

## **Innovation in E-Government Services: New Framework to Improve the Effectiveness and Efficiency of Citizen Service Processes and Public Management of Decision-Making – Case of ISO/IEC 20000-1 in Government**

### ***Innovación en los Servicios de Gobierno Electrónico: Nuevo Modelo para Mejorar la Efectividad y Eficiencia de los Procesos de Servicio al Ciudadano y Gestión Pública de la Toma de Decisiones – Caso de ISO/IEC 20000-1 en el Estado***

**Pablo Cardozo Herrera.** IT Service Excellence and Innovation at DXC Technology. CEO at FFMM Innovation, Argentina. IT Director at Fundación FIEP  
pablo@cardozoherrera.xyz

**Abstract.** With the expansion of IT Services<sup>1</sup> in public administrations and citizen demands on high quality/performance in e-government solutions; it is imperative that Governments increase the effectiveness of public ITSM processes and improvement of ITSM project management through a support to the strategic decision-making process of IT administrators. The author presents an analysis of common issues of E-Government Services and strategic needs of information unmet that provoke ITSM processes do not achieve the effectiveness/efficiency expected. A framework consisting of an innovative theoretical model of Public ITSM management and a technological solution aligned to the ITIL<sup>2</sup> and ISO/IEC20000<sup>3</sup> with focus in citizen's needs, is proposed in the article. The research proves the framework integrates, manages and coordinates in a holistic, measurable and auditable way, ITSM process/projects of E-Government Services and use the effectiveness assessment for strategic decision-making to improve public process maturity level and e-government capacity of an efficient administration.

**Resumen.** Con la expansión de Servicios IT en la administración pública, y las demandas de ciudadanos por soluciones de Gobierno Electrónico de alta calidad/rendimiento; es imperativo que Gobiernos (nacionales, provinciales y municipales), incrementen la efectividad de los procesos públicos ITSM a través de la mejora de la gestión pública de los proyectos ITSM con soporte al proceso de toma de decisiones estratégicas de los administradores IT. El autor presenta un análisis de problemas comunes de los Servicios de Gobierno Electrónico alrededor del mundo, con necesidades estratégicas de información no satisfechas que provocan que los procesos públicos ITSM y la gestión pública de proyectos no alcancen la efectividad y eficiencia esperada. Se propone un framework compuesto por un modelo teórico innovador para la gestión pública ITSM y una solución tecnológica alineada a ITIL, a ISO/IEC20000 con foco en las necesidades de los ciudadanos. El artículo presenta evidencias que prueban que el modelo propuesto es capaz de integrar, gestionar y coordinar de forma holística, medible y auditable todos los procesos/proyectos públicos ITSM de gobierno electrónico utilizando la evaluación de la efectividad alcanzada para los procesos de toma de decisiones estratégicas e incrementando los niveles de madurez existentes.

**Keywords:** Innovation in IT Services, E-Government Services, ITSM Processes, IT Service Management, Citizen Services.

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<sup>1</sup> IT Services: Information Technology Services

<sup>2</sup> ITIL, formerly an acronym for Information Technology Infrastructure Library, is a set of practices for IT service management (ITSM) that focuses on aligning IT services with the needs of business.

<sup>3</sup> ISO/IEC 20000-1:2011 is a service management system (SMS) standard. It specifies requirements for the service provider to plan, establish, implement, operate, monitor, review, maintain and improve an SMS. The requirements include the design, transition, delivery and improvement of services to fulfil agreed service requirements.

## 1 Introduction

The IT Service Management in Government is the group of skills and capabilities that IT Government Offices utilize to assure quality, effectiveness and efficiency in the services provided to citizens. Governments are available to delivery more value as they increase the level of public process maturity through the improvement of these three factors. However, this create a complex scenario and citizens' demands for better results in the efficiency and effectiveness of e-government IT Service Management. Therefore, as the e-government offices expand their size and scope, the greater the difficulty to manage the IT delivery services in an effectively and efficiently way witch jeopardizes the quality and value supplied to citizens.

