Evaluation and optimization of the service-oriented enterprise architectures interoperability
Application to Government Enterprise Architecture

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Plan

• Introduction

• Research area

• Interoperability Monitoring For E-Government Service Delivery based on Enterprise Architecture

• Conclusion
Research area

- Interoperability within collaboration networks (CN)

- Service oriented enterprise architecture (SOEA) to govern CN interoperability

Evaluation and optimization of SOEA interoperability with a focus on public integrated e-service delivery
Related Thesis – DIeGov Project

- **Strategic Planning**
  - Mouhssine Lakhdissi

- **Data Governance**
  - Farhoun / Naoua

- **Collaboration Network**

- **Strategic Alignment**
  - Kaouthar ELHARI

- **Interoperability Enhancement**
  - Badr ELMIR
Interoperability Monitoring For E-Government Service Delivery based on Enterprise Architecture

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Outline

• Introduction

• Interoperability in E-Government Service Delivery

• E-Service interoperability measurement method

• Interoperability monitoring tool

• Conclusion

Customers expect to perceive public administration as a homogeneous and coherent unit in order to have a unified access to services they need.

Public administration must prepare itself to provide fully integrated services for its clients (citizens, administrations, business, employees)

Study the back office integration of public administration (government-to-government) in order to provide operational integrated e-services.
Delivery process transformation

- invitation to adapt the internal processes. This involves a business process reengineering and a transformation of service delivery.

The three Stages of Strategic HIS Implementation (Adapted from [1])
Healthcare alignment assessment

Description of enterprise architecture using the S2AEA platform [2]

Healthcare alignment assessment

Strategic alignment assessment using S2AEA [2]

Interoperability assessment

- Interoperability maturity level of the environment surrounding the e-service.
- Compatibility degree of the external interfaces of the involved business processes.
- Operational performance of the support systems used to provide the online service.
Interoperability assessment

1. Delineating the scope of interoperation
2. Quantifying interoperation potentiality.
3. Calculating compatibility degree.
5. Aggregating the degree of interoperability.
1- Delineating the scope of the study

- This step includes identifying:
  - Departments involved in the cooperation.
  - Involved sub process within each Dept. in order to study compatibility.
  - Information systems used to support the automated business processes within each Dept.
2- Quantifying the interoperation potentiality

IMM have 5 levels ranked from 1 to 5 (from the weakest, to the strongest) : ITIM, LISI, OIMM, EIMM, GIMM

<table>
<thead>
<tr>
<th>Maturity Level (IMML)</th>
<th>Potentiality quantification</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
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<td>0.4</td>
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<td>0.8</td>
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<td>5</td>
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</table>

\[ PI_k = 0.2 \times IMM_k \] \quad (1)

Interoperation potentiality is characterized by the potentiality of its weakest sub entity

\[ PI = \min(PI_k) \] \quad (2)
3- Calculating the degree of compatibility

Use of a compatibility matrix of Chen. It consists of a combination of the “levels perspective” and the “barriers perspective”.

\[ dc_{ij} = 0 / 1 \]

<table>
<thead>
<tr>
<th></th>
<th>Conceptual</th>
<th>Organisational</th>
<th>Technology</th>
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<td>( dc_{33} )</td>
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<tr>
<td>Data</td>
<td>( dc_{41} )</td>
<td>( dc_{42} )</td>
<td>( dc_{43} )</td>
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</table>

We enumerate barriers in the different levels of interoperability concern. If a criteria in an area marked satisfaction the value 0 is assigned; otherwise, the 1 value is assigned.

\[
DC = 1 - \sum (dc_{ij} / 24)
\]  

\[ (3) \]
4- Evaluating operating performance

- «**DS**» the overall availability rate of application servers.

- «**QoS**» service quality of different networks used for interacting components communication. QoS is represented mainly by the overall availability of networks.

