APPLICATION OF ITIL FOR THE AUTOMATION OF THE INCIDENT MANAGEMENT PROCESS AT CUBATEL S.A.

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ABSTRACT

Cubatel S.A., as part of the transition of its business model to the eTOM management framework, pays special attention to the specialized technical support for incidents. This service used to be performed manually and without adequate management tools. This caused, among other disadvantages, an inefficient use of the company's human resources and a lack of management of the knowledge acquired during the resolution process. In response to this problem, it was proposed that an incident management process based on the ITIL best practices framework for I.T. service delivery be designed using software for its automation. For this purpose, a study of the latest version of the ITIL methodology was carried out, and the main helpdesk tools were evaluated based on the best practices for incident management. The proposed solution enabled centralized incident management and multiple communication channels and streamlined the service process, resulting in increased customer satisfaction as an added value for the company.

KEYWORDS: incident management, ITIL, helpdesk, process automation.

APLICACIÓN DE ITIL PARA LA AUTOMATIZACIÓN DEL PROCESO DE GESTIÓN DE INCIDENTES EN CUBATEL S.A.

RESUMEN

Cubatel S.A. como parte de la transición de su modelo de negocio al marco de gestión eTOM, presta especial atención al soporte técnico especializado de incidencias. Este servicio se realizaba de forma manual y sin herramientas de gestión adecuadas. Esto provocaba, entre otros inconvenientes, un uso ineficiente de los recursos humanos de la empresa y una falta de gestión del conocimiento adquirido durante el proceso de resolución. Como respuesta a este problema, se propuso diseñar un proceso de gestión de incidencias basado en el marco de buenas prácticas ITIL para la prestación de servicios TI, utilizando software para su automatización. Para ello, se realizó un estudio de la última versión de la metodología ITIL y se evaluaron las principales herramientas de helpdesk en base a las mejores prácticas para la gestión de incidencias. La solución propuesta permitió centralizar la gestión de incidencias, habilitar múltiples canales de comunicación, así como agilizar el servicio, lo que se tradujo en un aumento de la satisfacción del cliente como valor añadido para la empresa.

PALABRAS CLAVES: gestión de incidentes, Itil, mesa de ayuda, automatización de servicios.

1. INTRODUCTION

Every organization today depends on Information and Communication Technologies (ICT) to meet its corporate objectives and business needs. ICT has significantly improved business productivity and enhanced the Customer and employee experience when integrated into processes and services [1, p. 4] [2]. Therefore, to guarantee optimal levels of availability, every organization establishes a centralized point for the attention of technological incidents, ensuring that they are resolved in the shortest possible time without compromising customer satisfaction.

Currently, with the trend towards service automation in organizations, I.T. Service Management (ITSM) represents a quality management approach that focuses on the proper functioning of the I.T. services and support department as an integral part of the business [3], [4]. The need to properly manage I.T. services has led to the emergence of different

ITSM models or frameworks. Among the most recognized are ITIL, COBIT, MOF and eTOM. Each has its characteristics, depending on its specific objectives [5]. Because of its adaptability to different scenarios, allowing companies to customize its implementation to their specific needs, the Information Technology Infrastructure Library (ITIL) is the ITSM framework of reference. It can be easily integrated with other emerging methodologies, such as Agile and DevOps. It also considers using software to automate the management process, reducing costs and providing timely information for decision-making [6].

As shown in [2], [7], [8], the implementation of ITIL contributes to the provision of quality I.T. services. In [9], implementing an ITSM methodological adaptation of ITIL demonstrated an 88% improvement in response times to incidents or service requests. According to [2], when it comes to ITIL processes, the first to be implemented is Incident Management. Numerous studies conducted in recent years in this specific area, both in the public [10], [11], [12], [13] and private sectors [14], [15], [16], show that the use of ITIL exponentially improves the management of reports and increases the satisfaction of users with the service provided [17].

