

Assessing the Organizational Interoperability of the National Single Digital Gateway (GOV.GR)

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Abstract

Achieving interoperability in public administration is a crucial factor for delivering efficient, cost-effective, transparent public services. There are still many challenges and limitations, due to technical, semantic, legal, and organizational factors. This paper highlights the importance of organizational interoperability in e-Government as well as the need for its successful assessment, to define the gaps and to suggest improvements. A short review of existing assessment tools, frameworks and models is provided. The paper presents the evaluation of a new, holistic model for organizational interoperability assessment with the aid of a large-scale digital implementation. The new model is extended with new attributes and assessed with data gathered from the National Single Digital Gateway (GOV.gr) case study.

Keywords: Organizational interoperability, assessment, digital services, maturity models

1. Introduction

Enhanced interoperability among public bodies and respectively public and private organizations is of critical importance for building e-Government added value models (Pardo & Tayi, 2007). The integration of government information resources and processes and thus the interoperation of independent business systems applications is essential to accomplish agile, citizen-centric, accountable, transparent, effective, and efficient governmental services (Gottschalk, 2009).

There are several European Commission directives that indicate the crucial impact of interoperability on digital transformation. Interoperability is presented as one of the core priorities in the Digital Europe Program (European Commission, 2020). Several public programs and projects such as ISA² (Interoperability Solutions for Administrations) were funded by the European Commission and observatories on e-Government developments, such as NIFO (National Interoperability Framework Observatory) were created. Moreover, several national interoperability strategies, action plans, and expert groups were established in the

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last decade to highlight the importance of interoperability in public administration.

Despite the recognition of the importance, investments and man-effort dedicated in the pursuit of improved collaboration between different organizations, the level of interoperability remains far from adequate. In (Rezaei et al., 2014) three main categories of interoperability barriers are identified: organizational, conceptual, and technological incompatibility.

Interoperation in public administration remains an enduring challenge due to organizational differences, such as different organizational structures and management processes (Maheshwari & Janssen, 2012). Many researchers consider organizational interoperability to be a crucial factor for successfully promoting e-Government (Kubicek et al., 2011) (Margariti & Stamati, 2018) (Rauffet et al., 2009). Since organizational interoperability is so important, public administration needs to be guided by a holistic approach that will help identify the gaps and determine weaknesses and deficiencies to finally lead to recommendations for improvements. An Interoperability Transition Plan can be for further established for adopting and implementing e-Government initiatives (Sarantis et al., 2008).

2. Theoretical Background

Integration, information sharing and interoperability in government have become of major interest (Kubicek et al., 2011). Digital government initiatives face serious challenges since the required level of interorganizational collaboration and trust is often not supported by existing institutional arrangements, organizational structures, and management processes (Luna-Reyes et al., 2007). Lack of commonly agreed processes, difficulties in interpreting administrative procedures and legislation, difficulties in defining authorities and responsibilities are some of the reasons which justify why cross-border and national interoperability have not yet been achieved (Scholl & Klischewski, 2007).

According to (K., 2006), the complexity of organizational aspects of interoperability may surpass the technical issues as the public organizations

toward inter-organizational governance. Gottschalk (Gottschalk, 2009) describes that interoperability is not only a technical subject, but there is a need to conceptualize the organizational aspects of interoperability. In (Margariti & Stamati, 2018) the importance of organizational interoperability in e-Government is highlighted, along with its relevance to governance, open data policies and information sharing. Recent research attempts to clarify and re-conceptualize the layer of organizational interoperability by introducing an empirically based conceptual framework (Kubicek et al., 2011) are presented.

Evaluating the organizational interoperability degree is necessary to overcome the barriers towards information integration. The evaluation process includes definition of metrics to assess the maturity level and afterwards make suggestions for further improvement. The assessment of the maturity level is accomplished with the aid of a maturity model through which an organization can identify its current capability status and its desired capability maturity level (Sarantis et al., 2008).

