

# Tape Mbo'e: A First Experimental Assessment

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**Abstract.** The development of software needs not only to consider the construction process, but also other aspects such as cost, human resources and communication among stakeholders. The lack of simplicity into this context becomes explicit when some restrictions such as service oriented must be considered as the basic architecture style to build sustainable applications into environments were practitioners are not aware of this software technology. Besides this, most of the available software processes are not direct applicable neither reusable making the learning time risky to the development of the project. Therefore, Tape Mbo'e (TME)<sup>4</sup> had been proposed to strive the building of such applications, into development environments like developing country where we can have economic constraints and scarcity of proficient practitioners. TME is being used to develop a software application whose goal is to provide the interoperability among legacy systems of distinct public agencies in Paraguay. To observe TME's use, observational studies have been executed to reveal TME's feasibility and applicability in supporting public agencies to organize their software projects. Initial results indicated the feasibility and simplicity of TME when applied in the field. Therefore, an experience accomplished into a Paraguayan public agency is presented in this paper.

**Keywords:** Sustainability, Interoperability, Evaluation, Service-Based Application

## 1 Introduction

The interest in Service Oriented computing has increased due its observed benefits such as supporting the interoperability among heterogeneous legacy systems, the re-usability of functionalities and construction of adaptable and loosely coupled applications.

<sup>4</sup> Tape Mbo'e means: “method” in Guarani Language

Building service-based applications requires repeatable software development processes to produce high quality software. However, the existing development processes, such as those proposed to object-oriented or component-based paradigm, do not completely fit the needs of service oriented application development. On the other hand, the service oriented processes focus on developing service, but not deal with project management. The project management is critical in the construction of complex systems (e.g. e-government applications) mainly considering different aspects such as human resources management, quality assurance management, outsourcing, among others [1], [2], [3].

For these reasons, Grau et al. propose Tape Mbo'e (TME), a service oriented process [4]. It encompasses the whole life cycle of service-based applications that are built considering the sustainability, which means the capability of affording operation of software in the long term [5].

TME was not built from scratch; it is based on Open Unified Process (OpenUP)<sup>5</sup> that has been chosen for being a light version of Rational Unified Process (RUP). RUP is a well-organized methodology and it has been widely used in the industry. However, it includes many artefacts and documents, making its use hard in this context because its adaptation would be time consuming and expensive.

TME is being applied for the first time in the Information and Interchange System (IIS) whose goal is the interoperability among legacy systems of public agencies of Paraguayan government. The investigation regarding TME represents a long term study. However, the first observations indicated the feasibility and applicability of TME when used by practitioners. It is worth noting, the novelty of TME's evaluation being the first application of rigorous experimental evaluation in the public sector in Paraguay. Therefore, the first results of this experience is going to be described in this paper.

So, this paper is organized as follows.

Section 2 depicts how the TME' disciplines are performed during the life cycle. Section 3 outlines the process followed to evaluate the application of TME in case studies. Moreover, the process is illustrated with the experience of applying TME in a public agency en Paraguay. Finally, conclusion indicates some future directions.

## 2 Tape Mbo'e: a Service Oriented Methodology

TME is a process for developing and maintaining service-based applications (SBA). TME is based on OpenUP that has been extended, and modified mainly in its life cycle and disciplines. TME's life cycle includes a new phase, namely **Operations**, to cover the maintenance, evolution, and retirement of SBA.

TME adds a new discipline, called **Quality Assurance**, to assure process, and deliverables quality. Moreover, the disciplines of OpenUP such as Architecture, Development, and Project Management were redefined to support services features and the needs of diverse type of projects [4]. TME is described in the next sections.

<sup>5</sup> <http://epf.eclipse.org/wikis/openup/>

## 2.1 Inception

It comprehends gathering requirements, defining the project scope, elaborating the project plan, estimating human resource, cost and time, as well as identifying risks. The disciplines carry out during this phase are the following:

*Project Management.* It focuses on establishing project base, outlining the major requirements and taking the major decisions. Moreover, the negotiations with stakeholders are performed, as well as it can be signed contract with providers. These are performed through the following sub-disciplines.

