Towards a Practical Approach for Electronic Government Interoperability Framework (e-GIF)

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Abstract

Nowadays, many countries have adopted electronic Government Interoperability Framework (e-GIF) for their interoperable systems. The e-GIFs normally set out the policies, standards, guidelines and technical structure. Our literature review shows that the failure that governments face regarding e-GIFs includes lack of experience in their implementation. In fact, only following the suggested open standards, policies and contexts guideline in e-GIFs may be insufficient. The successful e-GIF adoption needs more practical implementation support. This paper proposes a practical approach to electronic government interoperability. The approach considers the adoption of Interoperability Practical Implementation Support (IPIS) tool. In this paper, we develop the IPIS tool and evaluate the results. A comparison between approaches with and without the IPIS tool illustrates significant differences. The case in this paper is a Thailand e-GIF pilot project to build a common XML schema standard for data exchange.

1. Introduction

Since 2000, e-Government Interoperability Framework (e-GIF) has become a crucial issue because recent ICT investments have reinforced the old barriers that made government decision-making, not to mention citizen access to public services, difficult [8]. E-Government interoperability can be achieved through the adoption of standards or through architecture to each other and to the environment, and the principles guiding, its design and activity [9]. In many countries, the e-GIFs are defined as a set of standards and guidelines that set out a common language to govern exchange of information between ICT systems. The governments have adopted the e-GIFs for their interoperable systems. However, the challenges that governments face regarding e-GIF include: 1) bureaucratic challenges due to the nature of bureaucracy and the lack of accountability of different agencies; 2) ensuring compliance or enforcement of the adopted standards; 3) capacity development; and 4) using the right metrics to measure the success of the e-GIF [8, 9]. In fact, the bigger and more complex the bureaucracy, the more difficult it is to implement an e-GIF.

Many governmental departments have entrenched cultures which avoid openness and cooperation with others. This makes the e-GIF adoption become more difficult. Moreover, in complying with e-GIFs, there is no guarantee that other agencies will truly follow. It would be more cautious for governments to adopt an incentives-based approach to e-GIFs compliance [18]. The e-GIFs implementation based solely on voluntary compliance is not a viable solution. Governments might have to develop mechanisms to enforce extensive use of the e-GIFs. A successful e-GIF should respond to realities that specific governments face. The particular conditions of each country are also a considered factor of the successful e-GIF adoption. Nowadays, many e-GIFs still focused on contents based guidelines, suggestions and contexts. In fact, merely following the suggested open standards, policies and contexts guideline is inadequate. Thus, governments have still been facing non e-GIF compliant projects and some failures regarding e-GIF. One failure includes inexperience with e-GIF implementation. The successful e-GIF adoption needs more practical implementation supports and successful experiences and skills. The literature reveals surprisingly little work on practical e-GIF developments guidelines, which could prevent failure. This paper presents a practical approach for e-GIF. The approach considers adding the Interoperability Practical Implementation Support (IPIS) to the e-GIF approach. The IPIS is a set or an integration of the support tools. It assists implementing interoperable projects through e-GIF approach. In this paper, we

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developed the IPIS tool to support a Thailand e-GIF pilot project. The project aimed to build common XML schema standards for interoperability in data exchange. We then evaluate the results of using the IPIS tool and compare them with a project that did not use the tool. The results show that the successful e-GIF adoption needs a practical support application in addition to standards and guidelines

The paper is organized as follows: First, an introduction of conceptual background, interoperability layers, and e-GIF concepts. Then, the basic concepts of IPIS, conceptual model, architecture and application are presented. The evaluation and comparison results are described. Finally, the conclusions are presented.

2. Conceptual background

Interoperability is the ability of a system or process to use information and/or functionality of another system or process by adhering to common standards [3]. Interoperability architecture is made up of a range of complementary technical specifications, systems, standards, guidelines and polices [22]. Regarding the concept of interoperability architecture, most e-GIFs have been designed to fall under the three dimensions of interoperability as follows:

- **Organizational interoperability** is concerned with the coordination and alignment of business processes and information architectures.
- **Information or semantic interoperability** is concerned with ensuring that the precise meaning of exchanged information is understandable by an application receiving the data.
- **Technical interoperability** is concerned with the technicalities of connecting computer systems for the purpose of exchanging information or using functionality.