2.1 Models and Frameworks

There are many research articles presenting interoperability assessment models (Rezaei et al., 2014), frameworks (Kubicek et al., 2011), technology maturity indexes and matrices (Sarantis et al., 2008) (Crowley & Gold, 2016) as well as methodologies and guidelines that can help an organization achieve the desired interoperability objectives.

Existing interoperability maturity models, commonly referred to literature and utilized by organizations at a national and/or international level are LISI (Levels of Information Systems Interoperability) (C4ISR AWG, 1998), OIM (Organizational Interoperability Model) (Clark & Jones, 1999), LCIM (Levels of Conceptual Interoperability Model) (Tolk & Muguira, 2003) and EIMM (Enterprise Interoperability Maturity Model) (ATHENA, 2003).

According to a survey and comparison of the above models introduced by Guédria (Guédria et al., 2008) as well as considering Maheshwari (Maheshwari & Janssen, 2012), none of these models which were developed and implemented by different researchers, national and international organizations discuss specific measures to assess the organizational aspects of interoperability or identify assessment constructs for measuring and benchmarking organizational interoperability.

Having identified on the one hand the lack of interoperability as a major obstacle for a successful

digital transformation and the gaps in existing assessment models on the other, the European Commission has introduced a new model, the Interoperability Maturity Model (IMM) (European Commission ISA2, 2016) which is based on the vision laid out in the European Interoperability Strategy (EIS) and it is fully aligned with the latest version of European Interoperability Framework (EIF) (European Commission, 2017)

2.2 Assessment Tools

Through the above maturity models and frameworks, assessment tools were respectively developed to identify the level of interoperability maturity and suggest specific improvements:

- Government Interoperability Maturity Matrix (GIMM) (Sarantis et al., 2008)
- Measurement instrument (Maheshwari & Janssen, 2012)
- Interoperability Maturity Model and Tool (IMM Full & Lite) (European Commission ISA2, 2016)
- Interoperability Maturity Assessment of a Public Service (IMAPS) tool (European Commission & Directorate General for Informatics, 2020)

According to (Margariti et al., 2020), although the above assessment tools incorporate an effective approach regarding the assessment of technical, semantic, and organizational interoperability readiness, specific measures to benchmark organizational interoperability are not proposed and alignment issues regarding the new European Interoperability Framework (EIF) are also introduced in most of them.

Despite Interoperability Maturity Assessment of a Public Service (IMAPS) is fully aligned with new EIF providing insight into the current interoperability maturity of a digital public service and introducing guidelines on how the digital public service can improve interoperability maturity in all four dimensions (legal, organizational, semantic, and technical), it does not include all the necessary characteristics for a holistic assessment of organizational interoperability (Margariti et al., 2020).

The MOIA model, introduced in (Margariti et al., 2022), provides a comprehensive approach to diagnose the current situation and plan further improvements in organizational interoperability, by combining different measures from different perspectives. It provides a more holistic perception of what organizational interoperability represents while it is based on the IMM model, IMAPS tool and the GIMM

matrix. The MOIA model, incorporating 34 different attributes categorized in 9 different sections, that either emerge from literature or satisfy current needs and new guidelines around interoperability, and which are fully aligned with the EIF.

This paper presents the extension of MOIA model with the four (4) additional attributes, introduced during the data analysis of the ESIDIS assessment through an additional wave of qualitative assessment and evaluation within a large-scale digital implementation from Greek public sector - GOV.GR.

3. Research Design

3.1 Waves of Model Extension

The extension of the holistic model for the assessment of organizational interoperability includes the following waves:

- Selection of the Assessment model and Tool
- Addition of new interoperability attributes
- Categorization of all attributes
- Enhancement of the assessment model
- Update of the tool / questionnaire
- Assessment of organizational interoperability within GOV.GR
- Analysis of the evaluation process

All the above waves are presented in the following methodology diagram:

