".

Other countries are not so much concerned with the format of the definition but more with the benefits and actual outcomes of projects related to interoperability.

2.2 Guidelines for better NIF-EIF alignment

Based on the analysis in chapter 4, an overview of elements or factors that contribute to better alignment of countries with the EIF have been identified. Table 2 below shows which elements contribute to some alignment in at least half of the countries (listed as ‘influential elements’) and elements that are fully aligned in at least half of the countries (listed as ‘highly influential elements’).

Table 2 – Influential and highly influential common denominators

Elaborated common denominators	Influential elements	Highly influential elements
PR 2, user-centricity,		PR 2, User-centricity
PR 3, inclusion and accessibility,		PR 3, Inclusion and accessibility
PR 4, the security and privacy principle,		PR 4, Security and privacy
	PR 6, administrative simplification	
	PR 7, transparency	
	PR 8, preservation of information	
PR 9, the principle of openness,		PR 9, Openness
PR 10, reusability,		PR 10, Reusability
	PR 11, technological neutrality and adaptability	
		PR 12, Effectiveness and efficiency
CM 1, the fact that the NIF contains a conceptual model,	CM 1, the fact that the NIF contains a conceptual model,	
CM 2, that the conceptual model is a component based service model,		CM 2, that the conceptual model is a component based service model,
CM 4, the set-up of infrastructure to connect loosely coupled service components,	CM 4, the set-up of infrastructure to connect loosely coupled service components,	
CM 5, making the authentic sources of information available to others,		CM 5, making the authentic sources of information available to others,
	CM 6, access and control mechanism to ensure compliance to security and privacy legislation	
		CM 7, development of interfaces to authentic sources that are aligned at semantic and technical level
IOPL 1, the fact that the four levels of interoperability are described,	IOPL 1, the fact that the four levels of interoperability are described,	

Elaborated common denominators	Influential elements	Highly influential elements
IOPL 2, the careful consideration of all the relevant legislation related to data exchange,		IOPL 2, the careful consideration of all the relevant legislation related to data exchange,
	IOPL 6, change management process to ensure continuous service delivery	
	IOPL 7, usage of a common taxonomy of basic public service	
	IOPL 8, encourage public administrations to support the establishment of sector specific and cross-sectoral communities that aim to facilitate semantic interoperability and that share results on national and European platforms.	
IOPL 9, the encouragement to agree on the formalised specification to ensure technical interoperability when establishing European public services,		IOPL 9, the encouragement to agree on the formalised specification to ensure technical interoperability when establishing European public services,
IOPA 2, the existence of a structured, transparent and objective approach to assess and select formalised specifications,	IOPA 1, interoperability agreements to be based on existing formalised specifications or participate to communities in the same area	
IOPA 3, preference for open specifications	IOPA 2, the existence of a structured, transparent and objective approach to assess and select formalised specifications,	
		IOPA 3, preference for open specifications
	IOPA 4, lead or participate to standardisation work	
	IOPA 5, minimum service requirements for secure data exchange	
IOPG 1, interoperability governance.		IOPG 1, interoperability governance.

An alternative view can be taken by looking at those elements that are actually lacking and could contribute to a better alignment if they would be established. The analysis has shown that there are certain elements that are least present across countries, such as:

- ❑ Principles: multilingualism (PR 5)
- ❑ Conceptual model: the encouragement to establish and use common schemes (CM 3)
- ❑ Interoperability levels:
 - ❑ the business processes are documented in an agreed way in order for other administrations to understand the overall business process (IOPL 3)

- ✉ encouragement to agree on how these processes will interact among the different levels of public administrations (IOPL 4)
- ✉ public administrations to clarify their organisational relationships as part of the establishment of a (European) public service (IOPL 5)
- ☑ Interoperability agreements: to actively participate to standardisation work (IOPA 4)
- ☑ Interoperability governance (IOPG 1)

By addressing these elements, many countries would increase their alignment score.

2.3 Recommendations for countries to overcome challenges in establishing, developing and implementing a NIF

The analysis in chapter 5 shows that there are a number of challenges that countries face that can either hold back the establishment of a NIF or the further development thereof. Such challenges were found in a number of areas these are shortly summarised below where also practical recommendations based on these challenges are drawn.

Legacy technology

Many country representatives stated that updating existing legacy applications is a time consuming process. Several representatives repeated this issue and requested information on what other countries are doing to tackle similar issues.

Indeed, practically all countries face such issues and are either working on these or have worked on it in the past. Information exchange on these practices is taking place between countries, for example Belgium is advising Portugal on elaboration of their interoperability platform. Other examples exist of exchange of information and advice between countries (e.g. Estonia is collaborating with Finland; Malta is cooperating closely with Denmark; Austria is advising Georgia and Moldova). Similarly, other countries could exchange best practice information. It is therefore recommended that the countries exchange information on what type of implementations they have through the Joinup platform and the NIFO community.

Legal factors

The legal factors differ significantly across countries. Some countries have opted to establish the NIF as a legal document (e.g. Greece, Spain and Poland). By having the NIF as a legal document its enforcement can be ensured. However, not all countries share the mind-set that the NIF should be a legal document. In Malta the adherence to the NIF is done via tacit agreements and checks performed by representatives of MITA.

Clearly, once a legal act enforces a NIF public administrations should adhere to it. However, this is only the case in several countries. Even with a legal act in place, the enforcement can pose challenges in terms of monitoring the adherence to the NIF. In general, the level of implementation of a NIF is not consistently monitored in the countries with the notable exception of Portugal where all new IT projects for central administration pass through the AMA compliance measures. Such practices would help the actual implementation of the NIF. It is therefore recommended that countries closely monitor the implementation of the NIF in their particular IT projects, particularly linked to the development of new systems and or major revisions of existing ones.

Organisational factors

Many public administrations have a long history of development in isolation or 'silos', one where individual public administrations collected their own data and used this data solely for purposes and processes within their own organisation. Furthermore, these administrations often receive(d) separate funding for IT that enables to 'keep the lights on' and perform updates. This independence creates silos that are very difficult to break down.

The independence of these silos allowed for the creation of large, independent applications over time. To further interoperability, breaking down the silos is essential. In doing so the cooperation and communication between the relevant stakeholders should be ensured at all levels of administration. Generally, individual public administrations may not be aware of the bigger picture in terms of the different stakeholders that could benefit from interoperability. Therefore, as a first step, the stakeholders of the NIF and interoperability should be clearly defined. Next, these stakeholders should be encouraged to participate to the establishment or elaboration of the NIF in a collaborative way. In addition, other stakeholders not pertaining to the government levels like standardisation bodies or academia should be included. This could be done for example via a public consultation procedure. It is recommended to consider this as part of the Interoperability Governance.

Once the NIF has been finalised it needs to be deployed and used as guidance for implementation by public administrations. The NIF should be distributed to all identified stakeholders and every government CIO should be aware of it.

Furthermore, at a more practical level it is clear that the stakeholders and related organisational aspects are not fully established yet. This is evidenced by the low scoring received for certain elements within the interoperability levels category of the EIF that relate to organisational level interoperability, including:

- ❑ Business processes should be documented in an agreed way in order for other administrations to understand the overall business process (IOPL 3);
- ❑ An agreement should be established on how these processes will interact among the different levels of public administrations (IOPL 4);
- ❑ Public administrations are encouraged to clarify their organisational relationships as part of the establishment of a (European) public service (IOPL 5).

To put these EIF recommendations into practice a number of actions can be formulated to support and ease the implementation. The element IOPL 3 can be broken down in several conditional parts. Public administrations need to agree on which method will be used to document the business processes. Next, it needs to be ensured that the correct tools are present to start mapping and documenting these agreed upon business processes. If the processes are mapped via different methods then this may not yield the expected results.

Once these processes are clearly documented, it will become clear how these interact between the different layers of the public administrations. It is only then that the administrations can start to clarify their organisational relationships related to the establishment of public services.

It may not immediately be evident for a country how to start dealing with the documenting of the business processes or related items. Good practices are difficult to provide because of the low alignment score. Nonetheless, countries can still learn from one another and perhaps even more so, from the approaches

that did not work out as planned. Therefore, it may be good to look for a 'partner' to tackle the more complicated areas in a collaborative way. This 'partner' could also be situated at a lower level or for example in another ministry that shares the drive towards enhanced interoperability.

An element that should be taken into account when working on the business processes and possibly changing them in the view of providing public services is change management. This should not be confined to purely technical change management, in assuring that all the applications can follow the updated business logic and processes, but extended to the human factor. People need to understand the implications and benefits that interoperability will provide for them.

Technical factors

The technical level in itself presents a limited obstacle. The technology does not present an issue as such. An essential concern voiced by the countries regards the follow-up and control mechanisms for implementation of the technical specifications and standards. A number of countries have adopted lists of recommended or mandatory technical specifications and standards (e.g. DK, ES, MT, NL, UK). However in terms of checking the compliance by public administrations in terms of using these as part of ICT implementations or referring to these in public procurement of ICT is more complex. The Netherlands for example uses a comply-or-explain approach⁹ whereby public administrations are supposed to either comply with the mandatory or recommended standards or provide a reasonable explanation why the choice was made not to do so. Public administrations are supposed to provide clarifications in annual reports. However, based on the experience and feedback from different countries a systematic checking of practices is cumbersome and resource intensive. Therefore, a monitoring approach should be established to keep track of the application of standards and specifications.

Furthermore, lessons can be taken from other countries and technologies can be shared and reused.

It is therefore suggested that:

- ❑ The countries participate actively to the communities relevant to their needs (ADMS community, eID community, etc.);
- ❑ The countries clearly document the technical environments relevant to the NIF, the implemented solutions and the challenges for national purposes;
- ❑ The countries share these documents on the JoinUp platform and the NIFO community.

Alignment with the EIF

The country representatives interviewed stated that it was sometimes not clear what the NIF should be, what it should contain and how detailed it should be. In this report, answers to some of these questions are provided. Therefore, the following recommendation can be provided to countries to better align their NIF with EIF:

⁹ For more information, see: <https://lijsten.forumstandaardisatie.nl/lijsten/open-standaarden?lijst=Pas%20toe%20of%20leg%20uit&status%5B%5D=Opgenomen&pagetitle=pastoeof>

- ❑ The countries should start by compiling the information they have on interoperability so that the available information can be assessed against the guidelines detailed in section 2.1 above to start or update a NIF;
- ❑ Take into account the extra elements mentioned in the previous sub-section to increase the alignment of the NIF with the EIF;
- ❑ If certain elements are unclear then examples can be taken from the list of good practices in annex to this report (section 6.2);
- ❑ Clarification or more detailed explanations on the approach can be requested from and provided by countries. Similarly, the JoinUp platform, and more specifically the NIFO community, should be used to voice any remarks or questions on interoperability the countries may have in order to allow for a collaborative approach to finding solutions.

Knowledge management

Interoperability is a subject that does require specific knowledge, mostly combining business and IT viewpoints. According to some countries the mixed skillset between business and IT is not easy to find and often government needs to turn to the market to acquire specific skills and knowledge. It is therefore essential that knowledge is managed and shared throughout public administrations. Therefore, it is recommended for a country to have a coherent system for knowledge management to ensure correct transfer.

The knowledge sharing on interoperability can be facilitated by:

- ❑ Active participation to the NIFO community to disseminate and gather information on the topic of interoperability and the NIFs in particular;
- ❑ Posting any information relevant to interoperability and the NIF on the NIFO community to receive feedback.

It may be also beneficial to involve academia to get a wider audience and gain deeper knowledge on subjects related to interoperability.

Business case

The general business case for interoperability was acknowledged by all countries. Country representatives indicated a number of benefits that derive from interoperability as such and from having a NIF in particular, including cost saving, better preparedness of the market because of the knowledge of the NIF and the applicable standards, and of course, having shareable and usable services, data, etc.

Nevertheless, the benefits may still need to be spelled out explicitly within a country or within the NIF of that country so that it is ensured that a common goal is pursued. This is considered difficult by many countries as monitoring and quantifying impacts of interoperability is not necessarily straightforward.

Here, the JoinUp platform and the NIFO community should be considered as a sounding board to share information and gather opinions. The community could:

- ❑ Provide more visibility as to how the NIF deals with the benefits and business case of interoperability

- ✘ Ease the exchange of information with those countries that have established and documented a business case for interoperability (like Portugal)
- ✘ Provide tools that could be used to establish the business case on a project level

Semantic factors

Semantic interoperability is needed for systems to transfer data with a shared and unambiguous meaning. In interactions with country representatives, semantics was mentioned merely briefly, from which it can be concluded that the countries do not have a clear focus on semantic interoperability. Examples do exist such as public administrations having encountered difficulties in cooperation due to semantic issues in relation to shared base registers. For example, changes in definition of a specific data field can lead to a situation in which the service consumer no longer receives the information requested. In Norway, this issue was addressed by reinforcing organisational inter-linkages to ensure correct information delivery.

Semantic interoperability implies cooperation between parties therefore the countries should participate to communities (e.g. the SEMIC community) that stimulate semantic interoperability

- ✘ Relevant questions related to semantic assets can be requested to and posted on the applicable forum to ensure collaboration by experts in the field

Exchange of information and good practices

Overall, an important recommendation is related to the sharing of information. Many countries have expressed a clear need for information and solutions that have proven their efficiency. Existing bilateral cooperation between countries shows the benefit of exchanging information and good practices and collaboration. Countries are recommended to further these efforts by sharing information to the benefit of all participants of the NIFO community.

A practical implementation of this could consist of:

- ✘ Active participation to ISA meetings to establish better bilateral relationships;
- ✘ Presentation of case studies at these meetings;
- ✘ Posting of this material on the NIFO community;
- ✘ Contributing to the NIFO by providing information on the alignment of NIFs with the EIF;
- ☑ The information will be processed and published so that other countries can benefit from practical experience and examples related to recommendations of the EIF;
- ✘ Actively participate to the JoinUp platform to take in information from other countries that find themselves in the same situation.

2.4 Recommendations on the EIF

The EIF in its current state is a high-level document intended to provide a reference context for interoperability provided through the means of recommendations. An often-heard request from the countries is for more practical information and examples. The EIF could cater for such a request yet it may

be preferable to leave the structure framework document as a high-level overview and supplement it with a more practical and pragmatic aspects in separate documentation and through the NIFO Community.

The EIF serves as a guideline document and can be coupled with a toolbox and accelerator to guide the implementation. The idea of this toolbox is that it should present an overview of possible options that could serve as a guideline for implementation. Such a toolbox could be provided in a separate document accompanying the EIF with practical examples per category and underlying elements. For instance, the interoperability levels, which are currently less established in the countries, could be detailed based on specific examples to help countries better comprehend and establish these principles at their national level. In addition, a listing of the most relevant artefacts that can be found for the legal, organisational, semantic and technical level (e.g. organisational business models, incentive schemes etc.) could be presented. The eHealth EIF is a good example where the EIF has been applied at sectoral level and serves as a toolbox to jump start implementation.