The main subjects of the article are the IT Services in e-government, the ITSM public Processes, the good practices for ITSM activities provided by ITIL and ISO/IEC 20000-1, and an analysis of the improvement opportunities in the public decision making process and effectiveness assessment and management performance of ITSM public process of IT service government offices through a new framework to manage processes and projects of the information technology service management system in e-government.

## 2 Government IT service offices ITSM common issues

Government IT services delivery offices and the top 20 IT service companies in the world share characteristics complexity, scope and customer/citizen expectations. The capability to deliver high quality and value results is directly linked to the organizational capability to manage their ITSM processes. Based in the high volume of services within the public catalogues of the top IT companies and top e-government services, the high amount of human capital and the amount of consumers; the IT offices must face a complex scenario in process and project structures and citizens' demands in deadlines and quality.

Therefore, the common issue observed in IT offices is the low organizational capability to manage their ITSM processes and projects in an efficient and effective way which results in a low level of Process Maturity. IT offices must increase their process maturity level through the improvement of ITSM project management with focus in the government strategy not only in the operation processes but regarding a holistic view of all ITSM public activities. In consequence it is observed that the majority of complex IT offices does not prioritize the integration of all processes and project as a public strategy nor as a powerful tool to increase the value delivered to citizens. This problem is fed with the lack of technological solutions capable to support integration, management and coordination of information in a measurable and auditable way, in order to support ITSM decision making process.

The article describes how government IT service offices can reach a Level 4 of Process Maturity Level <ITIL Maturity Model: level 0 (chaos), level 1 (initial), level 2 (repeatable), level 3 (defined), level 4 (managed), level 5 (optimized)> if they improve their capability of an effective and efficient management through a new framework and a technological solution capable to manage, integrate and coordinate information in a holistic way, measurable and auditable of all ITSM processes and projects, and also use this to support public ITSM

strategic decisions.

## 1.2. Rationale: strategic needs and objective

The baseline defined in the article is the fact that most of IT offices do not achieve their efficiency and effective goals established for the ITSM project management because of non-satisfied strategic needs of information and a lack of a technological solution standard, reusable, scalable and robust to proactively support the IT direction in the decision making process. The common IT strategic needs observed can be grouped in four categories:

- **Strategic IT data needs:** strategic IT data must be available in real time and through a dynamic behavior integrated with ITSM processes and projects. Most of the IT offices that do not have the infrastructure necessary to centralize the require information for different work teams and process leaders within the government office, present problems to achieve the performance and quality expected by citizens. ITSM data groups are composed by processes data (compliance controls of ISO/IEC 20000-1), project data (resources to accomplish ISO/IEC 20000-1 controls), roles and responsibilities data (with a defined measurable system for effectiveness) and balance scorecard data for ITSM decision support.
- **Framework needs:** in order to achieve an integrated management of ITSM processes and ITSM projects it is necessary a single framework that allows governments identify the relationship among the SMS components, the activities to achieve the SMS goals and the information workflow expected during the management of ITSM processes.
- **Training support information needs:** it is important for a complex organization with high HR rotation to establish a defined training support system for ITSM process leaders to grow the knowledge base.
- **ITSM indicators and metrics needs:** The needs described before can be summarized in a single group of strategic data based in indicators and metrics that support in real time ITSM decision making process to IT offices' directors regarding process management, project management, government IT risk management and ISO/IEC 20000-1 requirements.

From the strategic needs described, the main objective pursued by the author is to define a new framework (ITSM model) and a baseline for a technological solution (SMS tool) to help Government IT offices with complex ITSM scenario in adhere to ITIL good practices and ISO/IEC 20000-1 requirements; and improve their capability to integrate, manage and coordinate in a holistic way, measurable and auditable, all ITSM processes and ITSM projects with a standardization of the effectiveness assessment for the strategic decision making in order to achieve a level four of maturity with direct impact in the current capacity of efficient and effective public management.

## 3 Public ITSM Framework

Government not certified in ISO/IEC 20000-1 or with a low maturity level of ITSM process management, must align and coordinate their organizational effort to the international standards requirements. This demand creates strategic needs of information for the improvement of the IT service. The strategic information is based in a group of ITSM components with integrated, dynamic, centralized and availability characteristics; an ITSM

project management methodology; the capacity to support the training to ITSM processes leaders and the ability to obtain indicators and metrics in real time to support decision making process to decrease the risk in public project and delivery of e-government IT services.