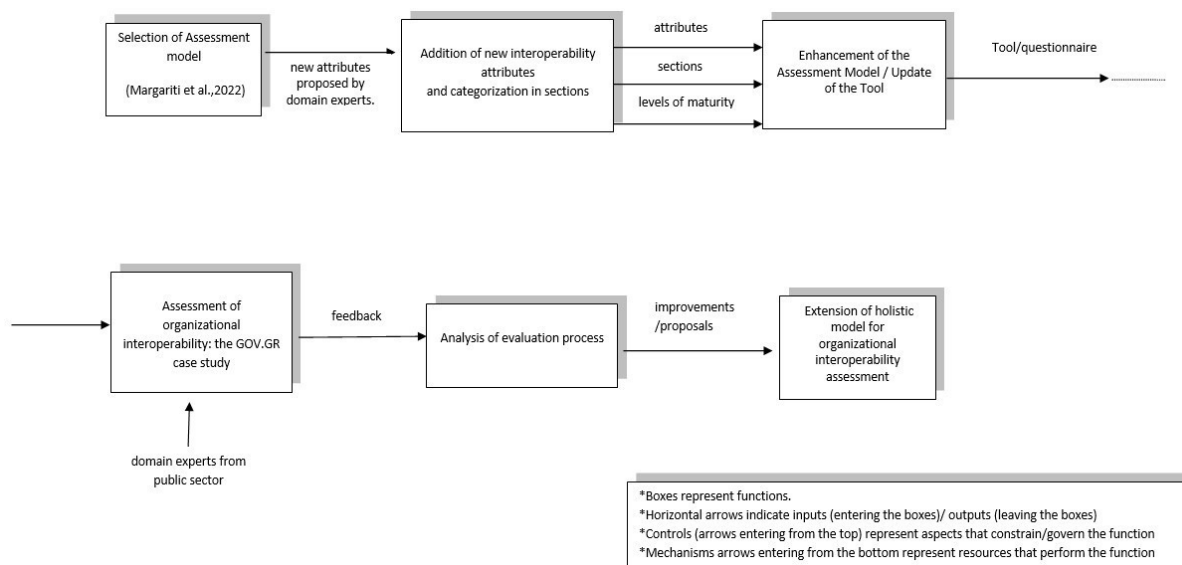


Figure 1. Methodology diagram

3.2 Application Scenario

3.2.1 Selection of an assessment model

MOIA model, a holistic model for organizational interoperability assessment that (Margariti et al., 2022) introduced, was selected to be further enhanced to incorporate new concerns and barriers.

3.2.2 Addition of new organizational interoperability attributes

These attributes were proposed by e-procurement domain experts and contribute to the achievement of a more holistic approach of organizational interoperability assessment. The following table presents the new proposed attributes and the relative justification.

Table 1. New proposed Organizational Interoperability Attributes

Attributes	Justification
Technological neutrality	Information systems development should provide technological neutrality to easily foster changes and this an attribute related to organizational interoperability
Data portability	Data portability is an attribute defining organizational interoperability in a digital service or a system in general.
Political commitment	Political commitment is a key feature for a successful governance model and a prerequisite for organizational interoperability
Institutional arrangements	Institutional arrangements are crucial for the establishment of organizational interoperability between governmental bodies to provide successful digital implementations

The following table (see Table 2) presents the aggregated organizational interoperability attributes arising both from the academic research and the quantitative/qualitative process. Furthermore, justification is provided to specify their added value.

Table 2. Aggregated Organizational Interoperability Attributes

Attributes	Justification
Best practices	Already cross-border relative implemented digital services should be considered as best practices during the process of the development of a new digital service
Cataloguing	The potentiality of searching, drawing, and integrating of services during the process of development is an indicator of high level of organizational interoperability