Additionally, during the interviews several other recommendations were suggested by the countries, including:

- ✘ It would be useful if the EIF could be completed with specific, tangible examples related to the recommendations. This is clearly a call for a more 'applied' approach.
- ✘ Similarly, when defining a particular enterprise architecture, it would be useful to have examples of:
 - ☑ A principle that has been undertaken by using a particular approach.
 - ☑ A link to practical pilot projects that are implementing the principles.
- ✘ Several countries indicated the need for an overview of the EIF by gathering the recommendations grouped on a single page.
- ✘ It was indicated that some of the recommendations combine diverse items. For example, recommendation 10 stating that countries should agree on a common scheme to interconnect loosely coupled service components and put in place the necessary infrastructure when establishing European public services. This recommendation essentially contains two elements. Another example is recommendation 13 stating countries should use a common taxonomy of basic public services and agree on minimum service requirements for secure data exchange. Yet another example is Recommendation 11 stating that public administrations should make their authentic sources of information available to others while implementing access and control mechanisms to ensure security and privacy in accordance with the relevant legislation (this one has also been spilt up in the NIFO analytical model). Ideally, these recommendations should be provided separately, thereby keeping a recommendation focused on one, and only one, item.
- ✘ The inter-linkages between different elements could be included in a section on 'points for attention'. For example, when making authentic sources available to others (CM 5) one should ideally first agree on minimum services requirements for secure data exchange (IOPA 5).

When revising the EIF, as many countries as possible should be involved to get a broad consensus and input from many different forms of NIF. Involving all stakeholders should ensure:

- ✘ Higher involvement on the topic;

- Feeling of ownership;
- Better exchange of good practices since many viewpoints will be covered.

Furthermore, other documents could provide complementary categories and elements to the EIF. The previously mentioned study carried out for The Netherlands¹⁰ provides several detailed elements that should be included in an interoperability framework. These can be mapped to the elements of the EIF. Likewise, the UNDP¹¹ has also produced some interesting material on interoperability that may prove a useful addition to the elements of the EIF and the RAND study. The elements from both studies that do not appear in the EIF include Implementation, Compliance regimes, and Development processes. These categories should be considered in detail when updating the EIF and when providing advice to countries on additional categories to take into consideration for their NIF.

Finally, the UNDP report also makes note of a 'compliance regimes' containing interoperability indicators for compliance, stakeholders, guide tools etc. (the example of the UK eGIF is mentioned here). This could be particularly important, given the difficulties that countries face in monitoring the NIF implementation and compliance. This item could be added to the EIF as a guideline.

2.5 Recommendations for NIFO

Throughout this report, a number of observations have been made in relation to the NIFO analytical model and data gathering. In addition, NIFO could play a facilitating role in some of the recommendations made for the EIF. Therefore, a number of issues have been identified that could be improved upon for the next round of NIFO.

First, the analytical model as it stands today provides useful insights and allows for assessing the extent to which alignment is being achieved by the countries. Nevertheless, a few enhancements could be made. For one, the NIFO analytical model is purely focused on NIF-EIF alignment as contained in the relevant country documents and initiatives. This means that there is no measurement towards implementation as such, but merely information that comes directly from the NIF and a scoring based on this information. The scoring per element contained in the NIFO analytical model is limited to a 0, 1 or a 2 score. This scoring mechanism only comprises a non-alignment (score 0) when a certain element is not identified in a country as part of the NIF, partial alignment (score 1) when a certain element is merely mentioned and full alignment (score 2) when a certain element is mentioned and explained in line with the EIF recommendation. The monitoring processes implemented by the countries should be examined in more detail. Doing so would provide an opportunity to

- Share the information and good practices on the NIFO community
- Update the NIFO analytical model in line with the recommendation for the EIF to include categories on implementation and the monitoring of compliance regime

Therefore, it was decided to modify the scoring system by adding a second dimension to the analysis, focusing on the status of implementation and monitoring of the principles and elements of NIFs. Two scoring systems shall be applied in order to capture the two dimensions of the analysis, i.e. the alignment of NIFs with the EIF and the level of implementation and/or monitoring.

¹⁰ http://www.forumstandaardisatie.nl/fileadmin/os/documenten/RAND_rapport_def.pdf, accessed 12/02/2013

¹¹ UNDP, e-Government Interoperability: Guide; United Nations Development Programme, 2007

For the alignment dimension, no changes are defined, therefore the scoring remains as it is, based on the following scores:

- 0 = not aligned;
- 1 = partially aligned;
- 2 = fully aligned.

For the implementation/monitoring dimension, the following scoring apply:

- 0 = not implemented and not monitored;
- 1 = implemented or monitored;
- 2 = implemented and monitored.

Currently, the NIFO analytical model contains evidence of countries related to each element per category in terms of where the specific element is implemented. However, the NIFO analytical model is not as such published online. Nevertheless, it would be beneficial to make use of this information by implementing the NIFO analytical model in an online environment. This would mean that the information contained in the model could be presented in a structured and searchable way such that countries could look-up experiences from other countries for specific elements and compare the approaches. This would cater to the request of the countries to have more practical information and examples and would facilitate the collaboration between countries.

Not only can the information contained in the NIFO be provided as a reference for countries but a step further could be taken where countries themselves update their most recent status vis-à-vis the EIF recommendations online.¹²

A number of additional suggestions could be catered for by NIFO, including:

- The NIFO community could cater for the request for more practical information. A process should be devised to gather this more practical information and disseminate it via the community
 - ▢ Information is requested such as presentations, more detail on approaches and implementation solutions, case studies, etc.;
 - ▢ One of the improvements noted by the countries was that it would be useful if the EIF would have an overview table of the recommendations. However, as a first measure, a self-devised version could be provided on the community;
 - ▢ Post the NIFs and all the relevant information on the community;
- Analytical models for the NIFO to be filled in by the MS themselves and freely usable
 - ▢ A standardised way of collecting the information should be found;

¹² Such an approach would mirror the approach taken in a recent project implemented for DG CONNECT as part of the monitoring of the actions in the Digital Agenda for Europe under the responsibility of the Member States as well as for the evaluation of the eGovernment Action Plan. An online tool was created that allowed the Member States to log-on and provide updates on the status of each action as well as indicating related initiatives and best practices. This platform can be found online on: www.daeimplementation.eu and <http://www.egovap-evaluation.eu/>. The platform was setup to support the communication between the Commission and the Member States on the status of the actions. The platform was warmly welcomed by the Member States as evidenced by comments in the eGovernment Subgroup and the fact that 26 out of 30 countries had provided their input on the website (in the case of the Digital Agenda for Europe). Indeed, this platform allowed a smooth data-gathering process and close involvement of the countries as well as an as objective as possible measurement of progress.

- Such a system would speed up the update process and reduce the delays and loss of information due to changes in responsibility and unawareness;
- Encourage 'champions' on the community
 - Ensure that positive feedback is given to high contributors;
 - Jointly define with the countries what is considered a good practice so that consensus is reached and do this via the platform and the champions.

Currently the only information concerning alignment with the EIF that is published on the NIFO Community and provided to the countries is contained in the factsheets. The factsheets only present a summary of the information contained in the analytical model. As noted above, ideally countries should be able to post their own material as part of the analytical model so that over time a knowledgebase is established. The analytical model itself could provide a wealth of information of benefit to the countries since they could use it as a reference model. The model would allow for comparison and sharing of approaches and practical examples of how EIF recommendations are addressed across countries. This would allow countries to identify those countries that have taken specific measures to implement an element of the EIF and how this was done. Furthermore, the countries would be able to distil good practices; these could serve as a source of inspiration for other countries and may be tailored to the unique situation of each country.

3 Content of a NIF

The analysis carried out during the NIFO action showed the trends and patterns identified based on similarities and differences across countries. In this chapter, the elements that are common to the NIFs are highlighted in order to answer the question: *what should be included in a NIF?*

This chapter provides an analysis of the common elements identified in the analysis (common denominators) as well as from the related international debate concerning the definition of a NIF.

3.1 Definition of a NIF

The 19 countries included in the NIFO all work on interoperability and all align to some extent with the European Interoperability Framework. For the NIFO all efforts concerning interoperability are relevant, independent of the specific approach, format or name a country has chosen to give shape to interoperability at national level. In other words, what falls under the term National Interoperability Framework is not necessarily commonly agreed and understood among all countries.

As mentioned, the EIF defines an interoperability framework as:

*“An agreed approach to interoperability for organisations that wish to work together towards the joint delivery of public services. Within its scope of applicability, it specifies a set of common elements such as vocabulary, concepts, principles, policies, guidelines, recommendations, standards, specifications and practices.”*¹³

In order to analyse what is considered as part of a NIF two steps have been taken. First, the analysis of the NIFO comparative model in order to identify what the countries commonly have in place. Such common denominators could be very useful to shed light on what currently the NIFs across countries share and what constitutes a NIF today. Next, recent reports on interoperability frameworks and a number of interesting suggestions made on the JoinUp Community are taken up.

While analysing and identifying the set of common denominators present in the European NIFs included in the Observatory, it was decided to apply **a threshold of 65%**, i.e. including only those elements present in at least 65% of the NIFs¹⁴.

This list of minimum common denominators was complemented with additional considerations and elements. Two additional elements are the preference for open specifications (IOPA 3 in the table below) and the principle of multilingualism (PR 5 in the table below). These elements were added as

¹³ European Interoperability Framework (EIF) Annex 2 to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions 'Towards interoperability for European public services' http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf

¹⁴ The threshold of 65% was adopted as it allowed including elements from all the categories of the analytical model and in particular all those with the highest scoring.

multilingualism is seen as a crucial part of EIF for the implementation of European Public Services and the preference for open specifications emerged from the analysis as an element strongly contributing to alignment. Furthermore, the current and previous version of the IEF¹⁵ stressed the relevance of this element, together with international literature¹⁶.

The minimum set of common denominators that emerges from the analysis is provided in Table 3.

Table 3 – Elaborated list of minimum common denominators for a NIF

Elaborated list of minimum common denominators
• PR 2, user-centricity,
• PR 3, inclusion and accessibility,
• PR 4, the security and privacy principle,
• PR 5, multilingualism
• PR 9, the principle of openness,
• PR 10, reusability,
• CM 1, the fact that the NIF contains a conceptual model,
• CM 2, that the conceptual model is a component based service model,
• CM 4, the set-up of infrastructure to connect loosely coupled service components,
• CM 5, making the authentic sources of information available to others,
• CM 6, access and control mechanisms
• CM 7, development of interfaces to authentic sources
• IOPL 1, the fact that the four levels of interoperability are described,
• IOPL 2, the careful consideration of all the relevant legislation related to data exchange,
• IOPL 9, the encouragement to agree on the formalised specification to ensure technical interoperability when establishing European public services,
• IOPA 2, the existence of a structured, transparent and objective approach to assess and select formalised specifications,
• IOPA 3, preference for open specifications,
• IOPG 1, interoperability governance.

As the table above shows, the set of common denominators of the NIFs analysed includes elements from all the five categories of the EIF (i.e. principles, conceptual model, interoperability levels, interoperability agreements and interoperability governance).

The set of common denominators stated above is directly derived from the EIF and the current state of play concerning the alignment of NIFs with the EIF. This list is therefore a view on what the countries have so far addressed and serves as an indication of priorities across countries for the establishment of a NIF. A NIF, however, is a living ‘thing’ either established in documents, compiled on a website, or in some cases established in laws and regulations.

In general, across the countries the relevant sources where specific elements relating to the EIF are addressed at national level is quite scattered. The information around interoperability and the NIF is generally spread across different sources (e.g. documents, websites, and laws) and across different administrations. Some countries (like Italy and Denmark) have consolidated their efforts into a single

¹⁵ See <http://ec.europa.eu/idabc/servlets/Doccd552.pdf?id=19529> and http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf respectively.

¹⁶ For example: UNDP (2007) eGovernment Interoperability: Overview; United National Development Programme, p.3

agency. This may not be the most suitable approach for all countries but on a smaller scale consolidation efforts could be undertaken to provide an overview of the NIF.

Having at least a single place where the information around interoperability is gathered, in the form of a document or a wiki page or just a section on the webpages, can provide benefits, including:

- the general public (citizens and businesses) could consult this single source of information;
- communication towards Europe would be eased since there would be a single point for gathering information and posting updates;
- communication towards and awareness of different public administrations is easier;
- communication and access channels for interested third parties (other countries, standardisation agencies, etc.) would be clearly defined and easily accessible.

This approach of centralising information is supported by countries that:

- already have a central document like Malta and Estonia, or are planning on establishing a central document like Austria;
- already have a central point of access like Belgium, Portugal and Slovenia, or are planning on establishing one like Germany.

3.2 Discussion on NIF

The definition of a NIF and in the elements contained in it is subject to debate in related literature and was also debated within the JoinUp community¹⁷.

The starting point of the discussion was the definition of an Interoperability Framework as stated in the EIF v2. No specific definition has been made for a National Interoperability Framework, therefore one of the difficulties that countries currently face is determining what a NIF actually is and what it should comprise. The definition of the NIF should ideally be a clear description of the framework's boundaries and modus operandi within the national context. In the Maltese case, the NIF is a single document but the actual framework for interoperability relies on a large set of ICT policies and Enterprise Architecture practices.

Some participants to the debate stated that the original definition of the EIF should be taken with some caution. For instance, not everybody agreed with the EIF sentence *“An interoperability framework is an agreed approach to interoperability for organisations that wish to work together towards the joint delivery of public services”*. It is argued that the interoperability framework does not necessarily include agreement of the relevant organisations. This highlights the complex nature of a NIF, that is generally established at national level but is intended to be used for implementation by public administrations at all levels of government (national, regional, local).

Furthermore, some of the participants to the debate state that "public services" does not fit into the general definition, as there could be IFs within organisations or between organisations for services that are not necessarily 'public'. However, the scope of EIF is "public services" without it the definition is too general. Some countries on the other hand are not so concerned with the format or the definition of a NIF but rather with what the benefits and actual outcomes are for projects related to interoperability.

¹⁷ <https://joinup.ec.europa.eu/community/nifo/topic/nif-definition-not-suited-its-purpose>, accessed 12/02/2013

A relevant study to this debate conducted by RAND in The Netherlands came to another definition of interoperability framework. It states that “An interoperability framework is a set of principles, policies, criteria, specifications, standards, protocols, and procedures aimed at helping eGovernment developers to design, acquire, and implement systems, data, semantics, business processes, and policies that interact with each other efficiently, effectively, flexibly, and meaningfully to enable government organizations to provide useful services to citizens, businesses, and each other¹⁸.” The study was conducted to provide The Netherlands with a better view what should be included in a NIF since NORA is considered more of an Enterprise Architecture. The RAND study accentuates that governance should be one of the first items that is established, next to semantic interoperability.

The study describes three levels where an IF should provide guidance, namely on the Governance, System and Implementation levels. RAND furthermore proposes four steps that lead to a NIF:

1. Develop a strategy to ensure semantic interoperability
2. Develop a governance model for the IF
3. Implement the IF governance model
4. Use this governance model to develop the IF

The study also provides for detailed elements that should be included in an interoperability framework. These can be mapped to the elements of the EIF.

Another relevant report from the UNDP¹⁹, the UNDP e-Government Interoperability Guide²⁰, analysed the Government Interoperability Frameworks (GIFs) of 14 nations across the world in order to identify what constitutes a GIF and help other countries to deliver better public services. The UNDP Guide identifies the following guiding principles in the development of countries' GIFs:

- ❑ Interoperability;
- ❑ Scalability;
- ❑ Reusability;
- ❑ Openness;
- ❑ Market Support;
- ❑ Security
- ❑ Privacy.

In addition, it identifies Accessibility, Multilingualism and Transparency as three additional elements especially relevant in some countries (the first two in the EU and the third one in Brazil).