Based on these dimensions, e-GIFs adopted several standards to ensure interoperability across governments [14]. A standard is an agreement among independent parties about how to deal with some tasks. The standards help to define component interfaces, technical techniques, and data. The main thrust nowadays is to adopt open and international standards for all government systems and to adopt XML and XSL as the core standards for data integration and the presentation data [4, 12]. This leads to increased interoperability, and to simpler, repeatable and quicker integration efforts [13]. Some e-GIFs focus on improving standards for **business services**. These standards are meant to support data exchange, particularly in business areas like e-learning, e-health, etc. Another extension to the layers is categories of standards for **web-based services**. These standards connect and integrate web-based applications over the internet [18, 20]. In addition to achieving interoperability through the standards, architectures have a crucial role in ensuring e-government interoperability success. The standards and architectures are two related approaches to interoperability. In Germany, governments developed an interoperable approach by including architecture and standards in one document called 'Germany's Standards and Architecture for e-Government Applications (SAGA)' [11]. In a European Union context, they are also endeavoring to adopt e-GIF, including the standards and architectures, to develop pan-European services [10].

However, in practice, architecture design is not a static concept. It will change and grow as administrations develop interoperable services, as technologies evolve, and as administrations change. Implementing all of the principles of an interoperable architecture will take time and may require tailoring of the possible solutions. Even the standards, their selection and categorization will differ from place to place. For example, the EU and German frameworks grouped standards according to services (i.e. job search, income tax, enrolment in university, etc.), and used these to address the three dimensions of interoperability [10,11]. Unlike e-GIFs in Australia [1], Brazil [2], Denmark [6], Malaysia [20], New Zealand [16] and the UK [5] approach interoperability standards by the technical aspects such as interconnection, data integration, metadata, presentation, and security [8,9]. These dynamic interoperable concepts make the implementation through e-GIFs become harder and more unachievable especially for e-GIF initiatives. Furthermore, the successful e-GIF implementation will need to address many challenges, including complex bureaucracies and agencies, compliance, enforcement and capacity development [15]. For example, in Thailand, an e-GIF initiative was announced in October 2006 called 'TH e-GIF' [19]. As an initiative, practically implementing e-Government projects through TH e-GIF has experienced obstacles and failures. To reduce the failures, the successful e-GIF adoption needs more practical implementation support and successful experiences. Our practical approach presented in this paper is one of the interoperability approaches to fill the gap of e-GIFs.

3. IPIS: basic concepts

This section proposes a more practical approach for electronic government interoperability. The approach considers the addition of Interoperability Practical Implementation Support (IPIS) into the former interoperability approach under e-GIF to fill the gap between concepts and practices.

3.1 Conceptual Model

Figure 1 shows a conceptual model focused on our approach. The model comprises three layers: Non-interoperability, Interoperability practical approach and Interoperability implementation. Non-interoperability among organizations is concerned. On an interoperability practical approach level, a new interoperability practical approach was introduced in order to achieve interoperability among the organizations. The approach emphasized the adoption of IPIS with e-GIF guideline. Based on e-GIF guideline, the use of UN/CEFACT Modeling Methodology (UMM) was proposed. UMM is a UML modeling approach to design the business services that each business partner must provide in order to collaborate [24]. At an information or a semantic interoperability level, UN/CEFACT Recommend 34 [25], Core component technical specification (CCTS) [23], and ISO 11179 are frequently guided in e-GIFs to standardizing and harmonizing data, and UN/CEFACT XML naming and design rule [25] is introduced to standardizing/naming XML schemas. At the level of technical interoperability, in e-GIFs the technical standards catalogue will be defined. The catalogue is a set of specifications that conform to the technical policies [7]. It covers the areas such as data exchange, interconnection, data integration, presentation and security. In our approach, the addition of IPIS was proposed.

Fundamentally, the IPIS is a set or an integration of interoperable support tools. Those tools are designed and developed to assist implementation of interoperable e-GIF projects. The tools include a business process modeling tool, a data modeling tool, an XML designing and developing tool, a web services developing tool and a technical standards usage support tool.

- **Business process modeling tool:** a tool to support in modeling/specifying business processes of an organization using UMM.
- **Data modeling tool:** a tool to support in standardizing/harmonizing data based on UN/CEFACT CCTS and Recommend 34.