Attributes	Justification
Multilingualism	The potentiality of providing a specific service in multiple languages should be considered in the evaluation of organizational interoperability
Coordination	The strategic approach of implementing the digital service is an essential parameter for the achievement of organizational interoperability
Interaction with NIFO Greece	The potentiality of providing feedback to a national observatory for interoperability is a crucial index for assessing the maturity of organizational interoperability
Accessibility to the European Interoperability Knowledge Base	The potentiality of the public authority to have access to the European Interoperability Knowledge Base (Learning organizations, ISA ² , NIFO, social media) to follow up all necessary updates for the digital service is a crucial parameter for assessing interoperability maturity
Dissemination	The providence of a dissemination system for the notification of the new digital service to other authorities is an important parameter for assessing the maturity of organizational interoperability.
Exploitation of dedicated to interoperability financial resources	The awareness and exploitation of all relative to interoperability financial resources for the development and the implementation of the digital service is an index for measuring the level of maturity of organizational interoperability.
Compatibility with National Digital Strategy	It is crucial to achieve alignment with national digital strategy.
Compliance with SDG regulations	The compliance with Single Digital Gateway regulations is a crucial index for assessing the level of organizational interoperability.
Availability of digital service at National Single Digital Gateway	The availability of a digital service at the National Single Digital Gateway incorporates business process alignment and consequently proves the accomplishment of organizational interoperability at national level
Interoperability Learning Profiles	The adoption of specific interoperability learning profiles that Interoperability Academy introduces during the training process is important for the achievement of organizational interoperability. Professionalization policies at national level are essential to ensure skills, knowledge, and integrity around interoperability.
Metadata Standards of Service	Current European guidelines around interoperability consider definition of metadata standards for a digital service a crucial factor for the organizational interoperability
Service Evaluation and Metrics	A service evaluation process and the availability of specific service metrics and indexes provide a high level of organizational interoperability. Outcome indicators (cost per service, number of users, response Time etc.), efficiency indicators, contribution to the digital transformation index
Assistance Service	The availability of an assistance service process should be considered as an important index for assessing the maturity level of organizational interoperability. e.g If users are still confused about which rules apply or have trouble with a procedure,

Attributes	Justification
	they will be guided to the EU or national assistance service most suited to address their problem
Compatibility with Accessibility Guidelines and relative standards	It is important that the digital service is aligned with all these guidelines the web accessibility legislation introduces so it is an index for assessing organizational interoperability
Technological neutrality	Information systems development should provide technological neutrality to easily foster changes and this an attribute related to organizational interoperability
Data portability	Data portability is an attribute defining organizational interoperability in a digital service or a system in general
Political commitment	Political commitment is a key feature for a successful governance model and a prerequisite for organizational interoperability
Institutional arrangements	Institutional arrangements are crucial for the establishment of organizational interoperability between governmental bodies to provide successful digital implementations

3.2.3 Categorization of organizational interoperability attributes

The next step was the categorization of all organizational interoperability attributes, old and new ones, into sections for better assessment results. The following table presents all the organizational interoperability attributes aggregated in sections.

Table 3. Interoperability attributes (IA) per section

Attributes	Sections
(A1) Procurement criteria	Design Process (A)
(A2) Specification Process	
(A3) Design methodology	
(A4) Collaboration	
(A5) Best practices	
(A6) Compatibility with Accessibility Guidelines and Relevant Standards	
(A7) Data portability	
(A8) Technological neutrality	
(B1) Compatibility with intergovernmental legislation issues	Government Process Alignment (B)
(B2) Certification	
(B3) Business Process Modelling	
(B4) Compatibility with National Digital Strategy	
(C1) Compatibility with EIF	Compatibility with European
(C2) Compatibility with GDPR	

(C3) Compliance with SDG regulations	policies and regulations (EIF, GDPR) (C)
(D1) Procedural transparency	Interaction with users (D)
(D2) User Feedback	
(D3) Service level Agreements	
(D4) Assistance Service	
(E1) Service Consumption	Service Consumption (E)
(F1) Reuse and sharing	Reusability of service (F)
(F2) Cataloguing	
(F3) Metadata Standards of Service	
(G1) Once-Only Principle	Interoperability at national-international level (G)
(G2) Cross border service delivery	
(G3) Multilingualism	
(G4) Availability at National Single Digital Gateway	Change Management (H)
(H1) Staff restructuring	
(H2) Training	
(H3) Interoperability Learning Profiles	
(H4) Definition of Job Profiles	Governance (I)
(I1) Coordination	
(I2) Interaction with NIFO	
(I3) Accessibility to EI Knowledge Base	
(I4) Service Evaluation and Metrics	
(I5) Dissemination	
(I6) Exploitation of dedicated to interoperability financial resources	
(I7) Political commitment	
(I8) Institutional arrangements	