A detailed study on what these different elements comprise and how they could influence the EIF and NIF will be the subject of a separate report. As a general comment, the elements and categories included in the EIF, in the RAND study and in the UNDP report overlap to a good extent. There are however, three categories proposed by both studies (RAND and UNDP) that do not appear in the EIF; these are:

- ❑ Implementation;
- ❑ Compliance regime;

¹⁸ http://www.forumstandaardisatie.nl/fileadmin/os/documenten/RAND_rapport_def.pdf, accessed 12/02/2013

¹⁹ UNDP, e-Government Interoperability: Guide; United Nations Development Programme, 2007

²⁰ See table 46 in Annex

▣ Development process.

Implementation for the UNDP comprises ‘implementation support tools’. RAND adds a roadmap to see the evolution towards the future.

Compliance regime is something that is not included in the current EIF and one of the items that could be considered in future version of the EIF²¹. RAND stipulates the addition of a measurement and evaluation framework, compliance criteria, adoption or implementation advice and best practices. The UNDP names interoperability indicators, responsibility for compliance, stakeholders, guide tools and non-compliance as elements within the compliance regimes. “Relationships to other efforts” is also noted explicitly by both studies. From experience during the implementation of the NIFO it is clear that many interoperability related initiatives are being carried out at national level that are not formalised in the EIF nor seen as part of the NIF.

The development process of the NIF, noted by the UNDP can also be considered. As a way to further and promote the development and revision process including relevant actors, responsibilities and a mechanism for consultation.

Several categories part of the EIF, including the conceptual model as well as semantic and technical aspects do not explicitly appear in the UNDP or RAND reports. Whereas the RAND study states infrastructure components and architectural advice to be of importance, the UNDP report does not make note of this. The RAND report mentions governance as prerequisite to establish cooperation, the UNDP does not note it that explicitly.

As mentioned a more detailed assessment of the elements included by the RAND and UNDP studies and how these compare with the EIF will be provided in a separate report. This analysis will provide input for further discussion on the definition of a NIF and possibly for a re-elaboration of a set of common denominators.

²¹ Indeed, this element has been taken into consideration by the EIF and has been included in the new cycle of the NIFO monitoring exercise, currently ongoing.

4 Guidelines for better EIF – NIF alignment

This chapter presents the analysis that provides insights on the basic research question of the report: *What should be included in a NIF in order to align with the EIF as much as possible? The analysis identifies the current trends in the development of interoperability and the factors influence the scores on NIF-EIF alignment?*

The purpose of the NIFO assessment is not to carry out a fully-fledged benchmarking exercise among European countries. The analysis refers to the status of the NIF-EIF alignment in the 19 countries covered by NIFO.

After a general overview of the NIF-EIF alignment (section 3.1), more details on the alignment for each of the categories of the analytical models are provided. Therefore, the chapter provides details about the NIF-EIF alignment on principles (section 3.2), conceptual model (section 3.3), interoperability levels (section 3.4), interoperability agreements (section 3.5) and interoperability governance (section 3.6). Whenever relevant, best practices from Member States are included.

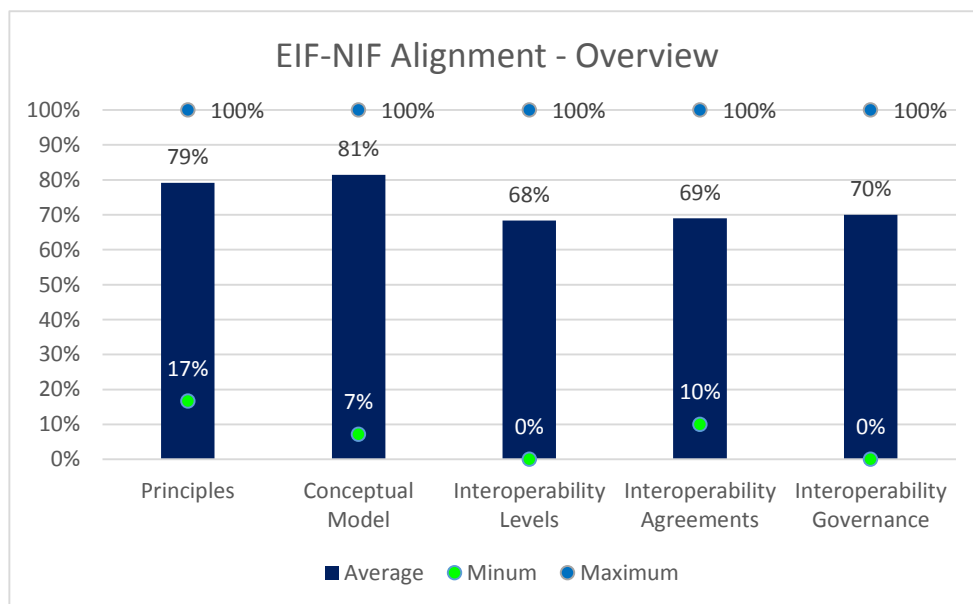
4.1 Overall alignment

The figure below shows the overall alignment of the 19 NIFs included in the analysis to the EIF. In particular, the blue bar shows the average alignment (calculated as the average of the scores for all countries for each of the five categories). The blue spot shows the highest level of alignment for each category (measured as the highest average score reached by a country) and the green spot the lowest level of alignment per category (measured as the highest average score reached by a country).

The five main dimensions of the EIF and the NIFO comparative model taken into consideration for analysis are:

- ❑ Principles;
- ❑ Conceptual Model;
- ❑ Interoperability Levels;
- ❑ Interoperability Agreements;
- ❑ Interoperability Governance.

Figure 1 - EIF-NIF alignment - Overview



As the figure above shows, there is overall a good level of alignment. The average alignment varies depending on the categories considered, with the highest alignment on the conceptual model (81%) and the lowest alignment with the interoperability levels (68%).

Looking at the lowest levels of alignment the picture shows that there is in general quite a wide range between the average alignment and the lowest alignment for each of the five categories. The gaps are notable especially for the categories of interoperability levels and interoperability governance; where with respect to the average alignment of 68% and 70% respectively some countries do not align at all (the lowest score is 0%). The gap is less in the cases of principles, interoperability agreements and conceptual model. It should be noted that Estonia is an exceptional case. Estonia's NIF fully aligns with the EIF on every category and its underlying elements (100% score).

The wide divergence in the scores reflects the different levels of maturity of the NIFs in the countries analysed. Indeed, some countries have started working on interoperability and on establishing a NIF only recently, while in other cases those activities date back several years. Furthermore, other factors that influence the alignment include legal and organisational aspects, technical factors (also including the existence of legacy systems), creation and transfer of related knowledge within the public sector, and external factors (such as the limited available resources for the development and maintenance of the NIF due to pressures on public budgets). The analysis of the main challenges linked with establishing and implementing a NIF (and aligning it with the EIF) are presented in Chapter 5.

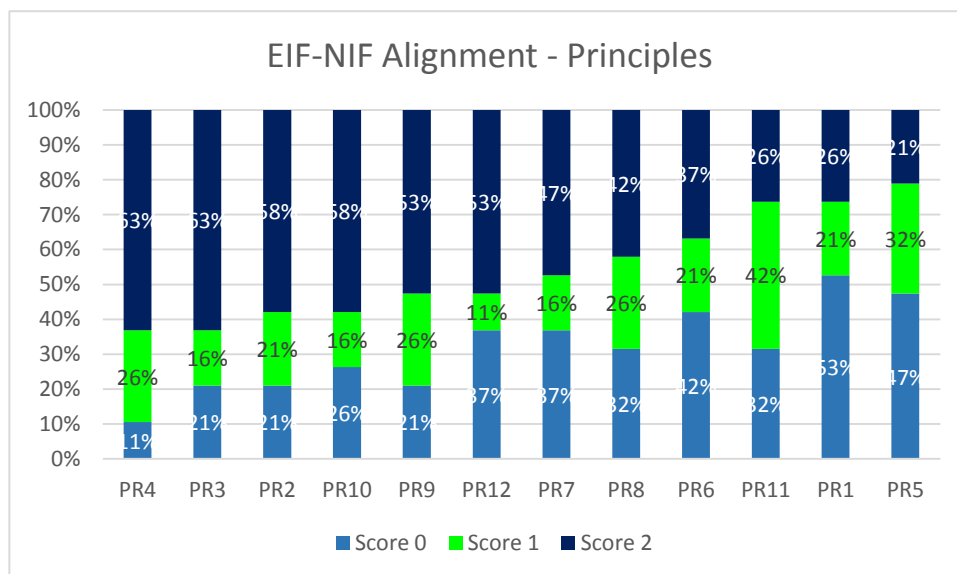
4.2 Principles

The principles set out in the EIF refer to principles of good administration that are relevant to the process of establishing European public services. The following 12 underlying elements have been defined in the EIF:

- ✘ PR 1 - Subsidiarity and proportionality: The subsidiarity principle requires EU decisions to be taken as closely as possible to the citizen. In other words, the EU does not take action unless this is more effective than action taken at national, regional or local level
- ✘ PR 2 - User-centricity: Public services are intended to serve the needs of citizens and businesses.
- ✘ PR 3 - Inclusion and accessibility: Public administrations should ensure that public services are accessible to all citizens, including persons with disabilities and the elderly, according to e-accessibility specifications widely recognised at European or international level.
- ✘ PR 4 - Security and privacy: Public administrations should consider the specific needs of each European public service, within the context of a common security and privacy policy
- ✘ PR 5 - Multilingualism: Public administrations should use information systems and technical architectures that cater for multilingualism when establishing a European public service
- ✘ PR 6 - Administrative simplification: Takes into account the reduction target of administrative burden on businesses by 25% by 2012 when establishing European public services.
- ✘ PR 7 - Transparency: Citizens and businesses should be able to understand administrative processes. They should have the right to track administrative procedures that involve them, and have insight into the rationale behind decisions that could affect them. Transparency also allows citizens and businesses to give feedback about the quality of the public services provided, to contribute to their improvement and to the implementation of new services.
- ✘ PR 8 - Preservation of information: Public administrations should formulate together a long-term preservation policy for electronic records relating to European public services.
- ✘ PR 9 - Openness: Public administrations should aim for openness when working together to establish European public services, while taking into account their priorities and constraints
- ✘ PR 10 - Reusability: Public administrations are encouraged to reuse and share solutions and to cooperate on the development of joint solutions when implementing European public services.
- ✘ PR 11 - Technological neutrality and adaptability: Public administrations should not impose any specific technological solution on citizens, businesses and other administrations when establishing European public services.
- ✘ PR 12 - Effectiveness and efficiency: Public administrations should ensure that solutions serve businesses and citizens in the most effective and efficient way and provide the best value for taxpayer money.

The figure below shows the degree of alignment of the 19 countries on the EIF principles. For each of the 12 elements contained in this category, the percentage of countries with a 0, 1 or 2 score is presented. The figure depicts the elements per decreasing level of NIF-EIF alignment.

Figure 2 – EIF–NIF alignment – Principles



As the figure shows, **security and privacy (PR 4)**, **inclusion and accessibility (PR 3)** and **user-centricity (PR 2)** are the elements on which NIFs are more aligned (the percentages of 2 and 1 scores are higher). On the other end of the spectrum, **multilingualism (PR 5)**, **subsidiarity and proportionality (PR 1)** and **technological neutrality and adaptability (PR 11)** are the elements less aligned (the percentages of 2 and 1 scores are lower).

Specific **examples concerning the principle on security and privacy (PR 4)** include **Estonia**, which states that through **personalised portals** the privacy of information can be ensured, these should be based on **secure data services**, and ensure **confidentiality, authenticity, availability, and verifiability**. The Estonian NIF also states that services must include the possibility for end-users to check and improve the public sector-related data collected and insight into the public's view of the data collected. With this, the Estonian NIF also provides for a clear focus on user centricity through this principle.

The second element of the principles concerns **user centricity (PR 2)**, where the user is put forward as the consumer of the government services and should therefore be at the centre of attention. **Germany** addresses this point by stating that there should be an orientation on usefulness for citizens, businesses and public administration. **Austria** has a similar view of putting the user in the centre, however, here the focus is solely on electronic means of communication (see also box). **Estonia** states that regarding inclusion of

Austria focuses solely on electronic means of communication by stating that *'Proximity to citizens: Government should be at the disposal of the people and not the other way around. Online services need to be easy to find and available at all times.'* This is linked to usability: *'The range of electronic services offered must be structured in an easily comprehensible, clear and straightforward manner. In order to gain acceptance and approval from users, forms and portals need to have a consistent design. Navigation and menus will need to be structured in an intuitive and logical way.'* (See also: Digital Austria, Administration on the Net, <http://www.digitales.oesterreich.gv.at/DocView.axd?CobId=44576>)

specific clusters of citizens like the elderly and people with special needs should have the same level of service as those other citizens accessing eGovernment services.

With regards to **reusability** (PR 10), the manner of describing this principle ranges from the provision of standardised services (Netherlands), to the reuse of software programs (and the creation/existence of specific repositories, as in Italy) and to the fact that content, basic services, applications and infrastructure can be bundled and re-used (Germany).

Openness (PR 9) is one of the principles that with a relatively high degree of alignment. However, this principle is interpreted differently by the Member States. **Italy** states that public data should be available in open formats so that third parties can process it; while **Estonia** goes further stating that public administrations need a justification for the use of closed standards and specifications.

The principle of **administrative simplification** (PR 6) has a relatively low level of alignment. Administrative simplification is understood in different ways across countries. The interpretation ranges from establishing a dedicated business manager for each service provided (**Greece**) to stating clearly within a law that the length of administrative procedures should be reduced substantially (**Spain**).

Technological neutrality and adaptability (PR 11) is also addressed differently across countries. Some countries focus on ensuring that this is verified by agencies or officials not involved in their implementation can check and enforce neutrality and adaptability of the operation, maintenance and upgrading of ICT for public services (as in **Malta**). In other cases, the principle of technological neutrality and adaptability is included in state laws with the aim to guarantee independence in the choice of alternative technologies by end-users and by public administrations as well as the liberty for public administrations to develop and implement technological advances within the context of the free market (e.g. **Spain**). The use of open standards and/or standards that are generally used and have substantial market take-up by public administrations is encouraged or enforced (e.g. **Denmark, The Netherlands**).

One of the least implemented principles is **subsidiarity and proportionality** (PR 1). The manner of implementation ranges from a general principle, such as the “residual responsibility principle” in **Denmark** that gives individual organisations responsibility for everything not regulated at a more central level, to more explicit acknowledgement of responsibilities at different levels. **Estonia** states that nation-wide information policy decisions should be established only if they are more effective than public sector agencies’ on the spot decisions, while information systems should take into account the drive for centralisation of services.

Multilingualism (PR 5) is an item that proves difficult in practice. Statements mainly concern domestic languages and having some other languages covered (like Austria, Denmark) to a wider range of languages like in Estonia (see box). The **Danish** NIF is seen predominantly as a domestic effort and since Denmark is not officially multilingual, multilingualism is not prominent. However, the strategy and parts of 'digist' are translated in English. In addition, the NDR for the XML dialect OIOXML does provide the user the choice between Danish and English as their working language.

The Estonian NIF defines multiple criteria and languages:

- Pan-European services, information services and user interfaces should be provided in addition to Estonian and English, Russian or other users with appropriate key languages.
- Tracking user interfaces should be easily adaptable to other languages.
- Information systems architecture, data structures, and the software should be language-neutral: the information system functionality in another language should include the realisation of a recycling mechanism.
- Information systems should support the semantics of multi-lingual and international.
- The state supports a significant population of free consumer software translated into Estonian.
- Public information systems and software products should include support for Estonian language technology tools.