The Engineering and Projects Division at Cubatel S.A. is responsible for specialized assistance in solving technological incidents. This service was provided through two primary means of communication: email and telephone calls. The registration was done manually in a document, which did not allow for correct traceability of the reports, along with the lack of management of the knowledge collected during the resolution process. The absence of defined procedures for managing incidents and automating the process posed a problem. As a result, the application of the latest version of ITIL for Incident Management was suggested. In addition, following the company's technological objectives, the use of open-source and free software was added as a requirement, allowing them to adapt to Cubatel's specific scenario.

2. INTRODUCTION TO ITIL

ITIL was created in the 1980s by the United Kingdom Government's Central Computing and Telecommunications Agency to improve the quality of I.T. services [18]. Since its inception, ITIL's recommendations for aligning I.T. with the needs of the business have been widely adopted by companies and organizations [19]. Due to the popularity of the results achieved through its implementation, ITIL processes have been integrated by other ITSM models, such as eTOM and the ISO/IEC 20000 standard [5], [17]. ITIL describes how all departments involved in I.T. management must work together to ensure a continuous and secure flow of information for value creation. How this value is created is described in the ITIL Service Value System (SVS) (see Fig. 1).
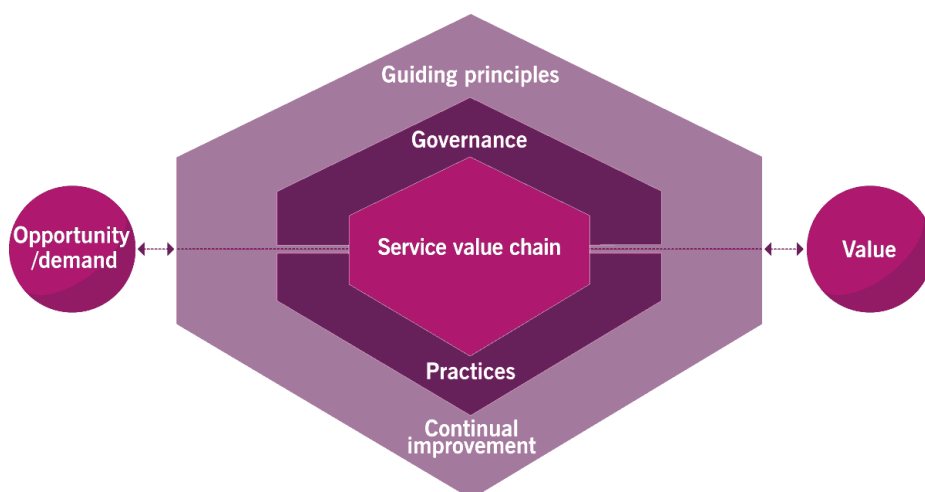

Figure 1: ITIL 4 Service Value System [18].

The various I.T. areas covered by the processes defined in ITIL include infrastructure management, security, service development, delivery, and support. The best practices described in ITIL help I.T. staff solve problems quickly and work proactively, providing a practical approach that has evolved over many years and is continually updated. Four versions of ITIL have been released, each with significant improvements over the previous version. These updates have addressed the I.T. needs of organizations across various industries, keeping ITIL at the forefront of ITSM.

ITIL 4 practices

The latest version of ITIL released in 2019, focuses on automating processes, improving service management, and integrating I.T. with the business. It updates the framework to incorporate new technological concepts such as Lean, DevOps, and Agile [20]. Its main innovation is the shift from processes to practices. Establishes a new conceptual model with four dimensions: organizations and people, information and technology, partners and suppliers, value streams and processes (see Fig. 2).