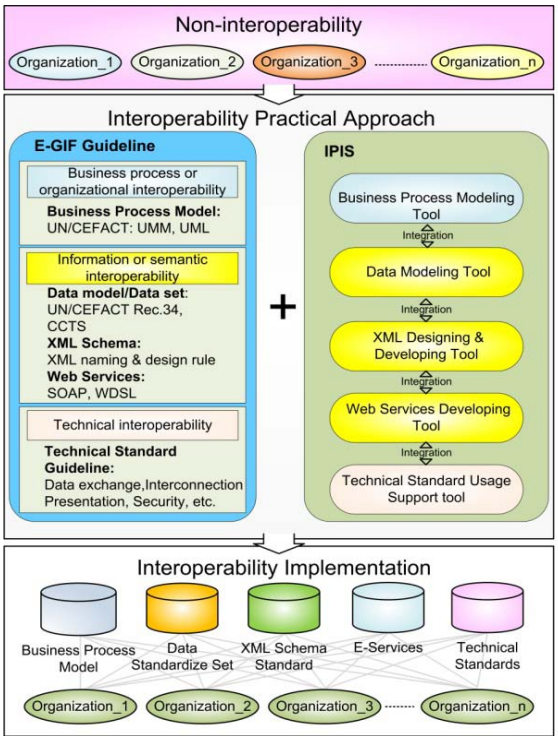

Figure 1. A conceptual model

- **XML designing and developing tool:** a tool to assist in designing/generating XML schema standard based on UN/CEFACT XML naming and design rule (XML NDR).
- **Web service developing tool:** a tool to develop web service implementing modules such as SOAP call and service.
- **Technical standards usage support tool:** a tool to describe/demonstrate how to implement each technical standard guided in the e-GIF technical standards catalogue.

Those tools in IPIS can be developed in individual or developed as integration. The tools are defined as "IPIS tools".

At a level of interoperability implementation, a set of reusable business process models, data standardized sets, XML schema standards, e-Services and technical standards are required. Based on the interoperability practical approach using IPIS, it will automatically accomplish some of those required interoperability implementing components.

3.2 Model Driven Tool Development

In order to develop the IPIS tools, we design a Model Driven Tool Development (MDTD) based on Model-Driven Architecture (MDA) [17] concept. We

see the MDTD as a new architectural approach for developing interoperable software tools based on

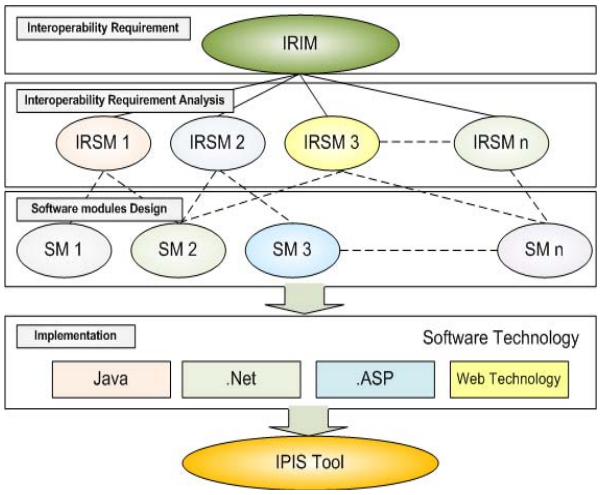

Figure 2. Model driven tool development

interoperability requirements. The MDTD starts with an interoperability requirement independent model (IRIM) describing the interoperability requirement for the IPIS tool development. The IRIM is further refined to an Interoperability Requirement Specific Model (IRSM). The IRSM is a model for designing software modules. In order to structure the IRIMs or IRSMs, we adopt the UMM. We design software modules based on IRSMs and implement/coding them with respect to software technology platform. Figure 3 shows a Model Driven Tool Development in our approach.

4. IPIS: Application

In this section, we applied the concept of our approach to a TH e-GIF pilot project. The project aimed to build common XML schema standards for interoperability in data exchange among governmental departments. Figure 3 illustrates overall concepts of the project. The project was performed based on TH e-GIF guideline. The figure also shows different models between the approaches with and without IPIS.