- **Development Management.** The viability study is carried out to decide about the project realization. The project scope is determined, and first estimation of cost, time, and human resources needs are performed. The risks are identified and how to respond to them, and it is elaborated the project plan and chart. Moreover, the decision about outsourcing development is taken.
- **Human Resources Management.** It involves hiring, assigning tasks, and monitoring to human resources. In addition, it is in charge of training the staff to become proficient for their jobs.
- **Communication Management.** It establishes the frequency of team meetings, and the meetings with clients, and users. Moreover, it coordinates the meetings.
- **Outsourcing Management.** It includes calling, assessing, and contracting providers.

*Quality Assurance.* It is in charge of standardizing of processes, and templates, services level agreement, and suggesting the good practices. These are performed through the following sub-disciplines.

- **Quality Management.** It elaborates the processes to follow and templates for the project if they have not been made yet. Moreover, service level agreement is defined.
- **Configuration and Changes Management.** It focuses on tracking version over time, controlling, and managing changes in project assets.

*Requirement.* The major project requirements are identified with users, and it is settled the priority list.

## 2.2 Elaboration

It includes describing and refining requirements, identifying non-functional requirements, and updating time and costs. The disciplines carry out during this phase are the following:

*Project Management.* It is performed through the following sub-disciplines.

- **Development Management.** At the beginning of the phase, the iteration is planned, the risks are identified and how to respond to them. Moreover, the project plan and chart can be refined and updated.
- **Human Resources Management.** The tasks are assigned to human resources who are monitored to ensure the tasks realization.
- **Communication Management.** At the beginning of the phase, the analysts meet with users to determine the requirement to develop in the iteration and receive the changes request. Moreover, team meetings are performed according to settled frequency to update about progress, pitfalls, and supporting making decisions.

*Quality Assurance.* It focuses on the quality of design and keeping artefacts (document and models) version. These are performed through the following sub-disciplines.

- **Quality Management.** At the end of the phase, it examined the quality of artefacts generated during the phase.
- **Configuration and Changes Management.** It focuses on tracking version over time, controlling, and managing changes in project assets.

*Requirement.* The analysts elaborate the use case and mock-ups. The mock-up are validated with users to ensure they accomplished the requirements. Moreover, the use case and mock-ups can be refined, and updated.

*Architecture.* It focuses on defining, depicting, and updating the application architecture. It is performed through the following sub-disciplines.

- **Business Modelling.** It provides a description of organization processes including flows, participants, and service composition. Modelling is carried out using Business Process Modelling Notation (BPMN).
- **Integration.** It provides top-down description of application including legacy systems with services provided and consumed. It is outlined using UML Component diagram. Moreover, it is in charge of interchange standards including data format and processes as well as unification of concepts, due to, they can be either incompatible or different across diverse legacy systems.
- **Components Specification.** The service model is depicted using UML meta-model proposed by De Castro et al [6]. Additionally, the data base and the modules decomposition are represented using UML diagrams of class and component respectively.

### 2.3 Construction

It involves the programming and testing of software as well as updating of deliveries of Requirement and Architecture Disciplines.

*Project Management.* The sub-disciplines of Development Management and Human Resources Management are like Elaboration Phase. The team meetings are performed according their frequency (Communication Management).

*Quality Assurance.* The Quality Management and Configuration and Change Management Sub-disciplines are like in the Elaboration Phase.

Once the development is finished, the Test Sub-discipline is performed to verify and validate the application firstly by developers and then analysts.

*Architecture.* It includes the Integration sub-discipline that represents the runtime configuration of processing nodes, and the components executing in them are described using UML deployment diagrams.

*Development.* Developing is carried out considering set out by Requirements and Architecture Disciplines. The service composition is performed using an orchestration language.

## 2.4 Transition

It encompasses the verification and validation of application by users as well as the application deployment.

*Project Management.* It is performed through the following sub-disciplines.

- **Development Management.** The project plan, chart can be updated. Additionally, the process to authorize the application deployment is followed.
- **Human Resources Management.** It is like Construction Phase.
- **Communication Management.** Team meeting is performed to discuss about the iteration issues and lessons learned.  
The analysts meet with users for verifying and validating the application. Moreover, the users are trained to use the application.
- **Outsourcing Management.** The provider delivers the application that has to be verified and validated before accepting.

*Quality Assurance.* It is performed through the following sub-disciplines.

- **Quality Management.** It focuses on quality of the deliveries that can be software, models, and documents.
- **Configuration and Changes Management.** It is like Elaboration Phase.
- **Test.** The verification and validation of the software is performed by users who have to accept the application before deploying.

*Development.* The application is deployed in production environment. The services are published in the UDDI.