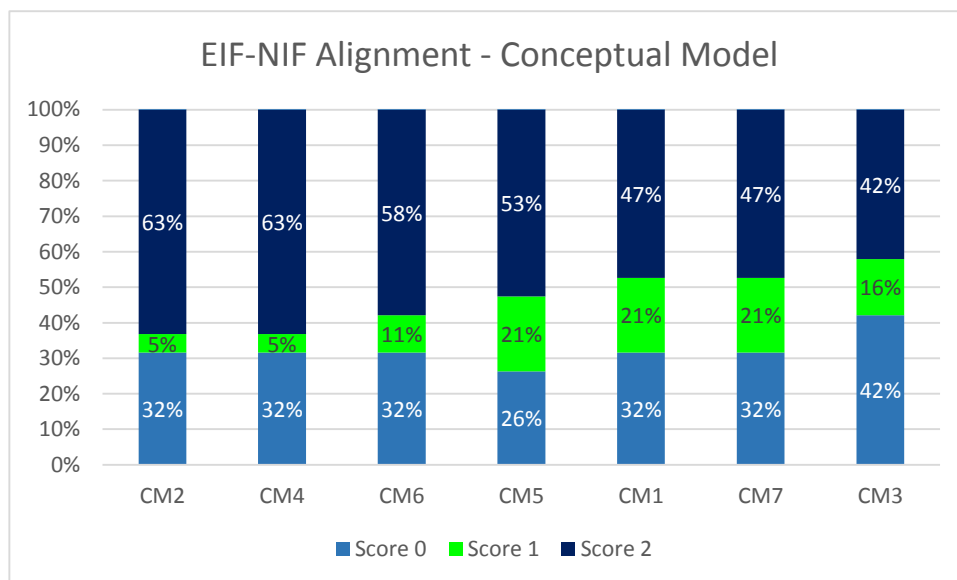
4.3 Conceptual model

The conceptual model as depicted and explained by the EIF brings together the common aspects and best practices observed from the implantation of public services in the Member States. As a blueprint for future implementations of European public services, the model helps develop a common vocabulary and understanding across Member States about the main elements of a public service. The model emphasises a building-block approach to setting up European public services, allowing for the interconnection and reusability of service components when building new services. The following seven underlying elements, defined in the NIFO comparative model as elements, have been derived from the EIF

- ❑ CM 1: Does the NIF contain a conceptual model?
- ❑ CM 2: Is the conceptual model a component-based service model? (e.g. SOA)
- ❑ CM 3: Does the NIF encourage the use of common schemes to interconnect loosely coupled service components?
- ❑ CM 4: Does the NIF encourage to put in place the infrastructure to interconnect loosely coupled service components?
- ❑ CM 5: Does the NIF encourage to make the authentic sources of information available to others?
- ❑ CM 6: Does the NIF encourage access and control mechanisms to ensure compliance to security and privacy legislation?
- ❑ CM 7: Does the NIF encourage the development of interfaces to authentic sources that are aligned at semantic and technical level?

The figure below shows the degree of alignment concerning the EIF conceptual model. For each of the seven elements contained in this category, the percentage of countries with a 0, 1 or 2 score is presented. The figure depicts the elements per decreasing level of NIF-EIF alignment.

Figure 3 – EIF–NIF alignment – Conceptual Model



As the figure shows, a **component-based service model (CM 2)**, **loosely interconnection of coupled service components (CM 4)** and **access and control mechanisms to ensure compliance to security and privacy (CM 6)** are the elements on which NIFs are more aligned (the percentages of 2 and 1 scores are higher). On the other end of the spectrum, **common schemes (CM 3)**, **aligned interfaces (CM 7)** and **conceptual model (CM 1)** are the elements less aligned (the percentages of 2 and 1 scores are lower).

The element that shows the highest degree of alignment is the **conceptual model as a service-based**

Austria puts forward a number of security related infrastructure components:

- **Public Key Infrastructure:** The public key infrastructure (PKI) forms the basis for authentication and identification of electronic communication with public authorities. This technology is based on the principles of asymmetric encryption.
- **Citizen Card Concept:** The citizen card concept offers functionality for the identification and authentication. The token controls the calculation of cryptographic functions and access to the data on the citizen card. The data stored on the citizen card includes the user's first and last names, date of birth and the keys required for creating signatures. In a separately controlled area, the source PIN for deriving sector-specific personal identifiers, and, where applicable, data on authority to act as a representative is stored as signed data according to applicable standards.

model (CM 2). This element is the most implemented across all countries covered. In many cases, explicit references are made to the fact that Service Oriented Architecture (SOA) will be used. **Estonia** a clearly states "*The state IT architecture will be developed for a service oriented architecture*". Furthermore, in Italy the Sistema Pubblico di Cooperazione (SPCoop) is to be used to support public administrations' e-government application services, this SPCoop is currently modelled as a Service Oriented Architecture (SOA), implemented using Web Service technologies.

The infrastructure to interconnect loosely coupled service components (**CM 4**) similarly shows a relatively high level of alignment. In **Spain** the communication network for public administration (red SARA) has been developed that allows for the interconnection of services and networks of the European Institutions and of other Member States.

Belgium has put in place the Federal Service Bus through which service oriented services are offered and brokered supported by international standards (e.g. SOAP, WSSecurity, UDDI), using a registry of published services and a repository with service documentation.

Some countries refer to building blocks (such as Estonia and The Netherlands) that can be used as common infrastructure services. In Austria, the ELAK infrastructure enables communication between core applications and systems of public administrations through defined interfaces. Denmark refers to Service-Oriented infrastructure standards to be used.

The access and control mechanisms to ensure compliance to security and privacy (CM 6) is also relatively well covered across the countries. Certain countries refer to a separate document, for example, the Austrian Handbook for Information Security describes the different measures in place. Others refer to the applications in place to ensure access control (e.g., **Estonia** states that authentication for data exchange is issued by X-road (systems security certificate server)).

The need for a NIF to contain a **conceptual model** (CM 1) is among those with the lowest alignment. The analysis shows that if the definition of “conceptual model” is taken to include a graphical representation it is very difficult to achieve for those countries that have written down their NIF in a legislative text (like Spain and Greece). **Italy** has solved this problem by having a separate document “NIFO document v1.2” that does have a graphical representation of the conceptual model. **Estonia** takes over the European Conceptual Model as an example.

The **development of interfaces to authentic sources aligned at technical and semantic level** (CM 7) is linked to CM 5 (encouragement to make authentic sources available). While more countries cover authentic sources under CM 5, the alignment interfaces at technical and semantic level is less covered. In The Netherlands, public administrations are encouraged to explicitly to create interfaces to use authentic sources. In Denmark, a more practical approach is taken, stating that many of the central authentic sources such as The Central Person Registry (www.cpr.dk) and The Central Business Registry (www.cvr.dk) are open and aligned by law and design. This is considered a core business requirement for registries. Although it is not explicitly mentioned in the NIF, the basic-data initiative aims to define, align and make available core authentic sources.

The usage of **common schemes to interconnect loosely coupled service elements** (CM 3) is an element that is not broadly taken up by the countries, as it shows the lowest level of alignment. Those countries that have elaborate descriptions go to the detail of stating e.g. that “*The X-Road data exchange layer can be regarded as the realization of services. Information systems need to be linked as loosely agreed in a common X-way and agreed XML (Extensible Markup Language) schemes and protocols.*” (**Estonia**); or that “*The SPCoop - Sistema Pubblico di Cooperazione [Public Cooperative System] presents the enterprise architecture that has been adopted for the realisation of a nationwide system*” (**Italy**).

4.4 Interoperability levels

The interoperability levels are in the strictest sense the four interoperability layers of legal, organisational, semantic and technical interoperability. All these layers deserve special attention when a new European

public service is established. The practical implementation of the conceptual model for cross-border/cross-sectoral services requires each of these levels to be taken into account.

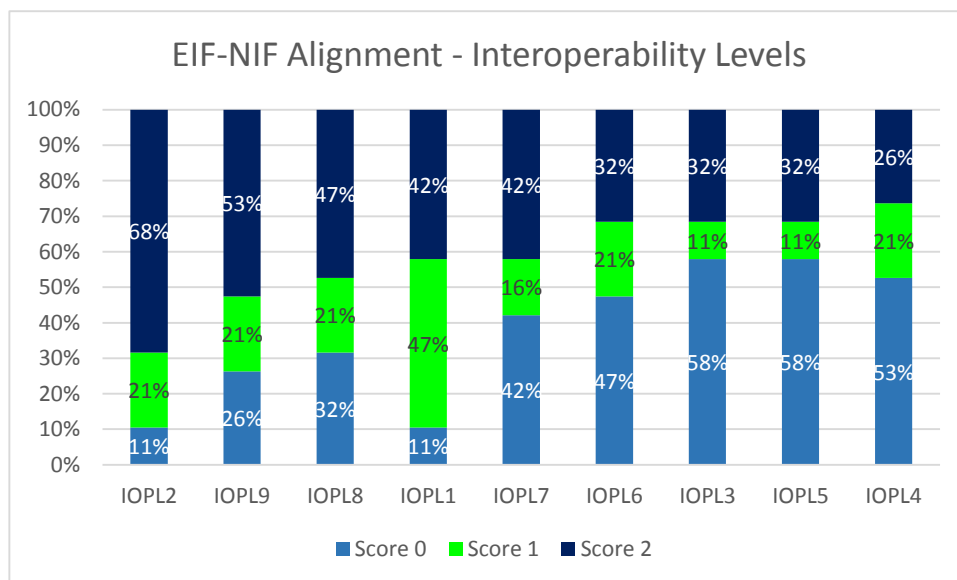
The interoperability levels treat the organisational aspect of having processes, having communities to facilitate semantic interoperability, the usage of formalised specifications, legislation related to data exchange and the consideration of the four levels of interoperability.

The following nine underlying notions, defined in the NIFO analytical model as elements, have been derived from the EIF

- ❑ IOPL 1: Does the NIF describe the four levels of interoperability?
- ❑ IOPL 2: Does the NIF impose to consider all relevant legislation related to data exchange?
- ❑ IOPL 3: Does the NIF describe that the business processes are documented in an agreed way in order for other administrations to understand the overall business process?
- ❑ IOPL 4: Does the NIF encourage to agree on how these processes will interact among the different levels of public administrations?
- ❑ IOPL 5: Does the NIF encourage public administrations to clarify their organisational relationships as part of the establishment of a (European) public service?
- ❑ IOPL 6: Does the NIF encourage public administrations to agree on change management processes to ensure continuous service delivery?
- ❑ IOPL 7: Does the NIF encourage the usage of a common taxonomy of basic public service?
- ❑ IOPL 8: Does the NIF encourage public administrations to support the establishment of sector-specific and cross-sectoral communities that aim to facilitate semantic interoperability and that share results on national and European platforms?
- ❑ IOPL 9: Does the NIF encourage public administrations to agree on the formalised specification to ensure technical interoperability when establishing European public services?

The figure below shows the degree of alignment of the EIF interoperability levels. For each of the nine elements contained in this category, the percentage of countries with a 0, 1 or 2 score is presented. The figure depicts the elements per decreasing level of NIF-EIF alignment.

Figure 4 – EIF–NIF Alignment – Interoperability Levels



As shown in the figure, the element related to the legislation related to the secure data exchange (IOPL 2) is the one with the highest level of alignment, followed by the usage of formalised specifications to ensure technical interoperability (IOPL 9) and by the establishment of sector-specific and cross-sectoral communities that aim to facilitate semantic interoperability (IOPL 8). On the other hand, the documentation of business processes in an agreed way (IOPL 3), the clarification of the organisational relationships (IOPL 5) and the agreement on interaction of processes among different levels of the administration (IOPL 4) have the lowest degree of alignment.

The element related to **the legislation related to the secure data exchange** (IOPL 2) is a prevalent element for all countries, and the one with the highest level of alignment. Most often it refers to a (or a set of) legislative act(s). This is the case for **Austria** for example, where the elements relates to the eGovernment Act, the General Administrative Procedures Act, Service of Official Documents Act and Electronic Signature Act. In **Denmark** this is covered by the Personal Data Act, while **Malta** does not refer to legislation itself but to ICT Governance and the Compliance Management Frameworks.

The **usage of formalised specifications to ensure technical interoperability** (IOPL 9) is often detailed by the best scoring countries by stating that there is a list of agreed upon specifications, often open specifications. Regularly this list is included in the NIF itself or it is referenced if it is published elsewhere. Ranging from specific documents on technical interoperability like SAGA for **Germany** to referencing an online repository like **Austria**.

The **establishment of sector-specific and cross-sectoral communities that aim to facilitate semantic interoperability** (IOPL 8) can be interpreted in different ways. **Estonia** states that the Semantic Interoperability framework recommends private companies and associations to participate in the creation, publishing and implementation of semantic assets. **Germany** promotes the German XöV standardisation initiative.

In Spain a broad vision on IOPL 8 is taken through:

- The establishment a Centre of semantic interoperability of the Administration: it will publish the models for exchange data, both common and sectorial, as well as the relative ones to common infrastructures and services, together with the associated definitions and codifications;
- The establishment of publishing of data interchange models that will be mandatory for information interchange between Public Administrations.

The **documentation of business processes in an agreed way** (IOPL 3) is amongst the elements with the lowest alignment. In several countries (Bulgaria, Denmark, Italy and Spain), this element was not observed. In other countries (like Austria) work is underway to establish a service catalogue and to define services. Some actions are therefore on going on even though these may not be stated explicitly in the NIF. As for the countries that have received a full alignment score, the level of detail provided differs. **Estonia** describes in several paragraphs (sections 4.12 until 4.16) what must be included as regards the processes. In addition, it notes that processes should be documented in a unified way so that administrations can work together. **Greece** goes beyond this and by stating that the process and data models' design must be based on BPMN and UML activity diagrams in the case of processes; and XML Schema and UN/CEFACT CCTS in the case of documents and data.

The element calling for the **clarification of the organisational relationships** (IOPL 5) also has a low level of alignment. **Denmark** takes a pragmatic approach, stating that the organisational relationships are clarified in the course of any collaboration. At the time of writing **Germany** is setting up a process library, designed to manage process building blocks and bring together the knowledge of administrative processes that exist at various levels. In **Estonia**, organisational units and roles involved in the provision of a service must be clearly reported in the documentation of the service. **Greece** goes a step beyond, as the NIF affirms that:

- The organisational units and roles involved in the provision of a service must be clearly reported in the documentation of the service.

- For each service provided, public administrations must know which bodies they communicate with, the aim of the communication and the information they exchange. The operational points of contact between bodies must be assigned on the organisational unit level of the bodies.

The Netherlands take up IOPA 5, which states that public administrations should agree on minimum service requirements for secure data exchange on a very practical level:

- AP 28: service provider and user have agreed on a Service Level Agreement
- AP 33: the service agrees with the Quality baseline. The baseline is a normative framework within the organisation, but based on standards en agreements within the sector
- NORA explains that individual organisations are themselves responsible for reaching these agreements.

IOPL 4, regarding **encouragement to agree on how these processes will interact among the different levels of public administrations** is scarcely present in many countries (it has the lowest level of alignment for the dimension. Good examples can be stated to be **Estonia**, though this is confined to all information systems architecture documents stating that they should clarify the processes they cover and how the

processes collaborate with other (external) processes and **Germany**, where a National Process Library is being established together with a platform for consultation.

4.5 Interoperability agreements

Interoperability agreements propose an approach to facilitate cooperation among public administrations cooperation at the different interoperability levels. Ideally, these cooperation arrangements are formalised in interoperability agreements. These agreements need to contain sufficient detail but also need to leave internal autonomy to the organisation. For the legal level, interoperability agreements are rendered specific and binding via legislation.