4.1 Project Concept and Approach

TH e-GIF guideline:

TH e-GIF sets out technical policies standards and specifications. It also provides a guideline and a procedure to build and manage XML schema standards [19]. The model incorporates UN/CEFACT Recommendation 34, Core Component Technical Specification (CCTS) and UN/CEFACT XML Naming and Design rules (XML NDR). The recommendation 34 is to assist governments in simplifying and standardizing. It is an iterative process of **capturing, defining, analyzing, and reconciling** government information requirements, and then mapping this simplified data to international standards [25]. Capturing process is to capture individual participating agency information requirements through identifying and listing the data elements. Defining process is to record the data element name, definition, representation (format or code). Analyzing process is to analyze information requirements for each data element. Reconciling process is the final step to consolidate the defined and analyzed data inventory into a data set through the process of reconciliation. This involves the agreement to use **one data element name** with a common definition and (or) common coding, and a standard message reconciled with the

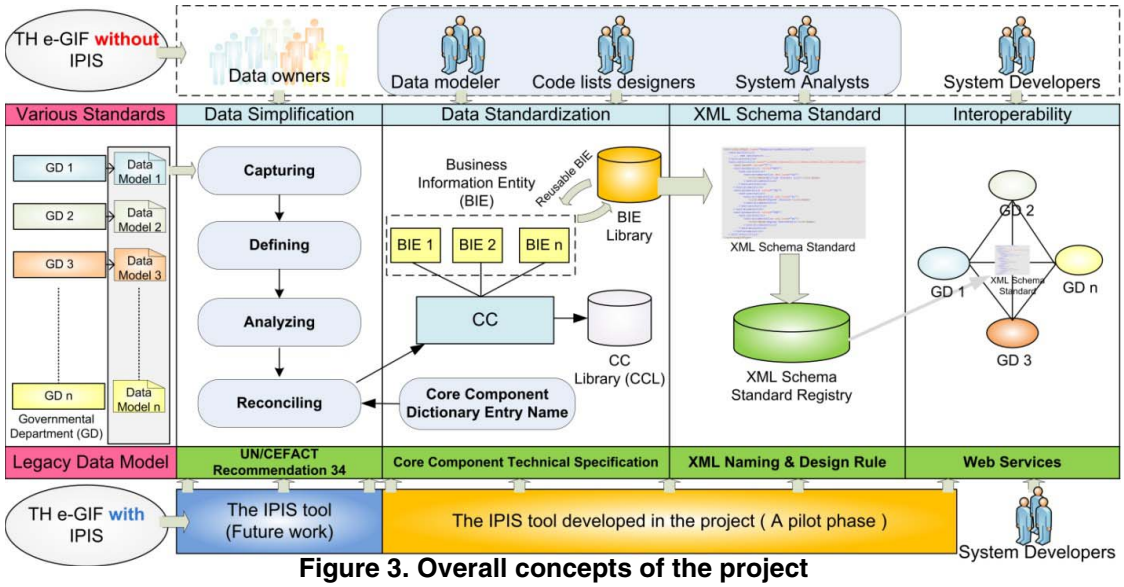

Figure 3. Overall concepts of the project

international standards of UN/CEFACT CCTS. The results of these processes is a common data standardized set from various data models.

In addition to CCTS, it provides a way to identify, and capture and maximize the re-use of business information to support and enhance information inter-operability across multiple business situations [23]. The key concept of CCTS focuses on two parts: core components (CC) and business information entities (BIE). CC is a building block for the creation of a semantically correct and meaningful information exchange package. BIE is a piece of business data or a group of pieces of business data with a unique *Business Semantic* definition [23]. It is derived from CC. In TH e-GIF, it adopts XML NDR to describe and specify the rules and guidelines when developing XML schemas based on information models developed in accordance with the CCTS. The result builds XML schema standards for interoperability in data exchanges.

TH e-GIF without IPIS approach (Approach 1)

As shown in figure 3, in order to build a common data standardized set and XML schema standard, it requires many data owners, data modelers and system analysts. The data owners extensively need to participant in activities based on the four processes in recommendation 34. Several meetings are essential to share, to analyze, to discuss and to reconcile the differences of their data models. It is time-consuming to reach agreement on common standards. Also, the data modelers and system analysts who have high skills and much experience are required.

TH e-GIF with IPIS approach (Approach 2)

To diminish the demands on the officers' time and skills, we incorporated the IPIS tool in this project. The IPIS tool development was partially divided into two phases. The pilot project developed the IPIS tool to automatically support in data standardization, XML schema standardization/development, and web service implementing modules generator. This result will aid in information or semantic interoperability level. In future, we plan to develop the IPIS tool to more automatically assist in performing the four processes in recommendation 34 (see figure 4).