## 2.5 Operations

It tackles software productive life that is characterized by corrective, adaptive, and evolution actions as well as the software abandonment. The disciplines of Requirement and Architecture are like in the Construction Phase while the others are as follows.

*Project Management.* It is performed through the following sub-disciplines.

- **Development Management.** It encompasses managing warranties as well as notification the software retirement. Moreover, the decision of starting a new development iteration can be taken to evolve software.
- **Human Resources Management.** The staff that is in charge of maintenance is monitored to ensure the tasks realization.
- **Communication Management.** Team meetings are performed to update about progress, pitfalls, and support making decisions.
- **Outsourcing Management.** The software warranty and maintenance can be carried out.

*Quality Assurance.* It is performed through the following sub-disciplines.

- **Configuration and Changes Management.** It is like Elaboration Phase.
- **Test.** The verification and validation of the software that have been maintained, are executed by developers and users. The last one has to accept the application before deploying.

*Development.* The corrective, adaptive, and perfective maintenance are performed. Moreover, the software retirement can be executed.

## 3 Evaluation Plan

The evaluation is inspired in the evaluation framework proposed by Grau et al [3] whose baseline is the work of Cernuzzi and Rossi [7]. It is composed of three phases: Planning, Execution and Analysis. During each phase is performed a set of steps that are described in the next sections.

### 3.1 Planning Phase

The Planning Phase describes how TME evaluation will be performed including goals, measures, scales, formulas, and steps. It encompasses the following steps:

**Definition of Research Questions.** The goal of this evaluation is to identify the relevant questions that will be answered, such as:

- Does TME cover the intrinsic features of the service paradigm better than the previous process of the organization?

- Does TME address the major characteristics of a software engineering process better than the previous process of the organization?
- Does TME address activities for project management better than the previous process of the organization?
- Does TME support the sustainability of applications better than the previous process of the organization?

**Definition of Measuring Goals.** Having defined the research questions, for each question is defined a set of goals and measures by using the Goal-Question-Metric (GQM) [8]. GQM hierarchically separates the goals in sub-goals as a tree where the leaves are the questions associated to metrics to measure the goals' achievement. The major goals with their sub-goals are the following.

*SO. Service Oriented.* It is related to intrinsic characteristics of the service oriented paradigm and data interchange issues. Its major sub-goals are the following:

- **SO.1 Service Description:** The services are depicted through relationship among services, roles, parameters, messages, and composition.
- **SO.2 Interchange Information:** It encompasses the definition of processes and data format for interchanging.

*SE. Software Engineering.* It involves the qualities that have to be present by any software engineering process. Its major sub-goals are the following:

- **SE.1 Life Cycle:** It covers the software life cycle from idea conception until software abandonment.
- **SE.2 Quality Assurance:** It focuses on quality of development process and deliveries. It includes monitoring, verifying, and validating.

*PM. Project Management.* It involves the fundamental activities to manage any type of project according to project management standard [9]. Its major sub-goals are the following:

- **PM.1 Development Management:** It encompasses the Integration Management, Scope Management, Time Management, and Cost Management of the standard of project management [9].
- **PM.2 Human Resource Management:** It embraces managing, monitoring, and controlling project team to assure accomplishment of project goals. Roles, and responsibilities have to be well defined.
- **PM.3 Communication Management:** It identifies stakeholders, addresses communication among stakeholders, and distributes information. It works with stakeholders (i.e.), and attends their requirements.
- **PM.4 Outsourcing Management:** It encompasses identifying, and selecting seller as well as awarding a contract. It manages relationship with sellers monitoring contract execution. It is referred not only to infrastructure purchase, but also to the services.

*SU. Sustainability.* It is the capability of organizations of supporting software maintenance on long term [5]. Its major sub-goals are the following:

- **SU.1 Documentation:** It controls the realization of models and documents proposed by Tape Mbo'e.
- **SU.2 Low Cost of Implementation:** It is related with strategies to save implementation costs.

**Definition of Measures and Scales.** Two types of measurements are performed: direct or indirect. The former is applied for leaves while the latter to non-leaves. For each type has been established the following measures: Frequency and Aggregation. These measures are described by Table 1. The description of

**Table 1.** Measures

Attribute	Measures	
	Frequency	Aggregation
Code	FR	AG
Description	It is used to measure the questions that are the leaves of the tree	It is applied to non-leaves and it is the arithmetic means of the child nodes
Type	Direct	Indirect
Property Measured	Occurrence	Occurrence
Type Scale	Likert	Likert
Scale Value	Positive Numbers	Positive Numbers
Interval Value	[0,4]	[0,4]

the scale of measures is showed in Table 2.