ITIL 4's management practices are grouped into three main areas: General Management, Service Management, and Technical Management. Incident Management is one of the fundamental practices established within the Service Management Practice, which focuses on the entire lifecycle of I.T. services, from their development to their maintenance and support.
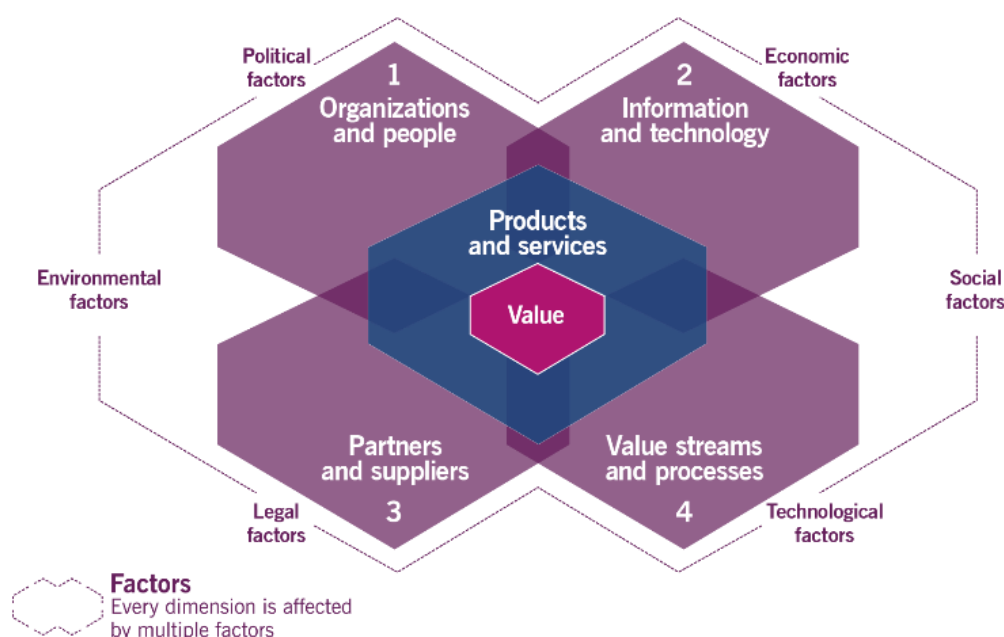

Figure 2: Four dimensions of ITIL 4 service management [18]

To avoid confusion with the term "problems", ITIL clearly and concisely defines an incident as an unplanned interruption or degradation of service [18]. The primary objective of ITIL Incident Management is to restore the regular operation of the service promptly, minimizing any adverse impact on the organization and ensuring customer satisfaction. To achieve this, ITIL 4 establishes well-defined steps: detection/identification, registration, categorization, prioritization, Diagnosis, escalation, resolution, closure, and documentation. It also strongly recommends using software applications to automate the process [21], [22].

3. IMPLEMENTATION

Free software and open-source helpdesk solutions based on ITIL were analyzed, focusing on those with greater experience, stability, and prestige in the market, to select the most appropriate. In addition, the following requirements have been taken into account: ease of installation and configuration, providing a friendly graphical interface for customer service, having a knowledge management database, managing Service Level Agreements/Operational Level Agreements, user management, role assignment, generating statistics and reports in real-time for process evaluation, and the integration with other management tools. The most outstanding solutions were osTicket, OTOBO, and GLPI.

The evaluation criteria were weighted for each tool. GLPI (*Gestionnaire Libre de Parc Informatique*) was chosen with 98.15% compliance and is supported mainly by the literature reviewed [13], [14], [15], [23]. GLPI is a web-based

ITSM tool whose Helpdesk and Service Reporting modules comply with ITIL standards. It offers a wide range of functions for the efficient management of incidents and other areas of I.T., such as project management, contract management, and inventory management. It also includes an extensive development and maintenance support community.

Definition of roles, owners, responsibilities, and priority levels

The organizational structure of the Engineering and Projects Department at Cubatel S.A. classifies personnel according to their level of intervention and responsibility in resolving incidents. In compliance with ITIL, new roles and their owners have been defined to delimit the roles and responsibilities of the personnel involved in the technical support service. Table 1 shows the relationship between the newly defined roles, the profiles in GLPI, and their owners.

Table 1: Assignment of roles.

Roles	GLPI profiles	Owners
Customer	Self-Service	Customer
Help Desk	Technician	First Level Technicians
First Level Support	Technician	First Level Technicians
Second Level Support	Technician	Second Level Technicians
Incident Manager	Administrator	Technical Assistance Leader
Critical Support Group	Super-Admin	Engineering and Projects Division Director

For efficient incident reporting and resource allocation, ITIL establishes priority levels based on the impact and urgency of the incident. These levels were defined in the Service Level Agreements and the Operational Level Agreements and then linked to the reports through the rule engine in GLPI. The priority levels shown in Table 2 were proposed according to the Engineering and Projects Department's established workflows.