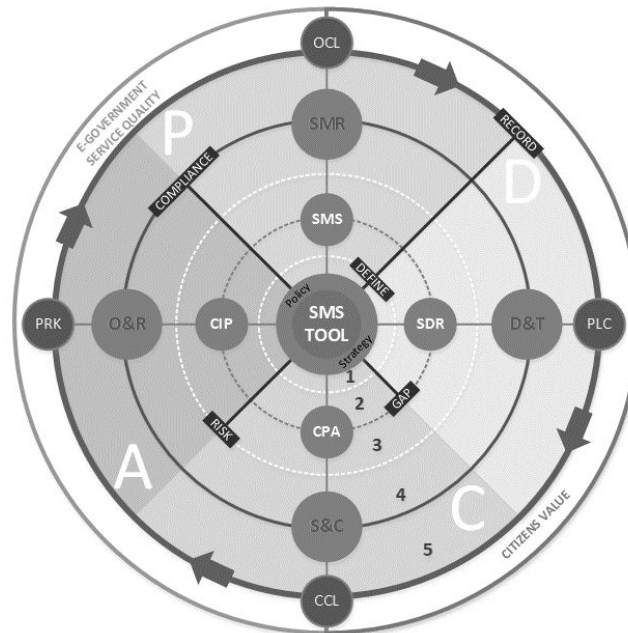


Figure 1 – Public ITSM Framework

In this article, the author proposes a new ITSM framework that reconfigures the implementation procedure of the SMS into governments, changing the focus from technical and operative aspects to a focus in a holistic management of public processes, achieving results as an integrated package and not only based in individual efforts. The new framework is based in two information sources: the SMS Policy which defines the strategy and the SMS Tool which integrates all ITSM necessary data. It is established by ITSM Activities that create an interrelationship with the Process Maturity Level achieved during the lifecycle of the ITSM processes and projects of e-government services. It is formed by Maturity Layers in compliance with the Process Maturity Level where each layer contains the interaction with its components and activities. The framework is based in the PDCA model<sup>4</sup> where each stage defined contains a sub-model of interaction among components, activities and layers in relation with the lifecycle of the ITSM processes and projects of e-government services.

The framework presented in the article is an iterative model where all the components and activities are linked during the lifecycle of the ITSM process or ITSM projects in the evolution through the defined layers and the PDCA stages. At the last layer, the framework establishes the Quality of E-Government Services and the Value to Citizens generated by all components and activities as a final product of interaction and relationship during the lower layers and the PDCA stages. The main objective of the framework is based in the principles of CSI

<sup>4</sup> PDCA Model: ISO/IEC 20000-1 framework (Plan, Do, Check, Act)

(continual service improvement), which allows governments a better management of e-government service continuous improvement assessing the current needs of improvement and executing actions to improve in an iterative process the effectiveness and efficiency of the value to citizens through an improved service delivery and quality excellence. The Figure 1 presents the Public ITSM Framework with all the components defined.

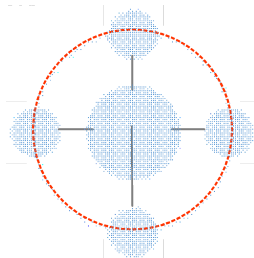
### **3.1 Policy, Strategy and Components of the Public ITSM Framework**

At the center of the framework is the Technological Solution (SMS Tool) as the data source that satisfied the strategic needs of information defined. The SMS Tool is limited by the SMS Policy and the Strategy of each Government IT Offices. Both, the Policy and Strategy define the focus of the organization to the quality, the service and citizens satisfaction over the technical and operational issues. The Figure 2, 3 and 4 presents all the Public ITSM Framework Components (Instruments, Teams and Success Metrics).