3.2.4 Extension of the assessment model/tool

An updated model was developed after the addition of the new interoperability attributes (IA), categorized in sections, defined in lines and the five (5) levels of the maturity model (IMM) defined in columns. The grade of fulfilment of an IA corresponds to a specific level of maturity in the organizational interoperability dimension. The extended assessment model/tool is presented in Table 4.

IA \ IMM levels	Ad hoc (1)	Opportunistic (2)	Essential (3)	Sustainable (4)	Seamless (5)
Design Process (A)					
(A1) Procurement criteria	No standards in procurement		Partially, standards -based procurement		Fully, standards -based procurement
(A2) Design methodology	No, design processes have not been used at all		Partially, best practice based designed processes		Fully, design approaches-based process transformation
(A3) Specification Process	Closed specification process		Stakeholders have been invited once	Stakeholders have been invited periodically (frequently)	Open specification process
(A4) Collaboration	No, working groups was not established				Yes, working groups with members from all stakeholders were established
(A5) Best practices	No, best practices have not been used at all		Partially, best practice based digital services		Fully, best practice based digital services
(A6) Compatibility with Accessibility Guidelines and Relevant Standards	No, there is no compliance at all		Partially, some guidelines and standards have been adopted		Fully, all guidelines and standards have been adopted.
(A7) Data portability	No				Yes
(A8) Technological neutrality	No				Yes
Government Process Alignment (B)					
(B1) Compatibility with intergovernmental legislation issues	No		Partly		Yes
(B2) Certification	No, there is no certification procedure available				Yes, there is a certification procedure available
(B3) Business Process Modeling	No BMP		Ad hoc BMP	Standards-based BPM	Standards-based and collaborative BPM
(B4) Compatibility with National Digital Strategy	No		Partially		Yes
Compatibility with European policies and regulations (EIF, GDPR (C)					
(C1) Compatibility with EIF	No		Partly		Yes
(C2) Compatibility with GDPR	No		Partly		Yes
(C3) Compliance with SDG regulations	No		Partly		Yes
Interaction with users (D)					
(D1) Procedural transparency	No procedural transparency		Partly procedural transparency		Full procedural transparency
(D2) User Feedback	No User Feedback channel		Physical Feedback channel	Digital Feedback channel	Digital Feedback channel and insight into others' feedback
(D3) Service level Agreements	No		SLAs without monitoring		Monitored SLAs and corrective action
(D4) Assistance Service	No				Yes
Service Consumption (E)					

IA \ IMM levels	Ad hoc (1)	Opportunistic (2)	Essential (3)	Sustainable (4)	Seamless (5)
(E1) Service Consumption					
Reuse and sharing (F)					
(F1) Reuse and sharing	None	One answer chosen	Two answers chosen	Three answers chosen	All answers chosen
(F2) Cataloguing	No				Yes
(F3) Metadata Standards of Service	No				Yes
Interoperability at national-international level (G)					
(G1) Once-only Principle	No				Yes, provision of diverse data only once in contact with public administrations
(G2) Cross border service delivery	Restrictions towards foreigners				Restrictions towards foreigners
(G3) Multilingualism	None		Partially		Fully
(G4) Availability at National Single Digital Gateway	No				Yes
Change Management (H)					
(H1) Staff restructuring	No		Yes, there was partly staff restructuring		Yes, there was fully staff restructuring
(H2) Training	No				Yes, all employees involved were trained
(H3) Interoperability Learning Profiles	No				Yes
(H4) Definition of job profiles	No		Partly		Yes
Governance (I)					
(I1) Coordination	No				Yes
(I2) Interaction with NIFO	No				Yes
(I3) Accessibility to European Interoperability Knowledge Base	No		Yes, but not in a systematic way		Yes, there is a department following up all European issues around interoperability
(I4) Service Evaluation and Metrics	No		Yes, but not in a systematic way		Yes, there is a service evaluation process along with metrics
(I5) Dissemination	No				Yes, there is a dissemination system
(I6) Exploitation of dedicated to interoperability financial resources	No		Yes, but not a dedicated one		Yes, there is a dedicated department authorized
(I7) Political commitment	No				Yes
(I8) Institutional arrangements	No				Yes