**Table 2.** Scale of Measures

Meaning	Description
No Apply	The evaluation can not performed
Never	It has never achieved
Rarely	It has achieved less than 50% or equal of 50% of the time
Normally	It has achieved more than 50% of the time
Always	It has achieved the 100% of the time

The scale of Aggregation Measure encompasses the range of values whose interpretation is the degree of satisfaction for goals achievement. The interpretation of Frequency and Aggregation Measures are showed in Table 3.

**Definition of Measurement Process.** The leaves are the questions answered by practitioners. They are measured giving a value located in the Frequency

**Table 3.** Interpretation of Frequency and Aggregation Measures

	Measures	
Scale	Frequency	Aggregation
No Apply	0	$0 \leq \bar{x} < 1; 0 \leq G < 1$
Never	1	$\bar{x} = 1; G = 1$
Rarely	2	$1 < \bar{x} \leq 2,5; 1 < G \leq 2,5$
Normally	3	$2,5 < \bar{x} < 4; 2,5 < G < 4$
Always	4	$\bar{x} = 4; G = 4$

Scale (see Table 3). Once all the questions are answered is calculated the value of non-leaves (goals and sub-goals) there is the arithmetic mean ( $\bar{X}$ ) obtained with Formula 1. Thus, the value of non-leaf is equal to the arithmetic mean calculated from its child nodes.

$$\bar{X} = \frac{\sum_{k=0}^n a_i}{n} \quad (1)$$

*a* is the child node  
*i* is the depth where the child node is located  
*n* is the number of child nodes

Various practitioners can be interviewed by a case study, and the responses of each one are part of a questionnaire that represents the tree. We calculate the value of sub-goals, goals, dimensions, and total value of each questionnaire. Finally, the total value of the case study is the upshot of combining the dimensions and the total value of all the questionnaires. The combination is done through obtaining the geometric mean ( $G$ ) with Formula 2.

$$G = \sqrt[M]{R_1 * R_2 * \dots * R_M} \quad (2)$$

*G* is the geometric means  
*R* can be the value of the dimension or the total value  
*M* is the number of individual questionnaires

The results of Formulas 1 and 2 are given in Aggregation Scale (see Table 3).

### 3.2 Execution Phase

Its goal is the execution of the evaluation plan by running case studies. At this moment, there is just one case study already performed, which will be described in the following section.

**Case Study: Interchange Information System (IIS).** TME was first evaluated in a case study regarding an interchange information system developed in a public institution in Paraguay (PIP). The PIP was set up in April 2012 and before using TME its development process used to be informal according to the information collected from its quality analyst in October 2012.

PIP experienced TME in the development of its IIS. The main system goal is the data interchange among dependencies of whole public sector using service oriented technology. To complete the full development of IIS will take some years. Therefore, this first evaluation encompasses the period of October 2012 to March 2013 and it does not include maintenance activities yet. This period was financed by a sponsor who had monitored the development and demanded to accomplish its quality standard. The sponsor support lasted until March of 2013.

IIS construction fell behind several times before due to some external factors such as political reasons, lack of a law to interchange sensitive data and staff’s renunciation. Only in January of 2013 was promulgated the law for interchanging sensitive data in Paraguay, what facilitated the decision making regarding the system.

The IIS team was composed of one project manager, one leader, one quality analyst, and three developers. The team profile is posed in Table 4 that shows the diversity of skills.

**Table 4.** IIS team profile

Staff	Academic		Professional Experience			Role			
	Degree	Post-Degree	Novice	Junior	Senior	Manager	Leader	Quality Analyst	Developer
Bachelor of Science	2	0	0	0	2	1	0	0	1
Engineer	3	1	1	0	2	0	1	1	1
Student	1	0	0	1	0	0	0	0	1

**Data Collect.** The questions associated to each goal or sub-goal are presented in a questionnaire that is answered by the participants in the case study.

The questionnaires are sorted out in: Control or Experimental according to the process that they report. The control questionnaires are answered by control group and inform how was the process of development in the organization before implementing TME. The experimental questionnaires are answered by experimental group and they measure TME performance.