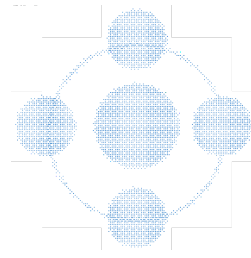
The red circles placed in the middle of the framework are the Instruments used in the lifecycle of ITSM public processes and projects delivery teams. These instruments are four (SMS, SDR, CPA and CIP) and they correspond to the basic requirements for a Level 2 of Maturity. The SMS (Service Management System) is the unique point of access to all processes, procedures, activities and roles definitions. The SMS is the instrument that makes the documents available to all the government offices. The SDR (Service Delivery Review) is the space of the service review through indicators and metrics presented to all government stakeholders to assess the service efficiency and effectiveness and the opportunities of improvement. The CPA (Corrective and Preventive Actions) are the registered corrective and preventive actions to solve any issues in the service delivered. The CIP (Continual Improvement Plans) are the detail steps to solve the actions identified.

The yellow circles placed between the center and the exterior limit of the framework represent to all roles and responsibilities in the IT offices grouped in four categories based in functions, scope and goals. These components are the Public ITSM Teams and they are strategic grouped to maximize the relationship and cooperation and improve synergy between them. The SMR (SMS Representatives) is the team of Public ITSM administrators, e-government service managers, public project managers and quality administrators. Its purpose is to compliance the requirements of the clause 4 of ISO/IEC 20000 establishing, controlling, managing and communicating the SMS to the different government offices. The D&T (Design and Transition) is formed by the process leaders with focus in the design and transition of e-government services. Its purpose is to compliance the requirements of clause 5 and sub-clauses 6.4, 6.5 and 7.2 of ISO/IEC 20000-1. The leaders in the D&T are related to the e-government service transition, public finance administration, IT government capacity management and public supplier management. The S&C (Support and Control) groups the process leaders in charge of the activities of support and control of the SMS. Its objective is compliance clauses 6.1, 6.2, 6.3 6.6 and 7.1 of the standard and its leaders are related to e-government service level management, report services, continuity and availability management, information security and citizen relationship management. The O&R (Operation and Resolution) is the last team defined and it is formed by ITSM specialists in incident and e-government service request management, e-government problem management, configuration management, change management and release management. The O&R team is

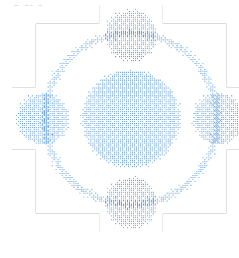
focus to operation activities with purpose of compliance the requirements of sub-clauses 8.1, 8.2, 9.1, 9.2 y 9.3.



**Figure 2** – Instruments of the Public ITSM Framework



**Figure 3** – Public ITSM Teams



**Figure 4** – Success Metrics of the Public ITSM Framework

The green circles placed at the top of the framework represent the main indicators and metrics of the Public ITSM Framework and they are the success criteria based in the effectiveness and efficiency degree achieved in each stage of the PDCA model. The Success Metrics are grouped in four categories. The OCL (Office Compliance Level) is an indicator defined by the compliance degree of all the government IT office regarding the ISO/IEC 20000-1 controls, controls evidence, components tasks and general status of the standard. The indicator provides a general status of the Public ITSM IT office health. The PLC (Process Leads Compliance) is the indicator that defines the compliance degree of all process leaders regarding the compliance goals of the ISO/IEC 20000-1 clauses. The metric provides a general status of the effectiveness and efficiency of each role regarding its functions.

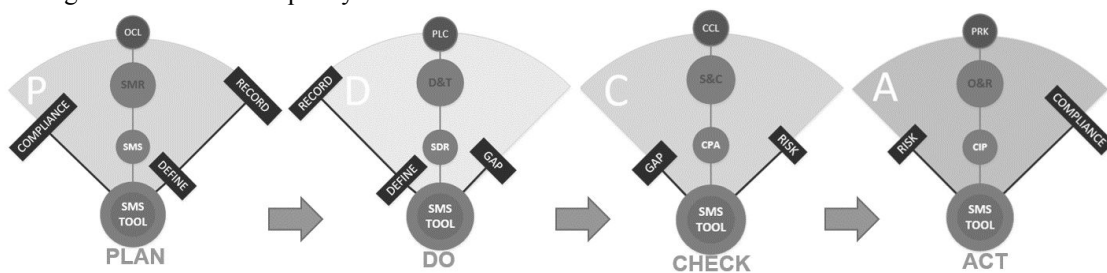
The CCL (Control Compliance Level) defines the compliance degree of each ISO/IEC 20000-1 specific requirements. The indicator provides the general status of the evidence compliance and it help to calculate the CLS (Compliance Level Status) by the average of all partial results. The PRK (Project Risk) is the indicator that defines the actual risk of the ITSM public project. For this framework, an ITSM public project is a group of activities in a defined time in relation to the public ITSM goals of e-government with limited resources and success objectives defined and documented. Among the ITSM projects are the internal and external audits of the SMS, ITSM compliances assessment for one team or government office, service migrations, new services, changes in the service delivered, service decommission, ISO/IEC 20000-1 certification and maintenance; and continuous improvement projects.