Table 4. Organizational Interoperability Maturity Assessment Services Matrix

3.2.5 The Updated Tool

The tool/questionnaire (Appendix Questionnaire1) which was introduced in (Margariti et al.,2022) was updated (Appendix Questionnaire2). New questions relative to the new attributes were added to represent a more holistic approach around organizational interoperability.

4. Evaluation Process

4.1 Case Study Selection

National Single Digital Gateway – GOV.gr was selected as a representative case study for the holistic assessment of organizational interoperability with the enhanced MOIA model. This implementation includes all these characteristics needed to conduct a holistic assessment of organizational interoperability.

GOV.GR is the Single Digital Portal of Greek public administration for citizens and enterprises, hosting by this time more than 1.500 digital services in a unique point of single contact. The development continues with the constant addition of new services and features that aim to increase the usability and accessibility of the portal. GOV.GR (<https://www.gov.gr/>) replaced ERMIS (<http://www.ermis.gov.gr/portal/page/portal/ermis/>). In its full development, GOV.GR, will act as the single point of digital contact between citizens/ businesses and the public administration, and as such the common digital “front office” of the latter.

A new organizational structure, the Coordination Service (Hellenic Republic Digital Service - HRDS) of the Single Digital Portal has been established under the law 4704/2020 (article 16), to better coordinate and monitor the development and management of GOV.GR portal.

GOV.GR adapts a civil-centric approach, following the prevailing international trend for central government portals that focus on citizens’ and businesses’ needs (user-centered design). The portal has structured (and presented) the offered services in a central taxonomy, based on life events while there is also a secondary classification of services based on the organizational structure of the institutions that provide them. GOV.GR aims to replace the legacy public service design, which was based on the internal view and capacity of public bodies, with a friendly and expandable digital ecosystem of public services.

4.2 Key Features of GOV.GR Case Study

The national single digital portal’s development introduces a governance model strongly related to the accomplishment of interoperability between the involved parties (Central State, Local Government, Businesses, and other public digital services) at all levels, technical, semantic, organizational, and legal level.

Establishment of interoperability between national base registries and GOV.GR portal is crucial for the provision of citizen - centric digital services under a unique infrastructure. New key features such as the achievement of interoperability with the National Notification Service and the Citizens’ Service Center have recently been implemented. Furthermore, the integration of EU’s Single Digital Gateway (SDG), which provide information about procedures to EU citizens, under the GOV.GR portal, also considers interoperability as a prerequisite for its successful deployment.

Authentication and security services are also consumed while assistance services and user feedback mechanism are also provided within GOV.GR.

Taking into consideration all the above regarding the national single digital portal - GOV.GR implementation it becomes obvious that it acts as a representative case study for conducting a holistic assessment around interoperability issues.

4.3 Methodology and Data Collection

4.3.1 Evaluation from Domain Experts in the Greek Public Sector

Quantitative and qualitative techniques have been used to evaluate the extended MOIA model with the digital implementation of GOV.GR as a case study. Several indicative services from National Digital Gateway- GOV.GR, all of which fall within the scope of organizational interoperability assessment were examined to evaluate structure issues, the procedures, the relations, the coordination, and other organizational aspects at all levels.