Table 2: Incident's priority levels.

Priority	Description
High	Critical Incident. Characterized by excessive or total service degradation that seriously affects the business performance.
Medium	It represents a moderate impact on the Customer due to partial service degradation. The priority may be increased if the issue is not resolved within the expected resolution time.
Low	The incident has a low impact and does not significantly affect the Customer. It can be resolved during normal business operations.

The suggested response and resolution times for each priority level and the assigned roles in CubaTel S.A. are shown in Table 3. Priority levels are automatically set to reports using GLPI's priority matrix.

Table 3: Response and resolution times by priority level.

Priority	Response time	Resolution time	Assigned roles
High	5 hours	48 hours	Incident Manager
Medium	12 hours	72 hours	Second Level Support
Low	48 hours	1 week	First Level Support

Design of incident management procedure

The proposed Incident Management procedure based on ITIL 4 consists of three stages. Table 4 summarizes the phases, the previously defined roles, and the ITIL processes included in each. The procedure designed is shown in Figure 3.

Table 4: ITIL Phases, participants, and processes.

| Phases	Participating Roles	ITIL processes included
Reporting and Logging	Customer, Help Desk, First Level Support	Detection / Identification, Recording, Classification, Prioritization
Investigation and Diagnosis	First and/or second level support, Incident Manager, Critical Support Group	Diagnosis, Scaling, Solution
Validation and Closure	Customer, Help Desk, First and/or second level support	Closing, Documentation
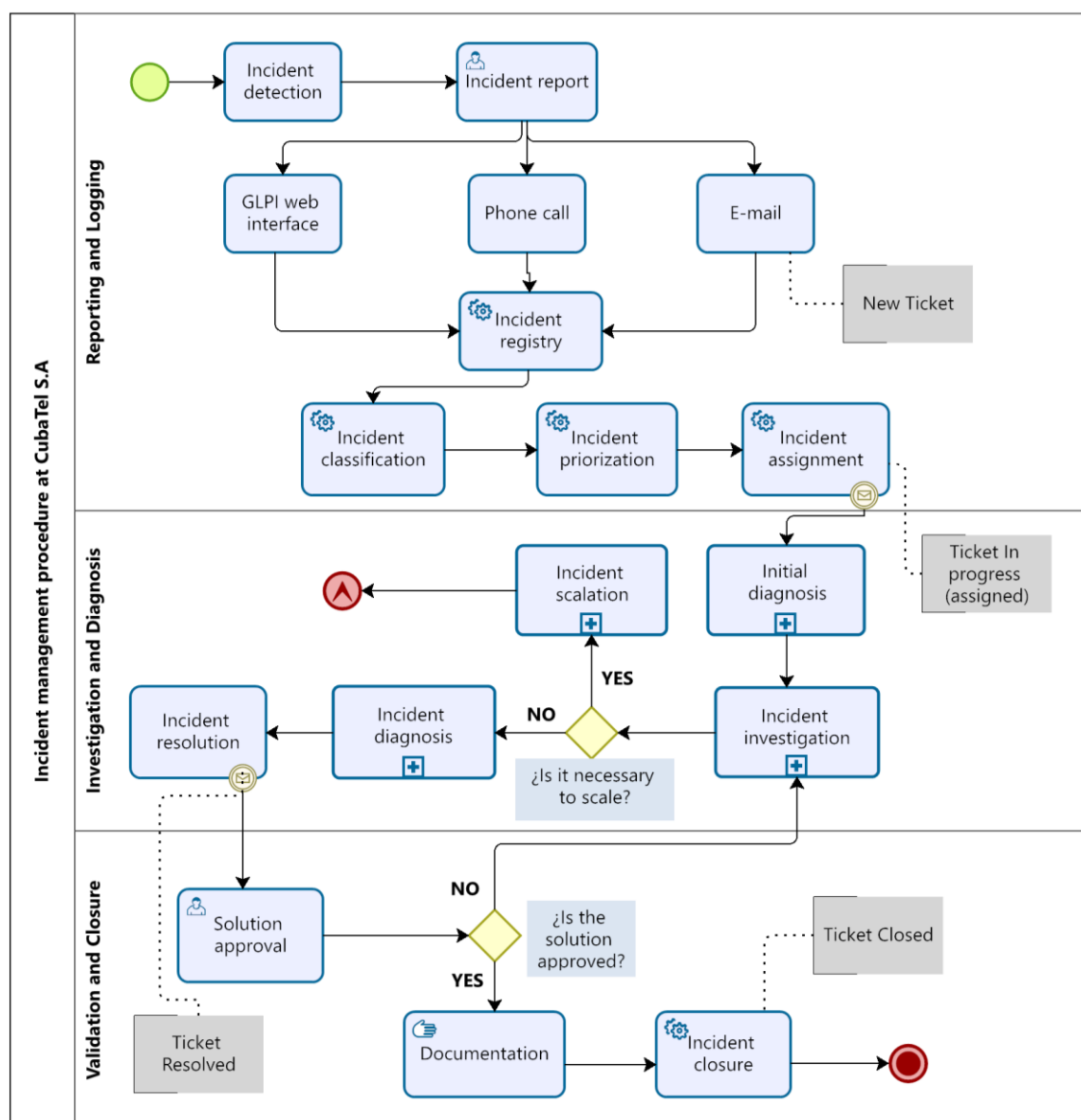
Figure 3: General procedure for incident management.