### 3.2 Activities and Stages, Maturity Levels and Layers of the Public ITSM Framework

The activities and stages defined in the framework act as an interface between the components through the lifecycle of the ITSM public projects and processes. The stages are funded in the PDCA model and define the project or process lifecycle with specific activities to plan, do, check and act while results are collected from the compliance indicators, the corrective and preventive actions from the e-government service review and the action plans of SMS improvement. The activities are grouped in five categories that include Definition, Applicability Analysis, Risk Assessment, Compliance management and Improvement Record distributed in the stages.

The Define activity represents the lowest level of maturity and its objective is to define

timelines, scope, roles, responsibilities and all the objectives of the projects and processes of the ITSM. The GAP activity (Applicability Analysis) represents a level 2 of maturity and it is oriented to the scope analysis and the projects resources. The Risk activity represents a level 3 of maturity and is based in the calculation of ITSM project risk through the PRK indicators presented before. The Compliance activity is oriented to the gathering of evidences and the execution of e-government service review, identification of corrective and preventive actions, and definition of improvement plans. These activities represent a level 4 of maturity and includes calculation of effectiveness and efficiency indicators and the results communication. The Record activity is focus to the recording of the e-government service improvements and represents the highest level of maturity and summarize all the interaction and relationship among the previous stages. This activity is in direct contact with the final assessment of e-government service quality and the value to citizens.



**Figure 5** –Activities and Stages of the Public ITSM Framework

The Figure 5 presents all the activities during the four PDCA stages aligned with the PDCA model in ISO/IEC 20000-1. The PLAN stage involves the ITSM SMR team, responsible of the management, definition, documentation and review of the SMS. During this first stage are executed the tasks of initial definition, compliance assessment and improvement record. The success criteria of this stage is defined by OCL indicator. During the DO stage the ITSM D&T team is involved. This team is responsible of the execution of the plans of the previous stage through the design and transition service. This stage utilizes the SDR instrument to execute activities of definition validation, analysis and record consulting. The success criteria of the DO stage are based in the PLC indicator. The CHECK stage involves the ITSM S&C team who is responsible of the review of the design and transition activities and the control of the operational activities. During this stage preventive and corrective actions are identified to execute validation tasks from the GAP and RSK activities. The success criteria of this stage are defined by the CCL indicator. The last stage is ACT. During ACT activity the ITSM O&R is involved who is responsible of the operations activities and service delivery. This stage results, are the assessment of effectiveness of the improvement plans through project risk alerts and compliance of the standard requirements. The success criteria of the stage are defined by PRK indicator.

The Maturity Layers of the ITSM framework are based in the five Maturity Levels of ITIL good practices. These layers represent the maturity of the framework components in a specific stage during the lifecycle in an ITSM project. The maturity layers are named as the maturity levels: 1-initial, 2-defined, 3-managed and 4-optimized. Each layer is divided by the activities related. The red layer defines the interaction level of the ITSM instrument. The white layer

defines the intermediate status of maturity or transition.

The green layer defines the level of interaction of the ITSM teams. The blue layer defines the level of interaction of the ITSM success criteria through the defined indicators.