A focus group of 10 domain experts at national level of public administration in Greece provided feedback utilizing the new model for the holistic assessment of organizational interoperability in GOV.GR case study (see Table 5). The selection of the specific group of domain experts was based on the representation of the basic roles in the development and management of GOV.GR, as well as on the requirement for the in-depth know-how of GOV.GR case study and policy issues around interoperability (Sink, 1983) (McMillan et al., 2016)

Case Study	Role of participants
National Single Digital Gateway - GOV.GR	Manager
	Manager
	Manager
	Manager
	Developer
	Developer
	Developer
	Policy Officer
	Policy Officer
	Policy Officer

Table 5. Domain experts at national level

4.3.2 Results

According to feedback given by the domain experts, the extended MOIA model introduces a holistic approach around organizational interoperability because most of relative concerns and barriers have been taken into consideration.

More specifically, according to their contribution, the new extended model not only considers the business process issues for such a large-scale digital implementation but other important concerns such as the need for coordination and collaboration between the different stakeholders, the need for organizational structures and definition of responsibilities to achieve horizontal governance, the need for institutional arrangements as well as the need for training, assistance service, change management and funding issues. All these attributes satisfy the general perception for an effective governance of an integrated digital implementation incorporating interoperability in all four dimensions, technical, semantic, organizational, and legal dimension.

In addition to the above evaluation, domain experts suggested that the implementation of GOV.GR would be more effective if such a model had been considered in all stages of the system's development. Nevertheless, such a holistic model can still give added value by helping them to identify weaknesses and lack of compatibilities.

5. Discussion

Organizational interoperability is an efficient factor for accomplishing efficient, integrated, and transparent intergovernmental services and is believed to be strongly related to IT governance. Moreover, the public sector considers it a key prerequisite to applying open data policies and therefore providing open data services.

According to comparative surveys none of the existing frameworks, maturity models and assessment tools that are presented in the literature provide a holistic approach of all the current concerns and barriers for the assessment of organizational interoperability

MOIA model, the new holistic model for organizational interoperability assessment provides a more complete and reliable approach to diagnose the current situation and plan for future improvements in organizational interoperability. It is based on a referential model combined with an existing maturity model and it has been further enhanced with several attributes that either emerge from literature or satisfy current concerns and needs as they are proposed by domain experts during the waves of its development.

Furthermore, it incorporates a more holistic perception of what organizational interoperability represents by introducing concerns and issues not only on the business process area but also by proposing attributes reflecting the need for institutional arrangements, political commitment and definition of organizational structures and responsibilities within public authorities as well as the need for coordination and collaboration between the different stakeholders.

The evaluation of the new model has been initially conducted during the assessment process of about 40 digital services by corresponding domain experts at various administrative levels and from various policy areas. On the second phase of its development, it is further evaluated by two focus groups. Ten (10) new digital services were assessed based on qualitative research for new attributes by an equal number of domain experts (first focus group) while the second group of eight (8) domain experts evaluated the new model within the field of a large-scale digital implementation in Greek Public Administration, ESIDIS.

The additional attributes, introduced during the data analysis of the ESIDIS assessment further enhanced the MOIA model through an additional wave which included a qualitative assessment of the final MOIA model with the 4 additional attributes. A large-scale digital implementation of the Greek Public Sector, the Single Digital Gateway, namely GOV.GR was selected as a representative case study for organizational interoperability assessment and confirmed the holistic approach the enhanced MOIA model provides.

The new holistic approach is expected to help public administrations determine the weaknesses and deficiencies they need to improve and finally formulate and implement an Organizational interoperability transition plan for a successful digital transformation.

In the future, more cases from different domains as well as cross-border ones involving more experts will be used to refine the weights of the methodology. and to

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APPENDIX

Questionnaire - 1. Retrieved from

<https://docs.google.com/forms/d/1SLzQty7LccCGI5Wcx9xq4SHcV4keEVt3Ee94SwTAno/edit>

Questionnaire - 2. Retrieved from

https://docs.google.com/forms/d/1wc659fYyDG0p38_r-rNFJzTBBGdsUzpxLga4mYO_C5A/edit