4. 2 Project Tool Development

This section illustrates how we design and develop the IPIS tool in our pilot project. Firstly, we design the tool development architecture following the MDTD described in section 3.2. Figure 4 presents the project tool development architecture based on MDTD. As shown in figure 3, the IPIS tool in this project is developed to support in standardizing data following CCTS and in developing XML schema standard following XML NDR. The tool is also designed to automatically generate web services implementing modules such as SOAP call and service. We design the IRIM as interoperability requirements serving semantic interoperability level. In this project, the IRIM is an integration model of requirements derived from data modeling, XML schema designing and developing and web services developing. In addition to interoperability requirements analysis, the IRIM drives five possible IRSMs. They are $IRSM_1$: core components design, $IRSM_2$: core components library, $IRSM_3$: business information entities (BIEs) library, $IRSM_4$: XML schema standards and $IRSM_5$: Web Services components.

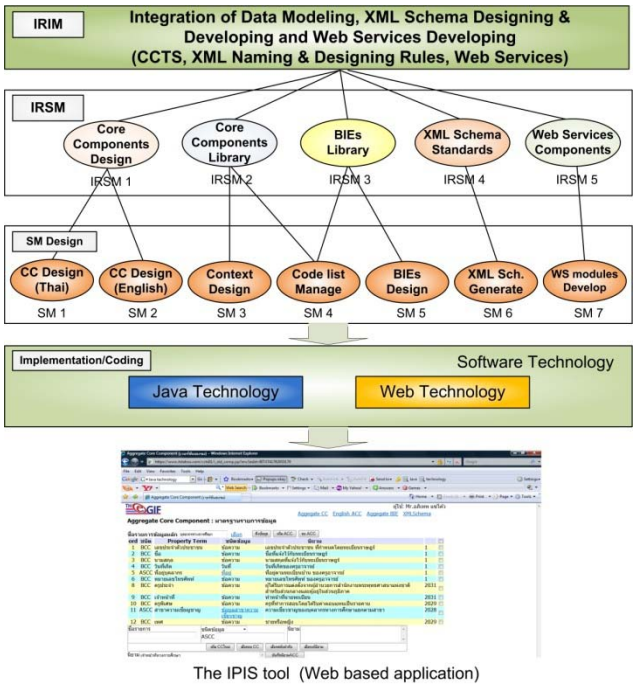

Figure 4. The project tool development architecture

For the IPIS tool design and implementation, seven software modules (SMs) are designed according to the generated IRSMs. They include: SM_1: CC designing (Thai), SM_2: CC design (English), SM_3: Context designing, SM_4: Code list managing, SM_5: BIEs designing, SM_6: XML schema generator and SM_7: Web services developing. In the CC design module, the system allows users to propose their required data model in Thai language. In CC English module, Thai data names are translated to English. In the context design module users can add their required contexts. In

the code list manage module users can add and edit code lists [18]. In the BIE design module users can design the required data model based on selected core components and contexts. In the XML schema generation module users can get a XML schema for a given BIE. In the web services developing module users can obtain various source programs for web service components. The IPIS tool was developed using java technology and was implemented as web based application. Figure 5 shows a model of some software modules according with CC design, BIE design and XML schema generating. The model is based on UN/CEFACT CCTS and XML NDR.