Service Level Agreements (SLA) or Memorandums of Understanding (MoU) can specify the obligations of each party participating in cross-border business processes for the organisational level. These documents can define expected levels of service, support/escalation procedures, contact details, etc. They may refer to agreements made at semantic and technical levels.

At semantic level, interoperability agreements can take the form of reference taxonomies, schemes, code lists, data dictionaries, sector-based libraries and so forth.

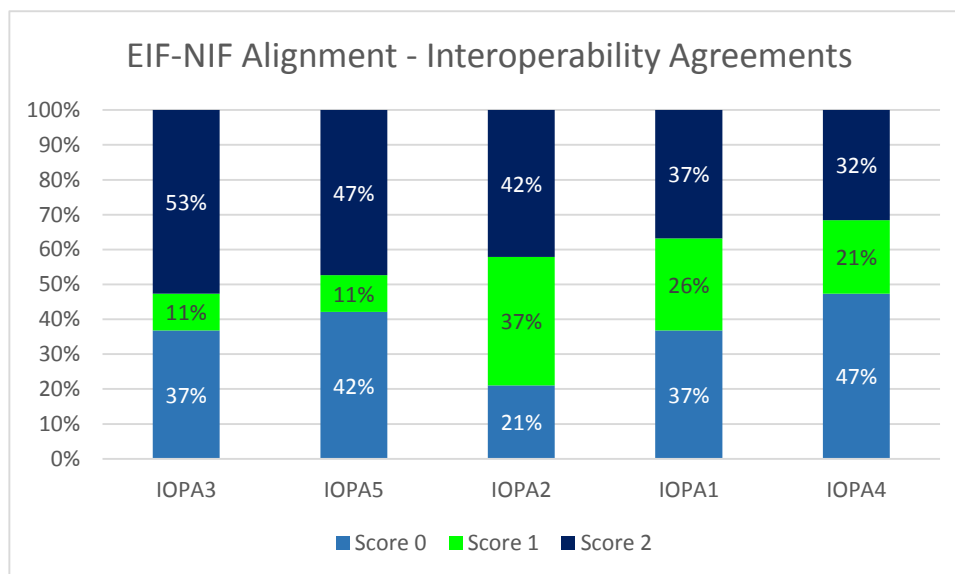
At technical level, interoperability agreements include interface specifications, communication protocols, messaging specifications, data formats, security specifications or dynamic registration and service discovery specifications.

The following five underlying notions, defined in the NIFO analytical model as elements, have been derived from the EIF

- ▶ IOPA 1: Does the NIF encourage:
 - ▶ Interoperability agreements to be based on existing formalised specifications? Or
 - ▶ if they do not exist, to cooperate with communities working in the same areas?
- ▶ IOPA 2: Does the NIF encourage Public administrations to use a structured, transparent and objective approach to assess and select formalised specifications?
- ▶ IOPA 3: Does the NIF encourage public administrations to prefer open specifications, taking due account of the coverage of functional needs, maturity and market support?
- ▶ IOPA 4: Does the NIF encourage public administrations to lead or actively participate in standardisation work relevant to their needs?
- ▶ IOPA 5: Does the NIF encourage public administrations to agree on minimum service requirements for secure data exchange?

The figure below shows the degree of alignment of the interoperability agreements. For each of the five elements contained in this category, the percentage of countries with a 0, 1 or 2 score is presented. The figure depicts the elements per decreasing level of NIF-EIF alignment.

Figure 5 – EIF–NIF alignment – Interoperability agreements



The element with the highest level of alignment is **preference to open specifications** (IOPA 3), followed by **agreement on minimum service requirements for secure data exchange** (IOPA 5) and **usage of a structured, transparent and objective approach to select specifications** (IOPA 2). Conversely, the need to **base interoperability agreements on existing formalised specifications** (IOPA 1) and encouragement to public administrations to **actively participate to standardisation work** (IOPA 4) show the lowest levels of alignment. It is interesting to note that Interoperability Agreements is the category that shows the smallest gap between the most and least aligned elements among the five elements in the analytical model.

Concerning the **preference of open specifications** (IOPA 3), some countries are quite explicit in what they consider as the criteria to prefer open specifications and state these clearly in their NIF: **Bulgaria** and **Estonia** mention openness, accessibility and maintenance, maturity, potential, market value, eligibility or applicability to national needs. **Italy** on the contrary only mentions, “open format”.

The second most aligned element of the Interoperability Agreements is the **agreement on minimum service requirements for secure data exchange** (IOPA 5). The implementation of this differs among countries. Some have a rather flexible approach, leaving to the parties involved in each collaboration the task of defining the service requirements. For instance, in **Denmark** it is generally assumed that service requirements are clarified in the course of any collaboration so it is not handled expressly in the NIF, while **Malta** states that while trust features are required in all data exchange scenarios, the level of assurance is dependent on factors that can be determined by participating parties.

IOPA 2 (**usage of a structured, transparent and objective approach to select specifications**) is implemented in different ways across countries. The **Dutch** Standardisation Forum has drafted an open procedure for making a list of standards. Organisations need to comply or explain to the standards on the list. Some countries (like Malta and Bulgaria) state general criteria to select the standards that can be applied easily.

The **encouragement to base interoperability agreements on existing formalised specifications** (IOPA 1) also ranges in the way it is adopted in NIFs. Some leave a certain degree of freedom for the implementation by administrations (such as **Denmark**), while others refer to specific documents that describe this in more detail (such as **Estonia** and **Spain**). Most countries make explicit which specifications should be used (often using XML as a basis (like **Germany** and **Italy**)).

The element that has the lowest level of alignment is IOPA 4, i.e. the **encouragement of public administrations to participate actively to standardisation work**. Countries show different ways of including this element in their NIF. **Austria** has established a working group structure constituting four working groups on: Law & security, Integration & access, infrastructure interoperability, presentation & standard data. In **Malta**, in all major domains expert groups are formed with the task of creating and maintaining the relevant semantic assets and participation to international interoperability fora is foreseen.

4.6 Interoperability governance

As opposed to other categories in the NIFO comparative model, the category of interoperability governance consists of a single element to **establish a framework for the governance of their interoperability activities across administrative levels**.

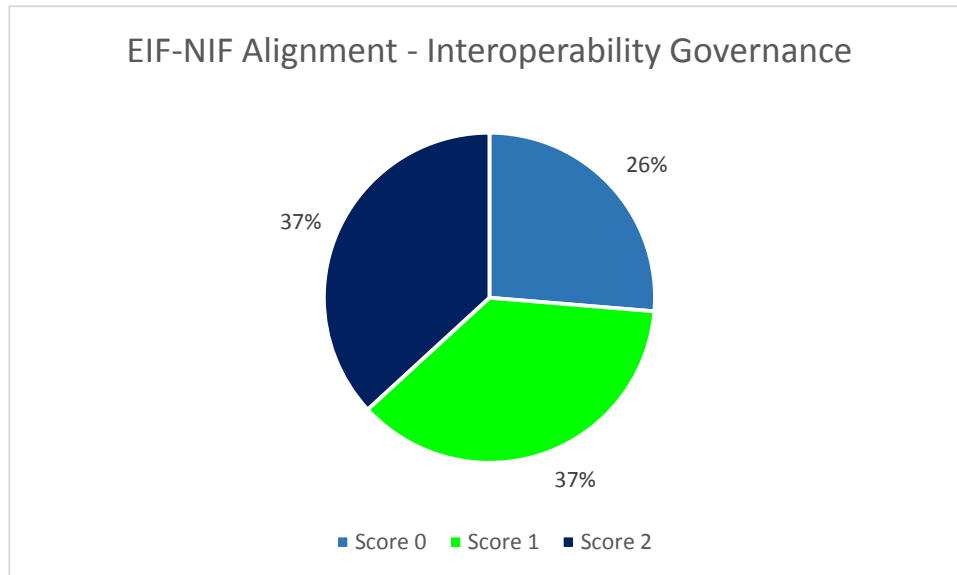
Because the common components and interoperability agreements are the results of work carried out by public administrations at different levels (local, regional, national, EU), coordination and monitoring this work requires a holistic approach.

Therefore, a defined governance process needs to be established. The following underlying notion, defined in the NIFO analytical model as element, has been derived from the EIF recommendation.

- ▶ **IOPA 1:** Public administrations should establish a governance framework for the control of their interoperability activities across administrative levels.

The figure below shows the degree of alignment of the interoperability governance. As for the previous dimensions, the percentage of countries with a 0, 1 or 2 score is presented.

Figure 6 - EIF-NIF alignment - Interoperability Governance



The scoring on interoperability governance is based on the existence and completeness of the governance process described. Governance processes are interpreted differently throughout, ranging from establishing boards that preserve an overview (Germany, Italy) to defining the governance process for specific elements such as the IT Security and data exchange (Austria, Spain).

The case of Italy provides a good example of governance, as it clearly defines who is involved in the process and provides some insight into the workings of the process:

The entire governance of SPC (Sistema Pubblico di Connettività e Cooperazione - Public Connection and Cooperation System) is under the control of the SPC Commission (or SPC Board). The Commission is formed by a first half of members appointed by Ministers and a second half of members appointed by the Assembly of local administration; that is, the political representative of local PAs. DigitPA has the presidency of the Commission.

The Commission is responsible for approving all the guidelines and procedures concerning the activities carried out within the context of SPC. Compliance rules are instead approved by the Prime Minister and updated by the Minister of PA and Innovation's decree.

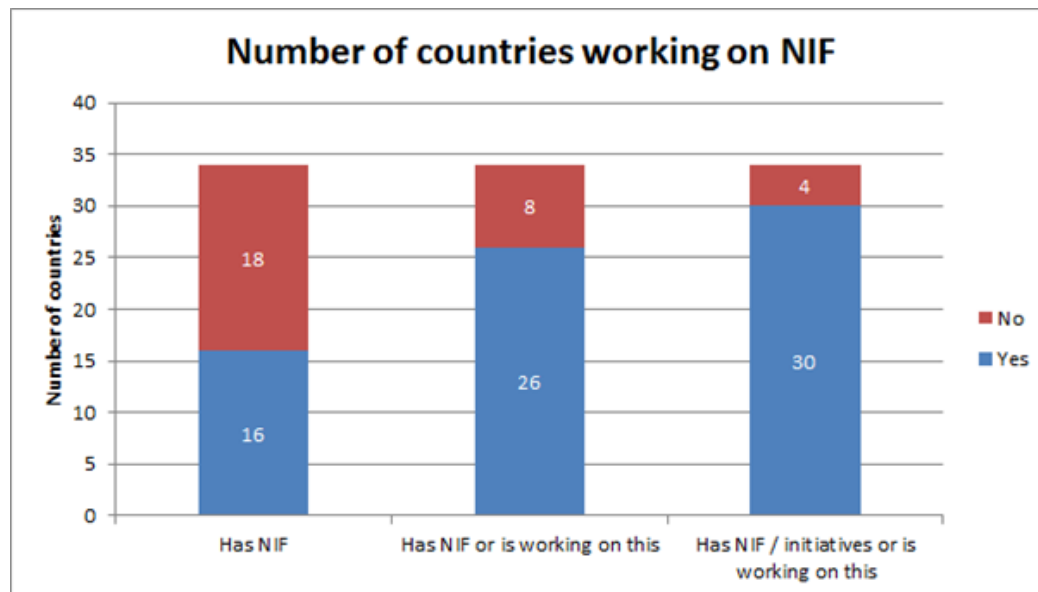
DigitPA, and the Italian Regions for what concerns local administration, are responsible for the governance of both the SPC Interoperability infrastructures and framework contracts defining the eGovernment services used by PAs.

5 Overcoming challenges

This chapter looks into the factors and challenges that countries face when establishing or further developing their NIF. The interoperability levels are taken into account, supplemented by the obstacles and difficulties noted by the countries during collaboration for NIFO.

The analysis of the 19 countries that participated in the exercise pointed out that most of the countries have established or are working on establishing a NIF. As can be seen from Figure 7 although only 16 countries state that they have a NIF, it is fair to affirm that all countries are at least working on interoperability.

Figure 7 - Overview of NIFs



Thus, it seems that it is not so much starting a NIF or interoperability initiatives that is difficult but elaborating on them and developing them in a framework. Targeted interviews were conducted with different Member States with the aim to gather insights into:

- The challenges encountered when establishing and further developing a NIF;
- The challenges encountered when implementing a NIF.

A closer look into the experience of a number of countries sheds light on further challenges that countries face. The following section present the results of in-depth interviews conducted with several countries.

5.1 Challenges that hold countries back from establishing their NIF

The challenges identified with regard to establishing a NIF differ with regard to the stages at which countries are on working on interoperability. For example, those countries that introduced a NIF some time ago have a tendency to remark on the difficulties with operationalising interoperability and/or the NIF. There are also countries that have either recently introduced a NIF or are in the process of introducing one. These countries concentrated their observations on the obstacles to defining and writing the actual NIF documentation.

One of the blocking factors that was noted by the countries is the economic factor. Given pressures on public budgets (IT) cost reductions coupled with a demand for efficiency result in a lack of resources for the definition or development of a NIF. Resulting in reduced priority of governments to formalise interoperability frameworks. Nevertheless, interoperability is still on the political agenda despite current European socio-economic challenges. Economic pressures can also act as a driver to get interoperability moving; in Spain, for example, there is political will and support for interoperability as a means for more efficient public administration.

Spain provides in their “*Plan estratégico de mejora de la administración y del servicio public, plan mejora 2012-2015 de la Dirección General de Modernización Administrativa, Procedimientos e Impulso de la Administración Electrónica – Documento Provisional*” a statement on the economic crisis and the possibilities that it presents stating the intention to “*end the crisis with more strength than when we entered, with collective action of all, so as to rethink certain aspects which otherwise would be unthinkable, and moving toward a sustainable solution through a medium-term planning based on knowledge, competitiveness and integration. The crisis is therefore an opportunity we cannot miss to improve.*” (unofficial translation).

Indeed, some countries explicitly stated the benefit of having interoperable systems as a means of cost saving (e.g. Latvia, Estonia and Denmark).

Interoperability is seen by many countries as a means to an end, and not as a goal in itself (e.g. Italy, Spain). Interoperability fits within the whole framework of general eGovernment, of more reuse of software and a rationalised IT landscape (to lower costs). Some countries emphasise that actions on eGovernment and the NIF are interrelated and that the economic state of affairs of a country does directly link to interoperability. If anything, the crisis presents opportunities to foster the implementation of actions foreseen already. Nevertheless, resource constraints were mentioned as a factor that impedes a swift implementation.

5.1.1 Legacy technology

A NIF may have considerable impact on already running systems and applications, to the interfaces and to base registers for example. New developments can follow the established guidelines but in the case of older applications and interfaces, investments may be needed for various changes and modifications. In other cases, a country may not be able to replace older information systems because of their relative importance; hence, it may be crucial to re-build the system in a simple way (noted by Malta and Poland in particular).

In Estonia, the work on interoperability started quite some years ago, the connection (X-road) is the digital backbone that was established in 2001 effectively linking several systems and promoting interoperability through legacy systems. This could serve as a good practice for other countries (such as Spain and Poland) that note that implementing a NIF does present quite some issues for running applications and systems.

One has to note that in both Spain and Poland different levels of public administrations often function quite independently of one another therefore limiting the immediate potential for those administrations to benefit from sharing and interconnecting. This is however problem that relates also to the organisational interoperability level.