### 3.3 Public ITSM Framework Continuous Improvement: E-Government Quality and Value to Citizens

The last element of the Public ITSM Framework is the highest degree of effectiveness and efficiency expressed in two concepts linked to government strategies. The end e-government service quality and the value delivered to citizens are the components that establishes the external limit of the framework and the objective is to accomplish the execution to all tasks, activities and relationship among all framework components. The service quality and citizens' value define the service continuous improvements and act as a support and validation to the maturity level achieved by the organization.

## 4. SMS E-Government Technological Solution Workflow

The e-government technological solution defined for the Public ITSM framework is oriented to execute the activities and stages defined to manage all the lifecycle of an ITSM project and manage ITSM processes through the components, activities and ITSM maturity layers. The Figure 6 presents the workflow of the SMS Tool in relation to ITSM projects and the compliance control for ISO/IEC 20000-1 requirements for ITSM processes. The workflow adjusts to the PDCA model and all the components of the proposed ITSM Framework.

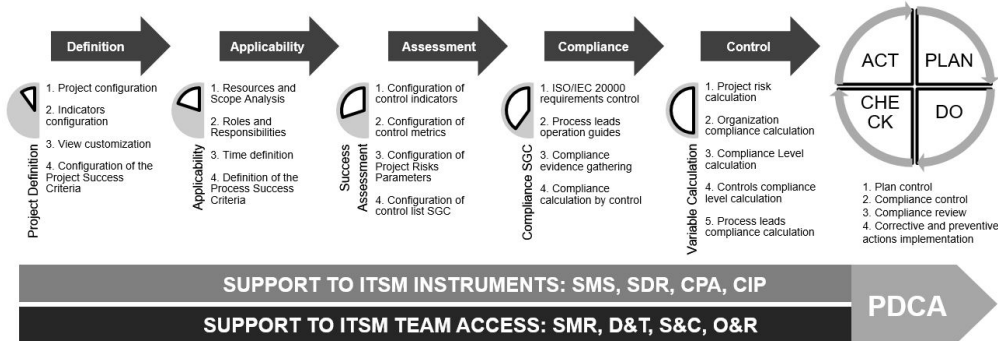


Figure 5 – SMS Technological Tool Workflow

## 5. Verification of the Framework

For the verification of the framework the author presents an analysis of IT offices performance before and after the implementation of the ITSM Framework proposed. The Table 1 presents the definition of the investigation variables used to validate the framework and the Table 2 presents the investigation sampling details.

Variable	Description	Success Value	Fail Value
ML	Total Maturity Level of the Organization	L4	L2



OCL	Organizational Compliance Level	>=90%	<70%
OCLT	Organizational Compliance Level Trend	Positive	Negative
CLS <sub>(X)</sub>	Compliance Level Status of Clauses. Clauses X = {4;5;6;7;8;9}	>=90%	<70%
CCL <sub>(X,Y)</sub>	Compliance Level Status of Sub-Clauses from Clauses X.	>=90%	<70%
PLC <sub>(Z)</sub>	Process Leads Compliance. Teams Z = {SMR; D&T; S&C; O&R}	>=90%	<70%
PRK	Total Project Risk	LOW	MEDIUM
Audit LVL	ISO/IEC 20000 audit level achieved	>=4	<=3
ML <sub>(N)</sub>	Maturity Level of Sub-Clauses. N = {4;5;6.1;6.2;6.3;6.4;6.5;6.6;7.1;7.2;8.1;8.2;9.1;9.2;9.3}	>=4	<=3
Audit FGP	Audit Finding: Good Practice	>=1	0
Audit FOP	Audit Finding: Opportunity of Improvement	<=5	>5
Audit FOB	Audit Finding: Observation	<=5	>5
Audit FNC	Audit Finding: Non-Conformity	<=5	>5
Audit FCC	Audit Finding: Critical Non-Conformity	0	1

**Table 1 – Verification variables**

Sampling	Variables	Scope	Period
Historical Data Sampling: Data of the process maturity before the implementation of the ITSM Framework.	ISO/IEC 20000-1 audit results and reports.	5 global IT offices assessed in 10 top citizens groups.	6 months before the implementation of the Framework.
Experimental Data Sampling: Data of the process maturity after the implementation of the ITSM Framework.	Described in Table 1	5 global IT offices assessed in 10 top citizens groups.	30 days after the implementation of the Framework