The questionnaire used for this case study is composed of 83 questions that measures 20 sub-goals. The questionnaire is written in local language (Spanish), and it was taken 20 min approximately to be answered by the practitioners. Figure 1 shows as example the questionnaire completed by quality analyst. We assign a weight in Frequency scale to each response of questionnaire. Having completed the questionnaire, the weight of each selected response is registered in

Marque con una X las casillas que corresponda. Cuando la pregunta no se puede contestar porque no tiene que ver con el caso de estudio seleccione "No corresponde".

OS Orientación a Servicios	
OS.1 Descripción de Servicios	
OS.1-P.1 ¿Se muestran las relaciones entre los servicios?	
<input type="checkbox"/>	No corresponde
<input type="checkbox"/>	Nunca
<input type="checkbox"/>	Raras Veces
<input type="checkbox"/>	Muchas Veces
<input type="checkbox"/>	Casi Siempre
<input checked="" type="checkbox"/>	Siempre
OS.1-P.2 ¿Se muestran los roles del servicio en la relación?	
<input type="checkbox"/>	No corresponde
<input type="checkbox"/>	Nunca
<input type="checkbox"/>	Raras Veces
<input type="checkbox"/>	Muchas Veces
<input type="checkbox"/>	Casi Siempre
<input checked="" type="checkbox"/>	Siempre

Fig. 1. Example of Questionnaire

a template to calculate the results (see Figure 2). The control questionnaire (CC)

5	Código	Atributos		E <sub>1</sub>	E <sub>2</sub>
6	SE	Orientación a Servicios	AG	2	2,56
7	SE.1	Descripción de Servicios	AG	3	2,67
8	SE.1-Q.1	¿Se muestran las relaciones entre los servicios?	FR	4	3
9	SE.1-Q.2	¿Se muestran los roles del servicio en la relación?	FR	4	2
10	SE.1-Q.3	¿Se provee las entradas a los servicios?	FR	4	4
11	SE.1-Q.4	¿Se provee las salidas de los servicios?	FR	4	4
12	SE.1-Q.5	¿Se firma el Service Level Agreement SLA?	FR	1	1
13	SE.1-Q.6	Se describe la composición del Servicio?	FR	1	2

Fig. 2. Example of Template

was answered by the quality analyst before applying TME. After six months of TME implementation, its performance was examined from the viewpoint of team leader ( $E_1$ ) and the quality analyst ( $E_2$ ) who filled in the experimental questionnaires.

**Measuring Process.** Once the questionnaires are completed, their responses are matched to the values of the Frequency Measure (see Table 3). Subsequently, the values of goals and sub-goals are obtained according to the process defined in Section 3.1.

The questionnaires are clustered by type, and then for each type is obtained the total values according to the process defined in Section 3.1.

The numerical results of goals and sub-goals regarding the three questionnaires (i.e, 1 before TME and 2 after adopting TME) are presented in Table 5. According to the range of values in which the numerical results must be interpreted, they are matched to the scale of Aggregation Measure. The results

for each dimension in Aggregation Measure are showed in Table 6, and the final result is “Normally”.

**Table 5.** Global results of Goals and Subgoals of the three questionnaires

Code	Goals	CC	E <sub>1</sub>	E <sub>2</sub>
	<b>Total</b>	<b>1,4</b>	<b>2,89</b>	<b>2,96</b>
<b>SO</b>	<b>Service Oriented</b>	<b>1</b>	<b>2,56</b>	<b>2,33</b>
SO.1	Service Description	1	2,67	3
SO.2	Service Implementation	1	2	1
SO.3	Interchange Standard	1	3	3
<b>SE</b>	<b>Software Engineering</b>	<b>1,42</b>	<b>2,78</b>	<b>2,75</b>
SE.1	Life Cycle	1,27	3,01	3,03
SE.1.1	Requirement	1,5	2,83	4
SE.1.2	Analysis and Design	1,33	3	3,5
SE.1.3	Development	1	3,2	1,6
SE.2	Quality Assurance	1,62	2,54	2,46
SE.2.1	Quality Management	1,2	2,8	3,4
SE.2.2	Configuration and Change Management	1,83	2,33	4
SE.2.3	Test	1,66	2,5	0
<b>PM</b>	<b>Project Management</b>	<b>2,2</b>	<b>2,48</b>	<b>2,57</b>
PM.1	Development Management	3	3,57	3,86
PM.2	Communication Management	1	1,25	1,5
PM.3	Human Resource Management	3,3	3,17	3,33
PM.3.1	Hiring of Human Resources	4	4	4
PM.3.2	Role Assignment	2,5	2,5	2,5
PM.3.3	Monitoring and Controlling Human Resource	3,5	3	3,5
PM.4	Outsourcing Management	1,5	1,63	3,25
<b>SU</b>	<b>Sustainability</b>	<b>1</b>	<b>3,75</b>	<b>3,83</b>
SU.1	Documentation	1	3,5	3,67
SU.2	Implementation Cost	0	3	4