- «**TS**» end users’ satisfaction level about interoperation.

\[
PO = \sqrt[3]{(DS \times QoS \times TS)} \quad (4)
\]
5- Aggregating the degree of interoperability

• The final calculation of the ratio characterising the interoperability process in question is done by aggregating the three previous indicators using a function \( f \) defined in \([0,1]^3 \rightarrow [0,1]\)

\[
\text{RatIop} = f(\text{PI}, \text{DC}, \text{PO}) \quad (5)
\]

• Given the independent nature of these three indicators, we opt for the arithmetic mean as follows:

\[
\text{RatIop} = \frac{\text{PI} + \text{DC} + \text{PO}}{3} \quad (6)
\]

• In case the business collaboration network has elements for pondering each one of these three indicators with different weights \((n1, n2, n3)\); we choose the weighted arithmetic mean.

\[
\text{RatIop} = \frac{(n1 \times \text{PI} + n2 \times \text{DC} + n3 \times \text{PO})}{(n1 + n2 + n3)} \quad (7)
\]
Interoperability Monitoring approach

### Periodic Interoperability monitoring tool

#### RatIop Monitoring Tool - Assessment

<table>
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<tr>
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<th>Accounting</th>
<th>Planned RatIop</th>
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<td>MEF</td>
<td></td>
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</table>

#### Maturity

- **GiMM**: Collaborative
- **Ad hoc**: Off
- **Independent**: Off
- **Combined**: Off
- **Unified**: Off

#### Operational Performance

- **Users satisfaction %**: 84
- **Network QoS %**: 99
- **App. Servers Availability**: 96

#### Compatibility

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Conclusion

• A **five steps measurement method** for interoperability used to deliver integrated e-services within collaboration networks.

• The proposed method takes into account the three main operational aspects:
  - interoperation potentiality,
  - interoperation compatibility
  - operational performance.

• It uses existing indicators within involved entities like quality maturity indicators, information technology dashboards, etc.

• Periodic monitoring approach for interoperability to deliver integrated public e-services

• The proposed method supporting tool tracks the evolution of interoperation degree in time and is able to propose a suitable scenario to reach planned degrees of interoperability
Thank you for your attention!
References


Research contribution

- Proposing a ratio metric and an approach for interoperability assessment
- Promoting interoperability as a requirement for integrated e-services provision
- Generalizing results to BCN context
- Enabling observability and controllability of interoperability.
- Combining multi-project management techniques and particle swarm heuristic techniques for interoperability optimization.
- Enabling Healthcare Alignment in Integrated Delivery Networks through Interoperability Enhancement.
Publications


2. Elmir, B. and Bounabat, B., “RatIop, a Ratio Metric for Assessing Interoperability between Automated Business Processes”. Journal of Computing and Applications JCA, Volume 1, Issue 1, Accepted for publication on June 2010.


B. ELMIR is a Software Engineer graduated from ENSIAS (2002), holder of an Extended Higher Studies Diploma from ENSIAS (2006) and is a “Ph.D. candidate” at ENSIAS since 2009. His research focuses on interoperability monitoring within Public Administration. He is an integration architect on the Ministry of Economy and Finance of Morocco since 2002. b.elmir@daag.finances.gov.ma
**Abstract:** Public administration has to prepare itself to deliver fully integrated e-government services. This delivery often requires cooperation via business processes interoperability across two or more public departments. In this context, public departments and agencies need to implement interoperability using enterprise architecture techniques to structure administrative business processes (ABP), information system supporting them and service oriented models to achieve their integration. Thus, it’s quite interesting to adopt enterprise architecture paradigm and techniques to analyze, track and control ABP’s interoperability degree evolution from the existing “as-is” state to the future “to-be” state. The present paper proposes a periodic monitoring approach based on an assessment method which takes into consideration three main aspects of interoperability:

- **Potentiality**, reflecting the preparation to interoperate. The objective is to foster interoperation readiness by eliminating barriers that may obstruct the interaction.
- **Compatibility**, referring to interoperation implementation through adequate engineering process. It aims to study the relation between the external interfaces of ABP with the surrounding environment in order to establish effective interaction.
- **Performance efficiency**, focusing on monitoring operational performance. It consists of the availability assessment of the communication infrastructure and the supporting system in general.

During each period, the proposed method supporting tool assesses interoperability degree through five steps: (i) Delineating the scope of the study; (ii) Quantifying the interoperation potentiality; (iii) Calculating the compatibility degree; (iv) Evaluating the operating performance; (v) Aggregating the degree of interoperability.

In addition to its capacity to track the evolution of interoperation degree over time, the interoperability monitoring tool (IMT) gives the possibility to determine the required effort to reach a desired degree of interoperability.

**Key-words:** *Integrated Public E-Service, Enterprise Architecture, Interoperability Assessment, Periodic Monitoring.*