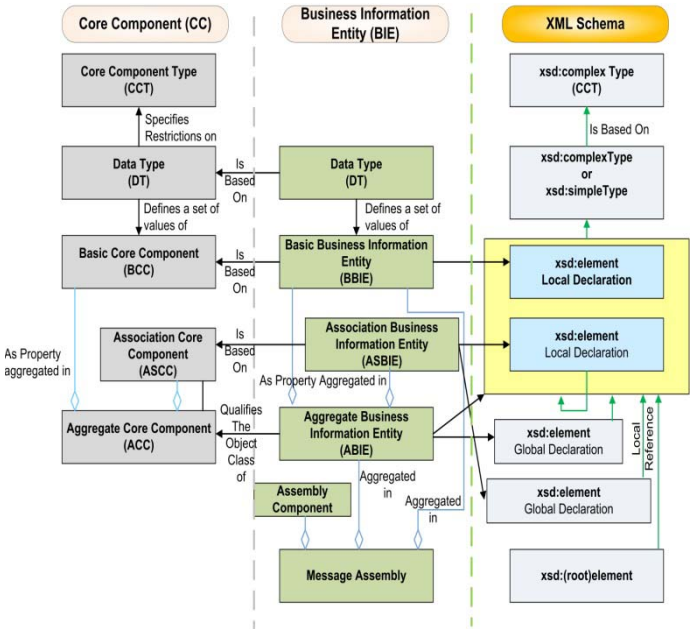

Figure 5. A model of some software modules in the project

4.3 Tool Results

In the project, the IPIS tool automatically generates various kinds of sample programs and scripts. These sample programs and scripts can be used in the interoperability implementation process. They include an XML document manipulation java program, a web service java program, a web service client program using SOAP, an XML digital signature java program, an XML encryption/decryption java program, WSDL specification files, database generation SQL scripts for data storage, and java server page program for managing and manipulating data. Government offices can use this prototype application as a pilot software development. The prototype software allows sending and receiving by using web services technology. Figure 6 illustrates a sample XML document which automatically generated based on XML schema. Figure 7 shows the screen shot of a generated sample java program. This generated program is a sample java program for XML document building.

The tool can be used by various participants in the interoperability development process. It assists in building and managing a core component library or dictionary. It also supports controlling, publishing, validating a version control of core component dictionary and XML schema standards. It enables users from different agencies to collaborate and build a set of common core components. This support tool can automatically generate a core component library, and context specific business information entities. It can generate a sample XML document, sample XML generator source programs with DOM API, and sample source programs for building web services with SOAP and SAAJ API. These capabilities help agencies to easily develop a pilot interoperable project. These capabilities facilitate electronic interoperability development in e-Government [18]. In future, we plan to develop the extended IPIS tool to fully support in data capturing, defining, analyzing and reconciling in recommendation 34.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
- <EducationIntegrationEducationManagement>
  - <EducationIntegrationStudent>
    - <EducationIntegrationThaiCitizen>
        <EducationIntegrationCitizenID>...</EducationIntegrationCitizenID>
        <EducationIntegrationTitle>...</EducationIntegrationTitle>
        <EducationIntegrationFirstName>...</EducationIntegrationFirstName>
        <EducationIntegrationLastName>...</EducationIntegrationLastName>
        <EducationIntegrationGender>...</EducationIntegrationGender>
        <EducationIntegrationBirthDate>...</EducationIntegrationBirthDate>
        <EducationIntegrationNationality>...</EducationIntegrationNationality>
      - <EducationIntegrationRegistedAddress>
          <EducationIntegrationHouseNumber>...</EducationIntegrationHouseNumber>
          <EducationIntegrationMoo>...</EducationIntegrationMoo>
          <EducationIntegrationSoi>...</EducationIntegrationSoi>
          <EducationIntegrationRoad>...</EducationIntegrationRoad>
```

Figure 6. A sample of XML document which automatically generated based on XML schema

```
public class CreateXMLEducationIntegrationEducationManagement extends SessBasic {
        public String dbsql = "";
        public Vector dbsqlv = "";
        public Document createXML(String id0) {
                try {
                        DocumentBuilderFactory factory = DocumentBuilderFactory.newInstance();
                        factory.setNamespaceAware(true);
                        DocumentBuilder builder = factory.newDocumentBuilder();
                        Document document = builder.newDocument();