**Table 6.** Upshot of Dimensions

		Numeric Values				Aggregation Measurement			
Code	Goals	CC	E <sub>1</sub>	E <sub>2</sub>	E <sub>1</sub> , E <sub>2</sub>	CC	E <sub>1</sub>	E <sub>2</sub>	E <sub>1</sub> , E <sub>2</sub>
	<b>Total</b>	1	2,89	2,96	2,92	Rarely	Normally	Normally	Normally
SO	Service Oriented	1	2,56	2,33	2,44	Never	Normally	Rarely	Rarely
SE	Software Engineering	1,42	2,78	2,75	2,76	Rarely	Normally	Normally	Normally
PM	Project Management	2,2	2,48	2,57	2,52	Rarely	Rarely	Normally	Normally
SU	Sustainability	1	3,75	3,83	3,79	Never	Normally	Normally	Normally

### 3.3 Analysis Phase

Although just one study is not enough to support a strong claim, independent observers related to be able to observe improvements in their processes due the use of TME. This evaluation validity can be constrained by the skills and perception of the practitioners.

Almost all the dimensions achieved the value “Normally”, and particularly the Sustainability goal achieved values very close to the “Always” (see Table 6):

*Service Oriented Dimension.* Despite TME suggests signing the Service Level Agreement (SLA), having a service repository (UDDI), and implementing techniques for concept unification, they have not been implemented in the PIP.

The quality analyst did not answer about the service implementation, because she did not participate in the development.

Nevertheless, the general score is quite close to “Normally”.

*Software Engineering Dimension.* There are different responses in the Requirement and Configuration and Change Management due to practices and documents proposed for them, but they have not always been considered by the developers.

The quality analyst had suggested to follow standards during the development, but she cannot ensure it has been done. Moreover, she did not answer about verification and validation practices.

Test has not always carried out by other people than developers and there was not a responsible to accept the development before deploying.

*Project Management Dimension.* Various processes and documents were not followed and completed, because they were unknown by the majority of the staff due to fault in Communication Management. This affected the Role Assignment, Monitoring, and Controlling Human Resources as well as the Outsourcing Management.

*Sustainability Dimension.* Despite the models are not easily understandable for some staff, the documentation is usually updated.

## 4 On going works and Conclusion

Tape Mbo'e (TME) is a service oriented process that extends OpenUP to include intrinsic characteristics of services. OpenUP's life cycle has been changed to overcome the maintenance and retirement of system.

As OpenUP disciplines are concerned, several of them have been changed, and it was proposed a new one: Quality Assurance.

To evaluate the TME, we prepared an evaluation plan that is described in Section 3. This plan includes goals, measures, scales and applies Goal-Question Metric to organize the overall observation structure and guide the case studies

execution. More than one case study is expected to be accomplished. This paper presented the results of the first one, which is also the first application of rigorous experimental evaluation in the public sector in Paraguay. Next case studies are ongoing. Individual results will be produced by following the same approach we have described in this paper. To integrate all case studies results the use of meta analysis (non-parametric aggregation) [10] is expected. For this, Vote Counting (VC) will be used because it can estimate an improvement index in order to determine how better one treatment is than another. The vote counting is not applied in this paper, because only one case study result has been obtained so far regarding the Information Interchange System (IIS). IIS belongs to a public Paraguayan agency and its development was addressed using TME. In the evaluation TME has demonstrated to contribute to the PIP evolution obtaining “Normally” against “Rarely” when compared to the previous institution process.

As future works we envisage carrying out the evaluation plan to combine the results of various case studies which have been modelled and/or under development using TME in various public and private organizations in Paraguay. Moreover the future version of TME will include techniques for services identification and criteria for their selection.

The contributions of this paper are the description of the evaluation plan and its application to the first assessment of TME’s performance in a real case study in Paraguay.

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