5.1.2 Legal and political factors

The EIF touches upon a number of elements that have a clear legal impact. These factors are related to more political decision-making elements (such as the principle of subsidiarity and proportionality) for which a legal framework can be a facilitating factors, while others concern legal frameworks for data privacy and protection in the light of new technological developments. Countries take different approaches to tackling these recommendations from the EIF whereby in some cases a legal framework is applied while in others this is not explicitly the case.

By their nature, legislative acts are enforceable and stable; however, they are generally also very slow to change and may become out dated in a fast evolving landscape such as interoperability. Preferably, more stable elements should go in a legislative act or a framework act with delegated responsibilities can be established. A NIF deals with an area of constant technological progress; it would therefore be advisable to write down more technical and practical items in regulations that allow for easier updating. One should consider avoiding references to technical standards and versions of specific products in the body of the main legislative text. Other elements, such as the criteria used to select a technical standard for example, could be taken up if they prove to be stable enough. The country implementing their NIF by law is recommended to consider this in the different legislative tools at their disposal.

Legal and political factors need to be taken into account when considering the legislative level at which the NIF is established. The principle of ‘Subsidiarity and proportionality’ is fully implemented in five countries. This principle entails the need for decision making on the appropriate level. Some countries have explicitly taken this up as part of their legislation (e.g. Spain) while other have addressed this on a wiki page (e.g. Belgium).

Technological developments, such as service-oriented architecture, cloud technology, mobile platforms and open data, may have implications for interoperability as well as related legal factors that need to be carefully considered. As cloud technologies become more and more in use in government, many have started putting in place a specific strategy (such as Denmark, Ireland, Italy, Switzerland and the United Kingdom) whereby legal factors generally need to be taking into account (in particular data privacy). In particular, in relation to mobile platforms, end-users expect that available online public services can be accessed on any platform and certainly the platform of his/her choice. User expectation management should thus become part of the government agenda in providing electronic public services.

As stated before, interoperability is a means to an end and reuse, better service development and transparency will contribute to the establishment of European public services. To enable such reuse, in particular in a service-oriented manner whereby different public administrations (at any level of government across different countries) would like to use for example web services, specific legal factors are paramount. Those legal factors would establish a trusted relationship that enables reuse through, for example, Service Level Agreements, contractual clauses and interoperability agreements that need to be clearly defined. Today this is generally subject to bilateral agreements since no overarching legal framework is in place.

Reuse is however stimulated by platforms such as Joinup where semantic and other reusable assets can be found.

Next to the legal requirements to sharing and (re)use of services or components there needs to be a clear governance mechanism in place for the use of interoperable services. For this, specific attention may need to be given to security issues since this presents a hurdle for many countries because of the implementation that greatly differs on a national level. As such, this political will also changes when new governments take their seat after elections. The fact of having anchored interoperability in a legal act should encourage keeping interoperability on the political agenda as it is the case in some countries.

5.1.3 Organisational factors

The experiences across countries show that a diverse range of obstacles is encountered in relation to interoperability that are dependent on the specific characteristics, historical background and organisation of the country itself. Obstacles can relate to the country's size and complexity, the distribution and delegated character of its government (and local) organisations, or its size (particularly the size of the smaller countries).

A country's size and complexity may affect to the ease with which appropriate interoperability initiatives are setup and agreed. The organisation of the country's governance structures, and/or the approach of the country to the introduction of interoperability may pose difficulties. For example, getting diverse ministries as well as public administrations at different levels of government (national, regional, local as well as across borders) to agree and work together may prove problematic. Consensus can also be difficult to achieve when a broad-based approach is used and there is a great deal of independence and autonomy on the part for example regions or municipalities. While such a participatory approach may be complex and take time, it does of course have the benefit of generating buy-in and local engagement.

Conversely, size can also affect the availability of resources devoted to interoperability initiatives. There are various resourcing problems that countries may encounter related to financing, skills shortages or time requirements. For example, small countries may be challenged by the complexity and abstraction of defining and designing a NIF (as noted by for example Malta). Skill shortages for personnel to work on aspects either of a NIF or on interoperability between government organisations may be problematic. Resourcing can also affect the ability to translate documentation (see the discussion of language and semantics, below). Therefore, problems can arise when establishing or implementing the NIF. Pressures on public budgets and for cost reduction also affect the work of countries on interoperability and the organisational aspects of it. Cost savings typically results in less available resources (skilled labour and budget), while in fact in the medium to longer term cost savings are expected to result from establishing interoperability. Several countries stated that interoperability is an incentive and is expected to lead to better back-office integration (e.g. Lithuania) and savings (cost, time and less resource duplication like in Spain). This highlights the importance of examining the business case to establish interoperability, the impact analysis and related qualitative elements. Monitoring the technical aspects of interoperability can prove to be difficult. It is difficult to check what the impact of interoperability is exactly; it is also difficult to formulate a model that can quantify the impact. The importance of investigating the evidence concerning benefits of sharing and re-use of data is important (as noted by for example Finland).

Electronic invoicing is already established in Denmark where any private company doing business with the government is obliged to submit invoices electronically. There is the one-sided track where the government establishes an agreement, upon request of either the government or the private sector.

Another relevant factor is the relationship with the private sector. The private sector begins to recognize the value of the NIF, interoperability in general and the interoperability agreements. For example, recently a request was received to develop an interoperability agreement on electronic invoices from and for the private sector. Nevertheless, perhaps more attention should be given to the collaboration possibilities between the government and the private sector to establish

jointly mutually beneficial agreements. One way of achieving this could be by setting up public-private-partnerships that could also relieve some of the financial burden on government.

Ultimately, it boils down to the business case of interoperability that needs to be proven. Overall, it is accepted that interoperability is useful and even necessary but the quantification of “useful and necessary” seems to be lacking. In some countries, new projects that start need to provide a business case (e.g. Denmark, Spain) but here often, it is stated that the benefits are difficult to measure and calculate, let alone to be able to follow-up on these once implemented and enforced (noted by Belgium for example).

Another important organisational aspect is governance. All stakeholders should be part of the process and reaching consensus on interoperability is not easy since the parties need to be aware that not all their needs can be covered. Finding this middle ground is a time consuming process (noted by Spain, Finland).

Countries also expressed the importance of sharing good practices. There are many examples of countries who share best practices bilaterally, for instance, Malta is cooperating closely with Denmark, Finland is working closely with Estonia, etc. The NIFO Community also serves as a sharing of good practices by different countries in relation to the different elements of the EIF and actively supports the countries to collaborate.

5.1.4 Technical factors

As mentioned above, the fast evolving technology landscape has impacts interoperability, it poses both challenges (e.g. from a legal perspective) and presents unprecedented opportunities (enabling sharing and reuse, interoperability and resulting in cost savings). One particularly important aspect in relation to this is the use of technical specifications and standards that contribute to interoperability and prevent lock-in effects. The Member States and the Commission have long recognised this. Member States assess and recommend or make mandatory the use of specific ICT standards and technical specifications. The ISA Programme has a dedication Action for the Common Assessment Method of Standards and Specifications (CAMSS) to support the sharing and reuse of such assessments and lists of recommended or mandatory standards and technical specifications across countries.

Country correspondents noted the importance of following up and monitoring the extent to which technical specifications and standards are being applied and used in practice. The extent to which this can be monitored was questioned as well as the extent to which a country (noted by Belgium) can enforce a law on use of open standards.

Standards and technical specifications are generally accepted as a prerequisite to interoperability. Certain countries are involving the larger public in the establishment of standards. For instance, the UK provided a draft process definition on open standards for data during 2013; following a public consultation, the draft

definition and policy are being further developed. Other countries have already clearly established their set of standards and technical specifications (Spain in their Standards Catalogue, Germany in the technical specifications module of SAGA, etc.). Most often, these standards are described in a separate document that allows for easier updating in this fast evolving landscape.

5.2 Challenges to continued development of a NIF

5.2.1 Alignment difficulty/usefulness of the EIF as guidance document

Overall, the EIF is well received as a document to provide guidelines for establishing a NIF. The EIF itself however does not make recommendations on the format that the national interoperability framework should take. Countries are following a wide range of approaches from establishing legal frameworks or establishing a single NIF document to covering relevant topics in a wide array of related initiatives.

The type of documents establishing a NIF therefore varies greatly across countries. This may also lead to paradoxical situations of countries where public officials do not consider having a NIF while researchers would disagree. For example, Germany has established the Standards and Architecture for e-Government Applications (SAGA) for the technical aspects of interoperability and several other initiatives for the other interoperability levels. Similarly, Switzerland has a SAGA for technical standards, and many interoperability initiatives that touch upon every interoperability level. However, they state that they do not have a NIF. It is therefore important to discuss the definition of a NIF or defining what should be included in a NIF. The different experiences across countries would serve as a starting point to find common ground in this respect.

Country representatives in relation to the establishment or development of their NIF often posed the following questions:

- ✘ What should be the format of the NIF? What is the definition of a NIF? The EIF relates the definition to an interoperability framework and does not state what should be included as a minimum.
- ✘ To what level of detail should the NIF go? Should different documents or items be made for more technical specifications?
- ✘ How do we include the practical use of the NIF? The EIF is the theoretical framework that should be translated into the theoretical framework that is the NIF but this should then be applied practically. How can we ensure this? Moreover, related to this, what is the level of detail that the descriptions need to have in the NIF itself?

Even though the EIF aims to provide a general view and possibility for interpretation, more concrete examples would be welcomed. The following sections provide further insights into concerns that were raised by countries during collaboration for the NIFO in relation to further development of their NIFs

concerning: awareness and knowledge management, making a clear business case for interoperability, organisational and semantic factors.

5.2.2 Knowledge management and transfer; awareness and communication

Interoperability is a topic that requires specific expertise and knowledge, mostly combining business and IT. It is not always easy to find these skills and resources within the public sector, which thus in some cases has to turn to the market to acquire the skills needed.

Once knowledge on interoperability is gathered within the public sector it should be managed, be augmented and disseminated to the appropriate people in order for them to be able to execute their tasks more efficiently and effectively. From the analysis, it became clear that often these public officials change posts, taking knowledge with them. A simple example would be that there is a new contact person for the NIF but that this person is unaware what his/her predecessor sent to the European Commission as information on the NIF. It needs to be ensured that there is a coherent system within the country for knowledge management but since this is national territory it is recommended to find a simple and standardised method for transmitting information related to the NIF.

This knowledge transfer is relevant for all those that work on interoperability as well as implementation of public services in general. Therefore, knowledge management as well as change management could be more explicitly addressed (though the latter is already in the EIF).

As part of the NIFO this has also been taken up by implementing new features on the Joinup Community that allow any interested stakeholder to gain insight into the alignment of a country with the EIF and the related evidence of the approach followed in each Member State. This allows both for recording and disseminating the information to a wider audience.

5.2.3 No business case: what is the added value, what's in it for me?

Although in general the business case for interoperability is well recognised there still seems to be a lack of incentive to pursue further interoperability and a NIF. Country respondents noted several factors that contribute to this, including the fact that:

- ✘ There is no legal obligation to set-up a NIF and there is no corrective action if a country does not set one up.
- ✘ A large incentive for establishing interoperability is cost saving but no other incentives are being developed:
 - These can range from monetary incentives to praise and recognition for good practices
 - The incentives need to stimulate interoperability by design more so that this would become the natural reaction
 - Communication within the country and outside should be promoted (this could also be done via the Joinup platform but an

Within the Danish Agency for Digitisation a clear defined process for making business cases has been established, there is a specific unit in the agency that has developed a model to create business cases for public services and from a certain threshold, a review board for IT projects evaluates the risk of a project.

Portugal has succeeded in the mission to establish a positive business case and is able to provide a solid answer towards the public administrations. It makes a strong case for cost savings by establishing an interoperability platform. The establishment of this platform is tackling one of the most challenging hurdles of interoperability, the interconnection of legacy systems.

often stated comment was that people need to have the time to post on or browse through the platform)

- More visibility could be given to interoperability and the NIFs, good governance examples should be applauded and possibilities for exchange should be explored:
- The Joinup platform is a first step towards this but the platform could use improvements in structuring and user friendliness

The Commission took up the latter by introducing new features on the NIFO Community on Joinup. Making it easier for any interested stakeholder to consult the NIF-EIF alignment scores and related evidence as well as compare across countries. In addition, a new scoring mechanism was introduced as part of the analytical models to gather information on the monitoring and implementation of the NIFs, allowing countries to highlight specific good practice examples linked which each of the elements of the EIF.

5.2.4 Organisational factors

Given that some countries have recently established a NIF, elements of the process that this involves were perhaps fresher in interviewees' minds. A considerable part of the observations came from Malta, for example. The remarks pertained therefore to early stages of NIF development, such as the drafting of the document and the public consultation procedure. Member States that have introduced NIFs at a somewhat earlier timing remarked on the resourcing of certain maintenance and support issues.

With regard to the drafting of a NIF document itself, obtaining the appropriate level of abstraction of the document can be challenging for a country that may find it easier to be more technical or more practical. (See also the feedback provided in section 5.4 on the level of abstraction of the EIF.)

An often-stated issue is the 'silo mentality' and the fact that many of the national administrations or departments function quite independently from one another. This hinders interoperability nationally (on municipality or regional level) and thus also the implementation on a higher level.

Organisational change management, people and knowledge management cannot be treated separately:

- It is not easy to get people to change their habits and business processes. For this a business case for change needs to be established, showing the benefits of better cooperation and guidance should be provided;
- Funding of departments/government instances may differ, departments may feel they "own" data and are reluctant to share information, let alone give it out for free to any other public entity;
- Change management processes need to be established to ensure continuous service delivery.

The organisational structure of a country may also complicate the implementation of a NIF. In the case of federated states, there are differences in implementation. In Germany, the usage of SAGA is obligatory for the federal level, in Belgium there is no such obligation on federal level and not on local level either but the possibility exists by having a service integrator. In Spain, the NIF is written into the legislation and each region is obliged to follow the law. Furthermore, in certain countries where regions have a high autonomy (Spain, Belgium) and a different language this may complicate things even more, while in this specific case it may also provide a stimulus for multilingualism.

5.2.5 Semantic factors

In terms of the semantic aspects of interoperability, the analysis shows that there is no automatic link between having a semantic or syntactic standard and interoperability. In the cases where interoperability works, it has taken dedicated work to achieve it.

Language(s) themselves can be perceived as an obstacle. Understandably, documentation tends to be in the country's own language(s). Translation can be problematic and costly. As some interviewees affirmed, "translation of metadata to English is needed for connectivity; however, not everything can be translated to English because of lack of resources."

6 Annexes

6.1 Methodology

The analysis carried out to address the basic research questions draws upon the information contained in the analytical model setup for the NIF Observatory. This analytical model has been populated during the course of the previous and current NIFO projects.

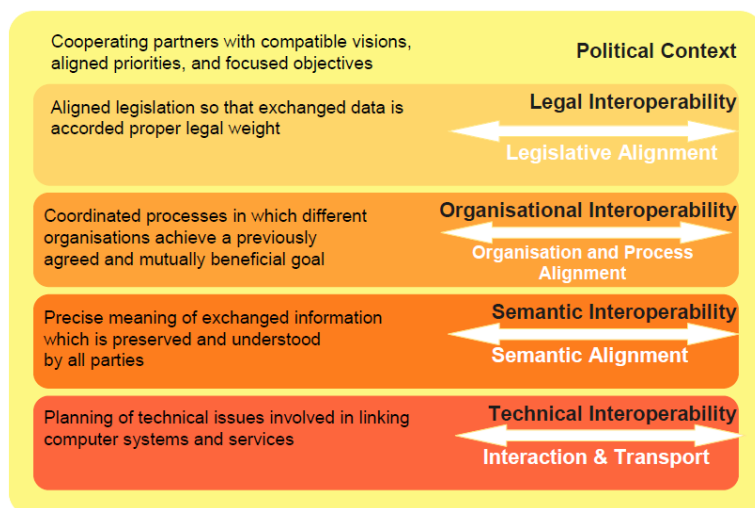
In particular, the data gathering exercise was carried out during 2012 and the first months on 2013 by the study team, that contacted Member States representatives to gather relevant information and documents. The study team then proceeded in elaborating the information collected and assigning a scoring to each of the element included in the model. Those scorings were disclosed to Member State representatives and discussed with them. The study team also requested additional information whenever relevant.