**Table 2 – Verification sampling**

With the definition of verification variables and verification sampling the author collected and analyzed input data from the scenarios before and after the implementation of the ITSM Framework. Regarding the high amount of data results and because of the purpose of this article, it is only presented the final average results and data comparison from both scenarios to review the framework performance. The Table 3 presents the average results of the maturity assessment by process of the Historical Data Sampling (HA: Historical Audits), and the Experimental Data Sampling (VA: Verification Audit). The Table 4 presents the average results of all good practices, opportunities of improvements, observations and non-conformance found for both audits processes (HA and VA). The graphical comparison between both average results is presented in the Figure 6 and Figure 7. The final average result of the verification assessment is defined by the variables Audit LVL (Assessment Level Achieved) and ML (Maturity Level Achieved). The Table 5 presents the final average results for both audit processes (HA and VA) with a solid evidence of improvement from a non-successful scenario in HA to a successful scenario in VA.

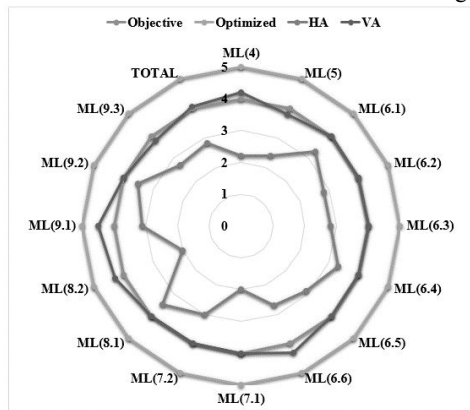
Variable	Process	HA	VA
ML(4)	SMS General Requirements	2.2	4.2
ML(5)	Design and Transitioning of Services	2.4	3.8
ML(6.1)	Service Level Management	3.3	4
ML(6.2)	Service Reporting	2.8	4
ML(6.3)	Service Continuity and Availability Management	2.8	4
ML(6.4)	Budgeting and Accounting for Services	3.3	4
ML(6.5)	Capacity Management	2.9	4
ML(6.6)	Information Security Management	2.7	4.3
ML(7.1)	Business Relationship Management	2.0	4
ML(7.2)	Supplier Management	3.0	4
ML(8.1)	Incident and Service Request Management	3.5	4
ML(8.2)	Problem Management	2.0	4.3

ML(9.1)	Configuration Management	3.1	4.5
ML(9.2)	Change Management	3.5	4
ML(9.3)	Release and Deployment Management	2.7	3.8
AVERAGE		2.81	4.06

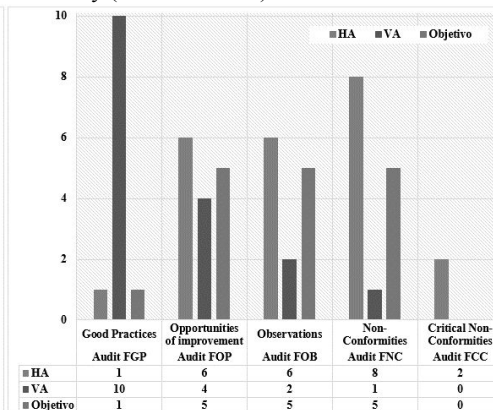
**Table 3 – Process Maturity Assessment (HA versus VA)**

Variable	Description	HA	VA	Objective
Audit FGP	Good Practices	1	10	>=1
Audit FOP	Opportunities of Improvement	6	4	<=5
Audit FOB	Observations	6	2	<=5
Audit FNC	Non-Conformance	8	1	<=5
Audit FCC	Critical Non-Conformance	2	0	0

**Table 4 – Findings Summary (HA versus VA)**



**Figure 6 – Process Maturity Level (HA versus VA)**



**Figure 7 – Findings Summary (HA versus VA)**

Audit LVL (Historical Audit)	Audit LVL (Verification Audit)
2	4
2	4

**Table 5 – Results Comparison (HA versus VA)**

### 5.1 ITSM Framework implementation results

The experimental activities and analysis of results in scenarios where IT offices does not implement a formal ITSM Framework versus the scenario where these IT offices implement a formal model to manage ITSM processes shows the major improvement the organization can achieve in their IT service delivery quality, value to citizens, effectiveness and efficiency. The Figures 8, 9 and 10 evidence the improvement registered after the experimental activities and the verification of the ITSM Framework hypothesis.