Reporting and Logging: begins with the detection and reporting of the incident. If the reporting source is not the GLPI web interface, First Level Support or Help Desk is responsible for these processes. They must record all the incident

details in GLPI and assign a priority level. The phase ends with the email notification of the report assignment to the specialists of the level corresponding to the incident's priority.

Investigation and Diagnosis: begins upon receipt of a new report notification. All Technical Support Group roles share this phase. It includes other sub-processes for which specific procedures are designed: initial Diagnosis, investigating, escalating (hierarchical or functional), and final Diagnosis. It ends with the incident resolution publication in GLPI and the automatic customer notification.

Validation and Closure: the customer reviews and approves the solution once the notification is received. If the solution is not approved, the investigation phase is restarted. It ends when the solution assigned to the incident is registered in the Knowledge Base by the support specialist who provided it, and then the report is closed.

Key Performance Indicators (KPIs)

To evaluate the effectiveness of the Incident Management process, ITIL defines a set of Key Performance Indicators (KPIs) to measure the level of compliance and to identify existing weaknesses. Those shown in the Table 4 were selected to measure the processes designed.

Table 5: Selection of KPIs.

KPI	Description
Resolution time	The average amount of time it takes to resolve an incident.
Initial response time	Average time from ticket receipt to technician response.
Resolution rate at first contact	Percentage of incidents resolved while the Customer is on the phone.
Number of escalations	Total number of incidents escalated.
Resolution within SLA	Percentage of incidents resolved within SLA timeframes.
Resolution outside SLA	Percentage of incidents resolved outside SLA timeframes.
Number of incidents re-opened	The total number of incidents reopened after being resolved in the first instance.

4. RESULTS

The final phase of the research was to install the latest version of the GLPI solution. This ensured the correct functioning of the tool and access to the latest functionalities. Two groups defined roles within GLPI: Entities and Support Groups. The first one includes users in the role of Customer, and the second one corresponds to technical support specialists in the roles of Help Desk, First and Second Level Support, Incident Manager, and Critical Support.

Report categories were created in GLPI based on Cubatel's service catalog. Priority levels were then defined according to impact, using the category assigned to the incident as a criterion. Responsible roles were assigned and response and resolution times were defined once priorities were established. Receipt of reports via email was also enabled. This ensured that the entire process was recorded correctly and that GLPI would be the only communication between the Customer and the company.

The validation method selected was the collection of use cases from three customers trained to use GLPI. Then, the procedures designed to resolve the incidents were applied. Positive opinions were obtained from a survey conducted using the service tool.

The second validation method used was the expert consultation (see Table 6), which is considered to be knowledgeable in I.T. service management and support. For this purpose, ten specialists from the same Cubatel S.A., Cuba Telecommunications Company (ETECSA) and the Technological University of Havana (CUJAE) were selected. The level of expertise of the respondents was calculated using a self-assessment questionnaire. The results indicated that all ten respondents had a medium or high coefficient of competence and could be used in the evaluation. The psychometric scale of Rensis Likert in 1932 was used to evaluate the proposal, and the concept of Percentage Index (P.I.) to analyze the results.