The request for information was sent to 32 countries. However, only 19 countries replied and provided the necessary data. Therefore, the findings presented in this report only refer to those 19 countries, namely:

- ❑ Austria;
- ❑ Belgium;
- ❑ Bulgaria;
- ❑ Denmark;
- ❑ Estonia;
- ❑ Finland;
- ❑ France;
- ❑ Germany;
- ❑ Greece;
- ❑ Hungary;
- ❑ Italy;
- ❑ Latvia;
- ❑ The Netherlands;
- ❑ Malta;
- ❑ Norway;
- ❑ Poland;
- ❑ Portugal;
- ❑ Slovenia;
- ❑ Spain.

The EIF has defined four interoperability layers: the legal layer, the organisational layer, the semantic layer and the technical layer. These layers are surrounded by the political context as can be seen in the figure below.

Figure 8 – The interoperability layers²²



The analytical EIA model is structured according to the framework elements based on the study on a common vision for an EIA²³. These framework elements are called categories in the NIFO analytical model and clear definitions are given (see table below)

Table 4 – NIFO Analytical Model

Categories	Definition
Best practices	A best practice is a method or technique that has consistently shown results superior to those achieved with other means, and that is used as a benchmark.
Building blocks	A component that encapsulate data and functionalities (i.e. services) that can be reused as 'building blocks' to build other public services or information systems.
Conceptual model	A conceptual model functions as a blueprint for future implementations of European public services, the model helps develop a common vocabulary and understanding across Member States about the main elements of a public service and how they come together.
Definitions	A definition explains the meaning of a term (a word, phrase or other set of symbols), or a type of thing.
Guidelines	A principle put forward to set standards or determine a course of action.
Interoperability agreements	Written interoperability agreements are concrete and binding documents which set out the precise obligations of two parties cooperating across an 'interface' to achieve interoperability.
Interoperability governance	Interoperability governance covers the ownership, definition, development, maintenance, monitoring, promoting and implementing of interoperability frameworks in the context of multiple organisations working together to provide structures and processes

²² As taken from the EIF v2, p21, http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf

²³ Phase 1 – Report on Proposed European Interoperability Architecture and Project Approach for Phase 2, version 1.4, ISA Work Programme, European Operability Architecture (EIA), 2/2011

Categories	Definition
	to ensure that the interoperability frameworks sustain and (public) services. It is a high-level function providing leadership, organisational structures and processes to ensure that the interoperability frameworks sustain and extend the organisations' strategies and objectives.
Interoperability levels	The interoperability levels classify interoperability concerns according to who/what is concerned and cover, within a given political context, legal, organisational, semantic and technical interoperability.
Life cycle of standards	A progression through a series of differing stages of applicability for standards.
Methods	A Methodology is generally a guideline for solving a problem, with specific components such as phases, tasks, methods, techniques and tools.
Objectives	The goals the MS are aiming for by improving interoperability.
Other initiatives on interoperability	This category aims to list all other initiatives on interoperability the MS are currently running or planning.
Principles	Principles are general rules and guidelines, intended to be enduring and seldom amended, that inform and support the way in which an organization sets about fulfilling its mission with respect to interoperability.
Scope	The area covered by the NIF.
Semantic interoperability assets	Semantic interoperability assets are a subset of interoperability assets and include any element of the semantic layer, such as nomenclatures, thesauri, multilingual dictionaries, ontologies, mapping-tables, mapping-rules, service descriptions, categories, and web services.
Standards	A standard is a technical specification approved by a recognised standardisation body for repeated or continuous application, with which compliance is not compulsory and which is one of the following: <ul style="list-style-type: none"> - international standard: a standard adopted by an international standardisation organisation and made available to the public, - European standard: a standard adopted by a European standardisation body and made available to the public, - national standard: a standard adopted by a national standardisation body and made available to the public.
Views	The representation of a related set of concerns. A view is what is seen from a viewpoint.

The recommendations of the EIF are mapped to the five fundamentals of the EIF: the principles, the conceptual model, the interoperability levels, the interoperability agreements and the interoperability governance.

It has to be noted that not all categories noted in the table above are treated in the analysis in chapter 3. Only the principles, the conceptual model, the interoperability levels, the interoperability agreements and

the interoperability governance are taken up. Nevertheless, the other categories were examined to see if they could provide a basis for the common denominators or other research questions. However, the information contained in these categories is only filled in sporadically and for very few countries. Therefore, the main analysis presented in this report is based on the alignment of these five major categories.

Recommendations that fall under a fundamental layer were each separately stated as an element that would contribute to interoperability. These elements were formulated as questions in the NIFO analytical model. The questions are posed to each NIF or all of the information provided by the countries. An assessment is made and a score is accorded for the elements in order to quantify the reply. These scores are noted in the analytical model and provide for objective comparison and allow comparing the alignment of the NIFs to the EIF.

A maximum scoring of “2” was accorded if indeed a full and complete answer was provided aligned to the EIF, a score of “1” was accorded if the information provided by the country gave a partial answer to the element. A “0” was given if no evidence could be provided for the element. This scoring on the specific elements allowed for aggregation into a score per category and ultimately an overall score and percentage. This way the different countries could be compared on the alignment of their NIF with the EIF.

Within the model and the graphical representations that can be found in this document and its annexes, a colour coding can be found presenting a visual representation of these basic scores.

Figure 9 – Scoring system

2	Full alignment, fully observed
1	Partial alignment, partially observed
0	No alignment, not observed

6.2 Good practices

Table 5 – Complete list of good practices

Country	Sort number	Category	Measurement	NIF element	Reference
Estonia	1.01	Principles	Does the NIF contain the 'subsidiarity and proportionality' principle?	<p>Subsidiarity and proportionality</p> <ul style="list-style-type: none"> - nation-wide information policy decisions should be established only if they are more effective than public sector agencies on the spot decisions. - Information systems in place, they should be associated with the centralization of services. 	Estonian Interoperability Framework (version 3.0), chapter 2, Principles
Austria	1.02	Principles	Does the NIF contain the 'user-centricity' principle?	<p>Proximity to citizens: Government should be at the disposal of the people and not the other way around. Online services need to be easy to find and available at all times.</p> <p>Usability: The range of electronic services offered must be structured in an easily comprehensible, clear and straightforward manner. In order to gain acceptance and approval from users, forms and portals will have to have a consistent design. Navigation and menus will need to be intuitive and logical, with a familiar structure so that users are able to quickly find what they are looking for.</p>	200911 Austrian minds about Interoperability Reichstädter.pdf, eGovernment Principles.

Germany	1.02	Principles	Does the NIF contain the 'user-centricity' principle?	<ul style="list-style-type: none"> - Orientation on usefulness for citizens, businesses and public administration - Orientation towards the needs of citizens - Involvement of users 	National E-Government strategy, http://www.it-planungsrat.de/SharedDocs/Downloads/DE/Strategie/National_E-Government_Strategy.pdf;jsessionid=87F5B5ABE7888A05AEBF933EB441758B.2_cid094?__blob=publicationFile SAGA 4.0, Chapter 4, The philosophy underlying eGovernment SAGA 4.0, Chapter 4, Organisational requirements
Estonia	1.03	Principles	Does the NIF contain the 'inclusion and accessibility' principle?	<p>Inclusion and accessibility</p> <ul style="list-style-type: none"> - Users should be able to choose their preferred channel to access government services: bureau, mail, telephone, e-mail (e-mail address sh@eesti.ee use), other Internet channels. - ID card found in a person must be able to obtain an official in the public service without an appearance. - Citizens must be able to participate in society and making decisions that concern him, and through electronic environments. - Information must be available and e-services through more widespread use of private or community-supported software systems (operating systems, browsers). - The authorities should issue the open formats of their data. - People with special needs and elderly should have the same level of service as other residents when accessing eGovernment services. - The interfaces of Information systems should meet the WCAG (Web Content Accessibility Guidelines) standards, which ensures the availability of the Estonian language by voice synthesisers. 	Estonian Interoperability Framework (version 3.0), chapter 2, Principles

Estonia	1.04	Principles	Does the NIF contain the 'Security and privacy' principle?	<p>Security and privacy</p> <ul style="list-style-type: none"> - the solutions to the state information must be secure, and data services, including the need to ensure confidentiality, authenticity, availability, and verifiability. - people must be provided services through which they can check and improve the public sector-related data collected by him. - people must be provided services through which they become aware of whom and what is the public's view of their data collected. 	Estonian Interoperability Framework (version 3.0), chapter 2, Principles
The Netherlands	1.04	Principles	Does the NIF contain the 'Security and privacy' principle?	<ul style="list-style-type: none"> - Confidentiality - users can rely on the information not being misused - AP 15 and 35 to AP 40 operationalise security and privacy demands on public services 	Basic Principles, nora_maart 2010-eng.pdf NORA principles for cooperation and service delivery

Estonia	1.05	Principles	Does the NIF contain the 'Multilingualism' principle?	<p>Multilingualism</p> <ul style="list-style-type: none"> - Tracking user interface MUST be the default language in the open is Estonian. - Information systems must be operational by the Estonian language voice synthesisers. - pan-European services and user interfaces on the importance of information services should be provided in addition to Estonian and English, Russian or other users with appropriate key languages. - Tracking user interfaces should be easily adaptable to other languages. - information systems architecture, data structures, and the software should be language-neutral: the information system functionality in another language should include the realization of a recycling mechanism. - Information systems should support the semantics of multi-lingual and international. - The state supports a significant population of free consumer software translated into Estonian. - Public information systems and software products should include support for Estonian language technology tools. 	Estonian Interoperability Framework (version 3.0), chapter 2, Principles
Estonia	1.06	Principles	Does the NIF contain the 'Administrative simplification' principle?	<p>Administrative simplification</p> <ul style="list-style-type: none"> - Databases RIHAs documentation with the purposeful and controlled collection of data to comply with the principle of a single request. - Everyone has the right to use public services simply and conveniently. Public services are provided so that a person is faced in technical detail. The authority and the business are not burdened with unreasonable people 	Estonian Interoperability Framework (version 3.0), chapter 2, Principles

Spain	1.06	Principles	Does the NIF contain the 'Administrative simplification' principle?	Law 11/2007, article 4 General principles: j) The principle of administrative simplification, by which the time periods for administrative procedures shall be reduced substantially thus achieving greater efficiency and effectiveness in administrative activity.	Law 11/2007, article 4
Spain	1.07	Principles	Does the NIF contain the 'Transparency' principle?	Law 11/2007, article 4 General principles: k) The principle of transparency and publicity of the procedure, as a result of which the use of electronic media shall facilitate the maximum possible diffusion, publicity and transparency in administrative affairs.	Law 11/2007, article 4
Bulgaria	1.08	Principles	Does the NIF contain the 'Preservation of information' principle?	<ul style="list-style-type: none"> - Storage of transactional information: In order to ensure traceability of the transaction process and demonstrability of the participants in its individual steps, the storage of copies has to be provided. - Management of electronic recordings: The MoReg specification for management of electronic recordings, based on the European Regulation 94/C 235/03; - The management of the life cycle of information: The management of the life cycle of the information in the e-Government systems has to be consistent with the Recommendations of the so called "Data Management Forum (DMF)". 	Bulgarian national interoperability framework for governmental information systems, chapter 5, Principle 3.
Estonia	1.09	Principles	Does the NIF contain the 'Openness' principle?	<p>Openness</p> <ul style="list-style-type: none"> - Public authorities should develop their own information systems architecture and software purchases to follow the principles of openness. - The decision to accept closed standards and specifications for use must be justified. 	Estonian Interoperability Framework (version 3.0), chapter 2, Principles

Germany	1.10	Principles	Does the NIF contain the 'Reusability' principle?	Reusability Content, basic services, applications and infrastructure can be bundled and re-used (Goal 18)	SAGA 5.0; saga_modul_grundlagen_de_bund_5_1_0; 3. Ziele National E-Government strategy, http://www.it-planungsrat.de/SharedDocs/Downloads/DE/Strategie/National_E-Government_Strategy.pdf;jsessionid=87F5B5ABE7888A05AEBF933EB441758B.2_cid094?__blob=publicationFile
Italy	1.10	Principles	Does the NIF contain the 'Reusability' principle?	Reusability is a precise principle of the CAD. Specifically art 69 "Reusability of software programs" clearly defines such a principle and art 70 "base register of reusable software programs" specifies how software programs can be made available for the reuse by other PA". Note that currently art 70 is enforced by the presence of an Italian repository which contains approximately 200 reusable programs for local administrations.	Art. 12, SPC_Rules_EN.pdf, art 69,70, DACno235_2011_IT.pdf
Spain	1.11	Principles	Does the NIF contain the 'Technological neutrality and adaptability' principle?	Law 11/2007, article 4 General principles: i) The principle of technological neutrality and adaptability to progress in electronic communication systems and technologies, guaranteeing independence in the choice of alternative technologies by members of the public and by Public Administration bodies, together with the liberty to develop and implement technological advances within the context of the free market. To these ends, Public Administration bodies shall use open standards and, as appropriate and in complement, standards which are of general use among the public.	Law 11/2007, article 4

Italy	1.12	Principles	Does the NIF contain the 'Effectiveness and efficiency' principle?	The savings obtained through technological and organisational innovation ('efficiency dividends') must be actually measured and will be used in part to fund incentives to the personnel involved, according to the provisions of Lgs. D. No. 150/2009, and in part for funding new projects in innovation; bonus mechanisms are being introduced for the best performing administrations as a result of the application of digital technologies, while disciplinary measures will be used for the administrations failing to comply;	Chapter 2, NIFOdokument_v1.2.pdf
Estonia	2.1	Conceptual Model	Does the NIF contain a conceptual model?	Estonia puts forward the European Conceptual Model.	Estonian Interoperability Framework (version 3.0), chapter 3, Conceptual model
Estonia	2.2	Conceptual Model	Is the conceptual model a component-based service model? (e.g. SOA)	<ul style="list-style-type: none"> - Services Interoperability Architecture / Service Oriented Architecture - The state IT architecture will be developed for a service oriented architecture 	Estonian Interoperability Framework (version 3.0), chapter 3, Service model and service space http://www.riso.ee/et/koosvoime/RITA1_01.pdf (version 1.01), chapter 2, Principles
Italy	2.2	Conceptual Model	Is the conceptual model a component-based service model? (e.g. SOA)	SPCoop is used to support PA e-government application services and is currently modelled as a Service Oriented Architecture (SOA), implemented using Web Service technologies.	Chapter 3, NIFOdokument_v1.2.pdf
Estonia	2.3	Conceptual Model	Does the NIF encourage the use of common schemes to interconnect loosely coupled service components?	- The X-Road data exchange layer can be regarded as the realization of services. Information systems need to be linked as loosely agreed in a common X-way and agreed XML schemes and protocols.	Estonian Interoperability Framework (version 3.0), Chapter 3, conceptual model

Spain	2.4	Conceptual Model	Does the NIF encourage to put in place the infrastructure to interconnect loosely coupled service components?	<p>Communication Network of the Spanish Public Administrations (SARA network): Public Administrations will use preferably the Communication Network of the Spanish Public Administrations to communicate with each other, purpose for which they will connect to it, either their respective networks, or their interoperability nodes, in a way that the interchange of information and services among them is facilitated, as well as the interconnection with the networks of the Institutions of the European Union and of other Member States.</p> <p>Data Mediation protocol (brokering services): 10049 Resolution of the Secretary of State for Public Administration of 28 June 2012, giving approval to the Technical Interoperability Standard for Data Mediation Protocols.</p>	<p>ES_NIF_Interoperability_Framework_RD4_2010.pdf, Communication Network</p> <p>20121106_BOE-A-2012-10049_Brokering_Services_EN.pdf: 10049 Resolution of the Secretary of State for Public Administration of 28 June 2012, giving approval to the Technical Interoperability Standard for Data Mediation Protocols.</p>
Bulgaria	2.5	Conceptual Model	Does the NIF encourage to make the authentic sources of information available to others?	All data of the companies and the citizens, interacting with the governmental information systems, can be entered only once. The administration units are obliged to use the data already gathered on a multiple basis.	Bulgarian national interoperability framework for governmental information systems, chapter 5, Principle 4.