                        Element elem0,elem1,elem2,elem3,elem4,elem5;
                        Statement state1,state2,state3,state4;
                        ResultSet resultSet1,resultSet2,resultSet3,resultSet4;
                        String id1="",id2="",id3="",id4="";
                        conn = connect();
```

Figure 7. A screen shot of generated sample java program

5. IPIS Approach: Evaluation

This section presents the evaluation of our approach. The evaluation model was designed based on the TH e-GIF project purposes. We compare the evaluated results between the TH e-GIF approach with and without IPIS. It shows the benefits of using IPIS for electronic government interoperability.

5.1 Evaluation Methodology

In order to evaluate our approach, we design the evaluation methodology to compare two approaches: 1.) TH e-GIF without IPIS and 2.) TH e-GIF with IPIS. First of all, we define Evaluation Factors (EF), and Evaluation Elements (EE) based on requirements. The requirements in the methodology focused on IRSMs proposed in section 4.2. They include $IRSM_1$: core components design, $IRSM_2$: core components library, $IRSM_3$: business information entities (BIEs) library, $IRSM_4$: XML schema standards and $IRSM_5$: web services components. The EFs are concerned about five factors: EF_1: Skill needed, EF_2: Experience needed, EF_3: Time and EF_4: Cost. In addition to EFs, we design four EEs for each EF and set a value of evaluation called "Evaluation Value (EV)". The EV is a number of 1, 2, or 3. The estimate of EV of EF_i is defined as follows:

$$\widehat{EV}_{EE_j}^{EF_i} = \frac{\sum_{j=1}^{4} EV_{EE_j}^{EF_i}}{4}$$

and the estimate of $\widehat{EV}_{EE_k}^{IRSM_j}$ of EF_i is defined as follows:

$$\widehat{EV}_{EF_i} = \frac{\sum_{j=1}^{5}\sum_{k=1}^{4} EV_{EE_k}^{EF_i\,IRSM_j}}{5*4}$$

Table 1 shows a list of evaluation elements designed according to IRSMs.

5.2 Evaluation Model and Results

We designed an evaluation model to evaluate two approaches. Figure 8 shows an evaluation model between two approaches. In the former project, government officers had to design core components and to develop CC library, BIE library and XML schemas under TH e-GIF without IPIS. However, in this project, over 200 officers from more 100 agencies used the IPIS tool to support in the designing and developing. Among the 200 officers, more than half of them have no skills and/or no experiences of guidelines, standards, techniques and policies in TH e-GIF, eight days of training was organized to teach the concepts of CCTS and XML NDR. Attendees built their own BIE XML document and experimented

Table 1: A list of evaluation elements

IRSM	EF	EE	EV
$IRSM_1$	EF_1	EE_1: CC designing EE_2: CC naming rule EE_3: CCTS structuring EE_4: CC dic. entry name	3:High 2:Medium 1:Low
	EF_2	EE_1: CC dic. entry name EE_2: CC designing EE_3: CCTS structuring EE_4: CC naming rule	3:High 2:Medium 1:Low
	EF_3/ EF_4	EE_1: Training time/cost EE_2: Developing time/cost EE_3: Designing time/cost EE_4: Analyzing time/cost	3:Long/High 2:Medium 1:Short/Low
$IRSM_2$	EF_1	EE_1: CC library designing EE_2: CC discovery EE_3: CC business term EE_4: CC catalogue	3:High 2:Medium 1:Low
	EF_2	EE_1: CC discovery EE_2: CC library designing EE_3: CC business term EE_4: CC catalogue	3:High 2:Medium 1:Low
	EF_3/ EF_4	EE_1: Training time/cost EE_2: Developing time/cost EE_3: Designing time/cost EE_4: Analyzing time/cost	3:Long/High 2:Medium 1:Short/Low
$IRSM_3$	EF_1	EE_1: BIE library designing EE_2: BIE reusability EE_3: Context categories EE_4: BIE rules	3:High 2:Medium 1:Low
	EF_2	EE_1: BIE rules EE_2: Context categories EE_3: BIE library designing EE_4: BIE reusability	3:High 2:Medium 1:Low
	EF_3/ EF_4	EE_1: Training time/cost EE_2: Developing time/cost EE_3: Designing time/cost EE_4: Analyzing time/cost	3:Long/High 2:Medium 1:Short/Low
$IRSM_4$	EF_1	EE_1: XML schema design EE_2: XML NDR EE_3: Namespace schema EE_4: Relationship to CCTS	3:High 2:Medium 1:Low
	EF_2	EE_1: XML schema design EE_2: Namespace schema EE_3: Relationship to CCTS EE_4: XML NDR	3:High 2:Medium 1:Low
	EF_3/ EF_4	EE_1: Training time/cost EE_2: Developing time/cost EE_3: Designing time/cost EE_4: Analyzing time/cost	3:Long/High 2:Medium 1:Short/Low