Table 6: Statements for the expert consultation.

No.	Statements
1	The choice of GLPI makes it possible to efficiently automate the company's technical assistance process.
2	The general procedure designed based on the best practices of ITIL 4 for the provision of technical assistance in the company is considered to be adequate.
3	The design of the specific procedures (reporting and registering, investigating and diagnosing, validating and closing) is adequate with the aim of optimizing the operations of the company.
4	By implementing the procedures designed within the tool, more effective management of the incident lifecycle is achieved, improving the transparency of the technical assistance process and increasing customer confidence in the company.
5	The proposed tool can enable more effective communication between support technicians and customers, thus improving the quality of the Help Desk service.
6	The proposed metrics for the evaluation of the procedures with the chosen helpdesk solution are considered to be adequate.

The P.I. of each expert's response to the six statements was plotted. Based on the Rensis Likert scale, values of more than 90% agreement are evident; therefore, the proposal was considered very appropriate (see Fig. 4).
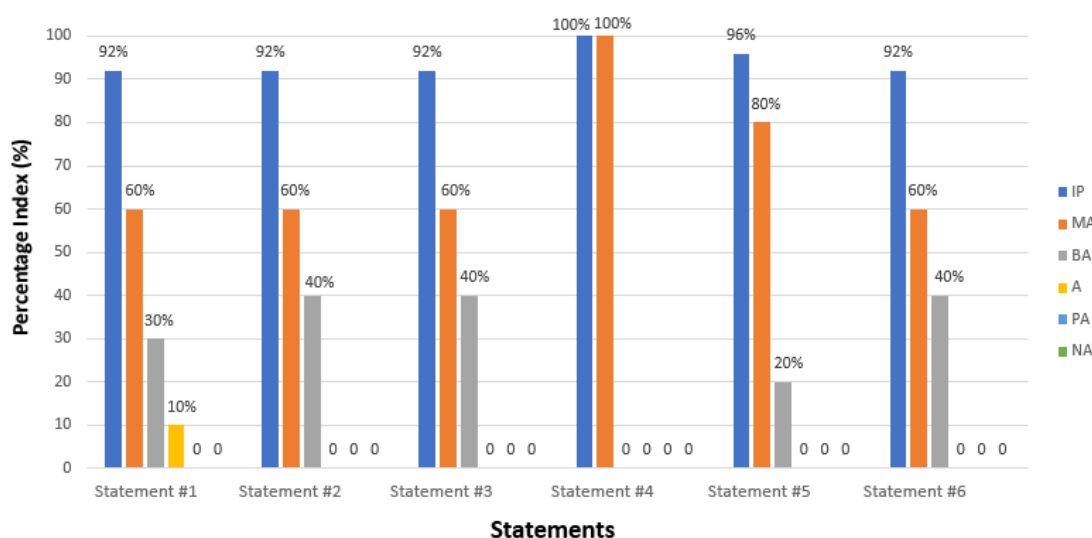

Figure 4: Percentage Index of the survey.

5. CONCLUSIONS

The automation of the Incident Management process in I.T. service providers has a positive impact on the quality of service delivered. Therefore, it is crucial to implement management frameworks such as ITIL that promote the use of I.T. tools for process automation, which is in line with the digital transformation of society. In addition, free and open-source software provides greater flexibility, reduces costs, and allows for customization, opening up many opportunities, especially at the national level.

The procedure, which is designed based on the best practices of ITIL in its latest version, has made it possible to optimize the company's technical support service, allowing the efficient handling of reports. Implementing the chosen solution has provided an alternative way of sending reports, improved communication with the Customer, and centralized the entire Incident Management. Finally, the defined key performance indicators allow for continuous monitoring and evaluation of the process by the ITIL Service Lifecycle for constant improvement.

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CONFLICT OF INTEREST

There is no conflict of interest between the authors and the institution to which they belong with regard to the content of the article presented here.

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