Austria	2.6	Conceptual Model	Does the NIF encourage access and control mechanisms to ensure compliance to security and privacy legislation?	<p>The Austrian Handbook for Information Security (Informationssicherheitshandbuch) describes, depending on the requirements of the application, two levels of security requirements. (see interoperability agreements)</p> <p>Austria puts forward a number of security related infrastructure components:</p> <ul style="list-style-type: none"> - Public Key Infrastructure: The public key infrastructure (PKI) forms the basis for authentication and identification of electronic communication with public authorities. This technology is based on the principles of asymmetric encryption. - Citizen Card Concept: The citizen card concept offers functionality for the identification and authentication. The token controls the calculation of cryptographic functions and access to the data on the citizen card. The data stored on the citizen card includes the user's first and last names, date of birth and the keys required for creating signatures. In a separately controlled area, the source PIN for deriving sector-specific personal identifiers, and, where applicable, data on authority to act as a representative is stored as signed data according to applicable standards. 	200911 Austrian minds about Interoperability Reichstädter.pdf, IT Security and Data Protection
Estonia	2.6	Conceptual Model	Does the NIF encourage access and control mechanisms to ensure compliance to security and privacy legislation?	Authentication for data exchange is issued by X-way (systems security certificate server).	Estonian Interoperability Framework (version 3.0), chapter 3, Conceptual model

Denmark	2.7	Conceptual Model	Does the NIF encourage the development of interfaces to authentic sources that are aligned at semantic and technical level?	Many of the central authentic sources such as The Central Person Registry (www.cpr.dk) and The Central Business Registry (www.cvr.dk) are open and aligned by law and design. This is considered core business requirements for registries and as such it is not mentioned explicitly very much in the NIF. However, the basic-data initiative aims to define, align and make available core authentic sources.	Law defining the CPR: https://www.retsinformation.dk/Forms/R0710.aspx?id=125606 Law defining the CVR: https://www.retsinformation.dk/Forms/R0710.aspx?id=27293 http://www.digst.dk/Home/ServiceMenu/English/Digitisation/Basic%20Data
Estonia	3.1	Interoperability Levels	Does the NIF describe the four levels of interoperability?	<ul style="list-style-type: none"> - Legal interoperability - Organisational Interoperability - Semantic Interoperability - Technical Interoperability 	Estonian Interoperability Framework (version 3.0), chapter 4, Interoperability levels
Estonia	3.2	Interoperability Levels - Legal Artefacts	Does the NIF impose to consider all relevant legislation related to data exchange?	<p>General laws on state information:</p> <ul style="list-style-type: none"> - Public Information Act - State Information Management System - Information system security system - Digital Signature Act - Electronic Communications Act - Archives Act - National Statistics Act - Personal Data Protection Act - The Public Procurement Act - Information systems data exchange - Classification system - Address Data System - Geodetic System 	Estonian Interoperability Framework (version 3.0), chapter 4, Interoperability levels

Greece	3.3	Interoperability Levels - Organisational Artefacts	Does the NIF describe that the business processes are documented in an agreed way in order for other administrations to understand the overall business process?	<p>- Process and service mapping and documentation, aiming at ensuring that electronic services offered by public organisations are well documented (process flows, metadata descriptions, etc.) and properly managed, i.e. it is clear who is responsible for the management and the delivery of each service (or part of a service), and these responsibilities are described in the documentation of the service.</p> <p>- The Documentation Model for Public Administration Processes and Data (DMPAPD) aims at defining the notation, the rules and the specifications that must guide the process and data models' design which must be based on BPMN and UML activity diagrams in the case of processes and XML Schema and UN/CEFACT CCTS in the case of documents and data.</p>	Interoperability and Electronic Services Provision Framework, overview_of_the_greek_nif.docx Documentation Model for Public Administration Processes and Data, overview_of_the_greek_nif.docx
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Germany	3.4	Interoperability Levels - Organisational Artefacts	Does the NIF encourage to agree on how these processes will interact among the different levels of public administrations?	<p>The research project "National Process Library", funded by the German Ministry of Interior, and in cooperation with Humboldt University zu Berlin, aims at gathering and exchanging business processes of the public administration across national, state, city and municipality level. The Business Process Technology group develops a process platform for the National Process Library providing a convenient tool to share, analyze, discuss and exchange processes among the different partners of the German administration. Major challenges are the ability to cope with the variety of different Business Process Notations used in the public sector as well as the different abstraction levels, structures and labels of these models.</p> <p>The platform is being designed to manage process building blocks and bring together the knowledge of administrative processes that exists at various levels and link it in a way that makes sense. The project is not about routinely aligning existing models of administrative processes at federal, state and municipal levels. Rather, it hopes to pool existing experiences and multiply knowledge by encouraging the different levels to work together. Using the integrated e-government community, information can be documented using modelling processes and exchanged between participants.</p> <p>Process modelling as a basis for the systematic integration of organizational and IT; Process modelling as a basis for interoperability; Process modelling as the foundation for e-government; Efficient management work;</p>	<p>http://bpt.hpi.uni-potsdam.de/Public/Research/Profile</p> <p>http://www.hpi.uni-potsdam.de/hpi/veranstaltungen/cebit/cebit_2011/national_process_library.html?L=1</p> <p>http://www.cio.bund.de/DE/Architekturen-und-Standards/Daten-und-Prozessmodellierung/Prozessmodellierung_node.html;jsessionid=19E73FBB31DCCDAC13C708F019F9E1F.2_cid324</p> <p>http://www.prozessbibliothek.de/ausgangslage/</p>
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Greece	3.5	Interoperability Levels - Organisational Artefacts	Does the NIF encourage public administrations to clarify their organisational relationships as part of the establishment of a (European) public service?	The organisational units and roles involved in the provision of a service MUST be clearly reported in the documentation of the service. For each service they provide to citizens, enterprises and other bodies, the Public Administration bodies MUST know which bodies they communicate with, the aim of the communication and the information they exchange. The operational points of contact between bodies MUST be assigned on the organisational unit level of the bodies.	Imprinting and documentation of services of public administration, Alignment of processes of different public administration bodies, PHD_unofficial_transation__EN.doc
The Netherlands	3.6	Interoperability Levels - Organisational Artefacts	Does the NIF encourage public administrations to agree on change management processes to ensure continuous service delivery?	AP 31 The quality of the service is governed on basis of cyclical feedback" (PDCA) AP 25 Delivery of the service is continuously guaranteed"	
Greece	3.7	Interoperability Levels - Semantic Artefacts	Does the NIF encourage the usage of a common taxonomy of basic public service?	Interoperability Framework includes guidelines for the definition of code lists, core data components, data types, standard XML schemas, metadata, ontologies, and interoperability registries. These topics are further analysed in the Documentation Model for Public Administration Processes and Data.	Interoperability and Electronic Services Provision Framework, overview_of_the_greek_nif.docx
Spain	3.8	Interoperability Levels - Semantic Artefacts	Does the NIF encourage public administrations to support the establishment of sector specific and cross-sectoral communities that aim to facilitate semantic interoperability and that share results on	- Centre of semantic interoperability of the Administration: it will publish the models for exchange data, both common and sectorial, as well as the relative ones to common infrastructures and services, together with the associated definitions and codifications - Public Administration bodies or Public Law Entities linked or depending on them, holders of competences with regard to information exchange with citizens and with other Public Administrations, as well as in terms of common infrastructures, services and tools, will establish and publish the corresponding interchange data models that will be of mandatory application for information interchanges in Public Administrations.	ES_NIF_Interoperability_Framework_RD4_2010.pdf, Semantic Interoperability

			national and European platforms.		
Austria	3.9	Interoperability Levels - Technical Artefacts	Does the NIF encourage public administrations to agree on the formalised specification to ensure technical interoperability when establishing European public services?	reference.e-government.gv.at / KONVENTIONEN	reference.e-government.gv.at - there the section for Konventionen, Infrastruktur-Interoperabilität, the platform was especially for collaboration within Austrian government (most of the information available in German)
Denmark	4.1	Interoperability Agreements	Does the NIF encourage: - Interoperability agreements to be based on existing formalised specifications? Or - if they do not exist, to cooperate with communities working in the same areas.	Inter-government cooperation (OIO) OIO is a common public framework for public administrations to work together to create coherent public service delivery based on common architecture and standards.	http://www.digst.dk/Arkitektur-og-standarder/Kopi-af-It-arkitektur/Tvaeroffentligt-samarbejde

Italy	4.1	Interoperability Agreements	<p>Does the NIF encourage:</p> <ul style="list-style-type: none"> - Interoperability agreements to be based on existing formalised specifications? Or - if they do not exist, to cooperate with communities working in the same areas. 	<p>Via Service Agreements and Cooperation Agreements. Firstly, a Service Agreement is a legally binding agreement established between a provider of a service and a client of the service. It defines the rules for the provision of PA's e-government application services and it is currently specified using the XML language. When generalized to cooperation among multiple parties, the agreement is named Cooperation Agreement. Secondly, a cooperation agreement defines the application services offered by the so-called Cooperation Domain, i.e., a set of different subjects that wish to cooperate for administrative processes automation purposes.</p>	Chapter 3, NIFOdokument_v1.2.pdf
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Malta	4.2	Interoperability Agreements	Does the NIF encourage Public administrations to use a structured, transparent and objective approach to assess and select formalised specifications?	<ul style="list-style-type: none"> - The Architecture Assessment process governed by the Enterprise Architecture Policy, among other things, is intended to verify that the Interoperability related building blocks are being used by public services as intended and that the envisaged benefits are in fact being fulfilled. Public services adopting building blocks as defined by the NIF will only need to describe their use within their solution without the need to explain their technical validity as this analysis would have already been done. For instance a solution proposing the use of SAML 2.0 (a formalised specification already adopted and endorsed by MITA) to request an authentication claim from the Government's identity repository of public officers can do so immediately. An added benefit here is that the overall assessment time can be drastically reduced if solutions are standardised and use pre-established services. - Technical standards need to be evaluated against a number of criteria mostly falling within the following categories: <ul style="list-style-type: none"> - Level of Openness - gauging the formalised specification's conformity with "open" characteristics including: <ul style="list-style-type: none"> - All stakeholders have the same possibility of contributing to the development of the specification and public review is part of the decision-making process; - The specification is available for everybody to study; - Intellectual property rights related to the specification are licensed on FRAND terms or a royalty-free basis in a way that allows implementation in both proprietary and open source software. - Relevance to the business context – gauging the applicability of the technical standard's features to its scope of use; - Market support - gauging the more practical side of the technical standard by looking at the quality of its implementations, commercially or otherwise, that are readily available for use; - Impact assessment gauging the extent to which the technical standard is envisaged to be used within 	<ul style="list-style-type: none"> - NIF Framework, chapter 2, 2.6.2 Governance - NIF Framework, chapter 5, 5.2.2 Selection Criteria
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Government and therefore what potential benefits and risks it might introduce.

Estonia	4.3	Interoperability Agreements	Does the NIF encourage public administrations to prefer open specifications, taking due account of the coverage of functional needs, maturity and market support?	<p>Estonia's criteria for open standards: eligibility, potentially, the openness of the market value.</p> <ul style="list-style-type: none"> - Eligibility. Expresses eligibility with the public sector "business needs" (In addition: accessibility, security, privacy, multilingualism, etc.) - Potential. Expresses non-functional features such as scalability, maturity, stability and manageability - Openness: availability of technical specifications, Market capacity for implementation, etc. - Market value: Market value reflects compliance with the standard "good practice" (with usability, availability of competing applications, application rate, the existence of support, etc.) <p>The Estonian NIF contains an open standards framework, a software framework and guidelines for the assessment of specifications.</p>	Estonian Interoperability Framework (version 3.0), chapter 5, Open standards
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Malta	4.4	Interoperability Agreements	Does the NIF encourage public administrations to lead or actively participate in standardisation work relevant to their needs?	<p>- Semantic interoperability depends primarily on high-quality documentation of repositories (registries / databases), services, applications and ultimately business domains. To reach a mature and stable semantic state, collaborative agreements should be established across the public sector to establish a realistic version of the asset descriptions. Policies, standards and procedures can be created to centrally coordinate and guide these efforts. An elaboration of dictionaries, thesauri and nomenclatures can be centrally established as a reference point. If necessary references to these semantic assets can also be made in the legislation; making their use mandatory</p> <p>The following actions can create an organisational support framework to drive semantic interoperability:</p> <ul style="list-style-type: none"> - In all major business domains, expert groups are formed with the task of creating and maintaining the respective business domain's semantic assets; - Semantic assets spanning or interacting among multiple domains might require cross-sectoral / cross-domain expert discussions. So while a multilateral agreement can eventually be reached, working groups represented by the relevant ministries / departments can create and maintain instructions on the translation/modification of data objects of one area into those of another area. - On an international level, the participation in semantic interoperability fora can influence the elaboration of mutual agreements and semantic gateways for the semantic interoperability between information systems of different countries. <p>Together with the Data Governance Council, public sector organisations are invited to incorporate semantic considerations when developing public services. This will facilitate the gradual transformation of data to value added information.</p>	NIF Framework, chapter 4, 4.4. Organisational support
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The Netherlands	4.5	Interoperability Agreements	Does the NIF encourage public administrations to agree on minimum service requirements for secure data exchange?	AP 28 Service provider and user have agreed on a SLA AP 33 The service agrees with the Quality baseline. The baseline is a normative framework within the organisation, but based on standards en agreements within the sector As said NORA explains that individual organisations are themselves responsible for reaching these agreements.	
Italy	5.1	Interoperability Governance	A governance framework exists to control the interoperability activities across administrative levels.	The entire governance of SPC is under the control of the SPC Commission (or SPC Board). The Commission is formed by members (a first half) appointed by Ministers and members (a second half) appointed by the Assembly of local administration; that is, the political representative of local PAs. DigitPA has the presidency of the Commission. The Commission is responsible for approving all the guidelines and procedures concerning the activities carried out within the context of SPC. Compliance rules are instead approved by the Prime Minister and updated by the Minister of PA and Innovation's decree. DigitPA, and the Italian Regions for what concerns local administration, are responsible for the governance of both the SPC Interoperability infrastructures and framework contracts defining the government services used by PAs.	Chapter 3, NIFOdokument_v1.2.pdf