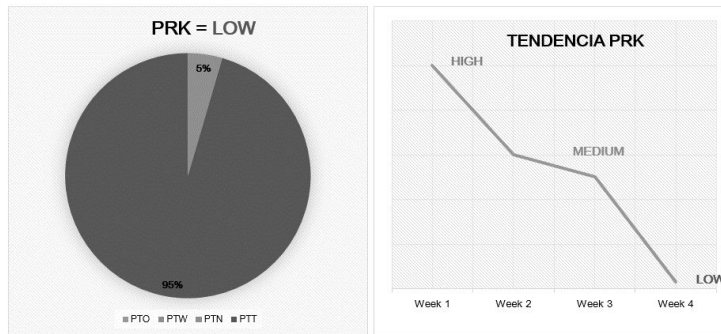


Figure 8 – ITSM Project Risk Average and Risk Trend

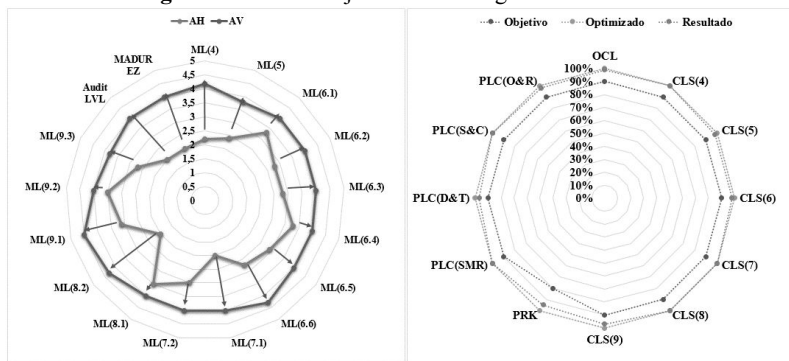


Figure 9 – Improvement in the Process Maturity Level

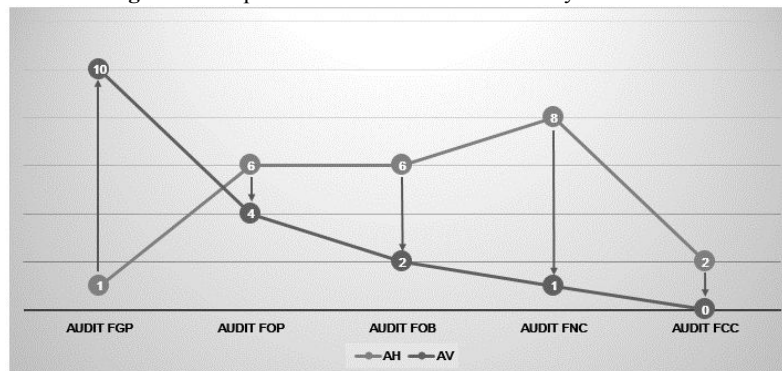


Figure 10 – Audit Process Improvements

## 4. Conclusions

The verification of the proposed Framework present a meaningful case of the current issues in Government IT offices with complex structure regarding the objectives of IT process management to delivery e-government services with high quality results and in compliance with international standards and citizens’ needs. The main and evident conclusion is the result of the verification activities that proves in a tangible, measurable, auditable and verifiable way the improvement of the Maturity Level of Processes (from level 2 to level 4), the improvement of the capabilities of effective and efficiency management through a theoretical model and a

technological solution focus in the integration, management and coordination of all the ITSM processes and project of complex IT offices in order to obtain significant improvement in the strategic decision making process. Therefore, the hypothesis and objective of the article is verified successfully. Besides it is observed an impact to the society through an increase of e-government service competitive advantage based in the ITSM framework with tangible benefits in relation to ITSM project management savings and the possibility to increase the organization management capability and government innovation capacity regarding an improvement of the capabilities of the public strategic decision making process as a competitive advantage, e-government quality and citizens' value improvement.

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