$IRSM_5$	EF_1	EE_1: SOAP, Java, WDSL EE_2: Web services concept EE_3: SOA EE_4: UUDI, PKI	3:High 2:Medium 1:Low
	EF_2	EE_1: Web services concept EE_2: SOA EE_3: SOAP, Java, WDSL EE_4: UUDI, PKI	3:High 2:Medium 1:Low
	EF_3/ EF_4	EE_1: Training time/cost EE_2: Developing time/cost EE_3: Designing time/cost EE_4: Analyzing time/cost	3:Long/High 2:Medium 1:Short/Low

with developing software for data exchange. They also learned about web services, SOAP, WSDL and UDDI.

From these components, the IPIS tool assists them to automatically generate core component libraries, context specific business information entities and XML documents. It can also automatically produce some source programs with DOM API and source programs for building web services with SOAP and SAAJ API. These capabilities help agencies to easily develop a pilot interoperable project and thus facilitate electronic interoperability development in e-Government.

The evaluation methodology was applied in the model to significantly illustrate the differences. Focusing on 80 EEs shown in table 1, the EV of each EE was evaluated by evaluators. To compare the approaches, the estimate of EV with respect to EFs was calculated. Table 2 shows the results of our evaluation model. The results show that the approach using the IPIS tool can assist the pilot interoperability project to achieve objectives more easily and economically. The time spent in the project approximately becomes shorter (65%). The cost estimate also was reduced about 53%. One of the main causes of failure in a government interoperability project is lack of experiences and skills [20]. The result also shows that by using the support tool, the officers need less experience and skills to achieve the desired interoperability requirements.

only following the suggested standards, policies and contexts guideline in e-GIFs is insufficient. Our literature review shows that many governments experience obstacles and failures in applying e-GIFs to their interoperability projects. Lack of experience and skills in e-GIF implementation is a significant contributor to these failures. To fill the gap, in this paper, we designed and developed the IPIS tool to support a TH e-GIF project. We then evaluated the results of our approach and compared it with the former e-GIF approach. The results indicate that applying the IPIS tool can assist the interoperability project to achieve the objectives more easily and economically. The time spent in the project also becomes shorter. The result furthermore reveals that the successful project needs less experience and skills by using the IPIS tool. This paper demonstrates that a tool such as IPIS provides much-needed practical approach to successfully implementing the interoperability that is at the heart of e-GIF standards.

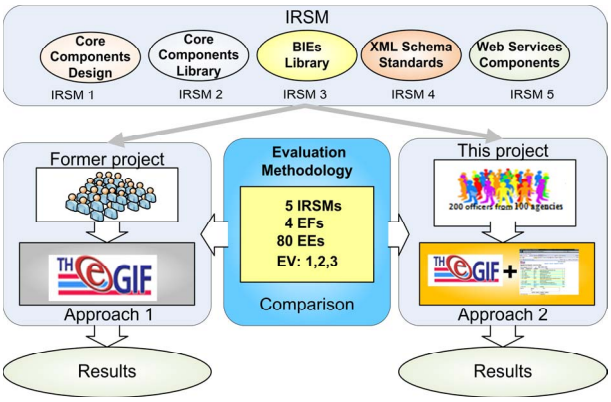

Figure 8. An evaluation model between two approaches

Table 2: The results of a comparison between two approaches

	$EV_{EE_j}^{EF_1}$ (Skill needed)			$EV_{EE_j}^{EF_2}$ (Experience needed)			$EV_{EE_j}^{EF_3}$ (Time)			$EV_{EE_j}^{EF_4}$ (Cost)		
	Approach 1	Approach 2	**Diff.**	Approach 1	Approach 2	**Diff.**	Approach 1	Approach 2	**Diff.**	Approach 1	Approach 2	**Diff.**
$IRSM_1$	3.00	1.00	**2.00**	3.00	1.00	**2.00**	3.00	1.25	**1.75**	3.00	1.25	**1.75**
$IRSM_2$	2.75	1.25	**1.50**	3.00	1.00	**2.00**	3.00	1.00	**2.00**	3.00	1.25	**1.75**
$IRSM_3$	3.00	1.25	**1.75**	2.75	1.25	**1.50**	3.00	1.00	**2.00**	3.00	1.50	**1.50**
$IRSM_4$	3.00	1.00	**2.00**	3.00	1.00	**2.00**	3.00	1.00	**2.00**	3.00	1.50	**1.50**
$IRSM_5$	3.00	1.00	**2.00**	3.00	1.25	**1.75**	3.00	1.00	**2.00**	3.00	1.50	**1.50**
EV_{EF_i}	**2.95**	**1.10**	**1.85**	**2.95**	**1.10**	**1.85**	**3.00**	**1.05**	**1.95**	**3.00**	**1.40**	**1.60**
%	98%	36%	**62%**	98%	36%	**62%**	100%	35%	**65%**	100%	47%	**53%**

6. Conclusions

This paper proposes a practical approach to implementing electronic government interoperability. The approach considers applying an Interoperability Practical Implementation Support (IPIS) tool to an e-GIF approach. Normally, e-GIFs set out the policies, standards, guidelines and technical structure. In fact,

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