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Analysis of the use of the ITIL methodology against other reference frameworks for service management 2018-2020

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Abstract- A systematic mapping of articles was carried out that propose a management model based on the ITIL methodology, used for the management of information technology services, focused as a basis on the difficulties that an organization may have when trying to implement in the best way and coping with difficulties such as financial, time, and resource constraints, lack of a strategic plan, lack of skills and staff skills. These difficulties must be solved to subsequently implement an adequate service model according to the organization, as are also the other frameworks, ISO / IEC 20000, COBIT or CMMI-SVC, which learned the service life cycle in order to provide a greater value to the business. In the development of this research, areas, interdisciplinary groups and tools are used that satisfy the problem of complex relationship between business and technology. For this reason, we classify the studies into three categories, which closely depend on the needs and solutions that organizations require regarding the implementation of ITIL. As a result, it was obtained that in three years there was an increase in the implementation of the ITIL framework, as well as the good Management of information technology services.

Keywords- *ITIL, ITSM, Framework, Service management model.*

I. INTRODUCTION

At the end of the 90s, the first versions of the models in relation to Information Technology Service Management (GSTI) emerged, which are ITIL, COBIT, ISO/IEC 20000, CMMI-SVC, among others. These models appeared due to the growing demand on the management of information technologies and the need to manage their daily operations in an orderly manner.

Information technology (IT) services can be defined as a set of applications, tools or processes that allow providing support to an organization's business.

IT service management (ITSM) is a strategic approach with the intention of adding value to the business through the use of IT solutions correctly combining people, processes and technology. ITSM helps make the connection between IT and business strategy, as well as helping organizations understand the impact IT has on their various business processes.

ITIL corresponds to a management methodology that proposes a series of standardized practices that help to improve the provision of services, reorganizing the

organization's way of working and specifically, that of the IT department.

So, it can be understood that ITIL is represented as an updated set of best practices for ITSM. For organizations that want to implement the ITIL framework, it will provide a better quality of services to users, achieve compliance with capacity objectives, service availability and consolidate that the actions of the IT organization effectively support the business objectives set by the organization.

For this reason, those convenient items have been identified in the implementation of the ITIL framework, as well as increasing the proper management of IT services, to generate greater value in the operations and processes of an organization. Starting with the identification of the difficulties that an organization may have in implementing the ITIL reference framework according to the organization, as well as other reference frameworks and complementary methodologies that will generate best practices for ITSM, generating greater value for the organization.

This study is structured in 7 sections. Section II presents the framework of references where the research topics are conceptualized. Section III presents the research methodology used in detail. Section IV presents the analysis of the final sample. Section V presents the results of the SLR data analysis based on the proposed methodology. Section VI presents the discussion of the results obtained. Finally, section VII presents the conclusions of the investigation.

II. REFERENCE FRAMEWORK

For the present study, it is based on the management of IT services (GSTI), for which it considers the service management models and the classifier of the problems of adoption of software models.

A. TSM (TI Service Management)

ITSM (GSTI) is seen as a framework for change that impacts people, processes, and the organization. Its focus is on customer service and governance, on people and their structure [28]. ITSM implementations require a shift in mindset from a technology that has a centralized or support-only focus, to one that sees the role of IT management as a function that generates value and competitive advantage to the business [28].

ITIL is currently considered as the de facto standard framework for ITSM in organizations that operate their business based on IT infrastructure and services [27].

B. Service Management Model

GSTI models are understood as a series of good practices where their creators have compiled based on their experiences received in organizations [31]. The purpose of these models is to seek to collaborate with organizations on how to effectively manage the IT services they use or provide as services to their customers [33,34]. Some of the most commonly used models in Ramakrishnan's study [25] are described below:

a) *ITIL Methodology (Information Technology Infrastructure Library):*

It is a de facto market standard that defines the requirements, abilities and organizational activities that allow a correct management of information technologies and their infrastructure [35]. ITIL establishes guidelines to carry out the entire management of available services throughout the life cycle. [29]. The guidelines are expressed as a set of processes, which are carried out according to the stage of a service life cycle (ITIL v3), which are: Service Strategy, Service Design, Service Transition, Service Operation and Continuous service improvement [35].

b) *ISO/IEC 20000:*

It is a standard with a focus on the integrated processes of a management system, operation, design, service configuration and relationship with customers or service users [31].

c) *COBIT:*

It is defined as a framework with use for IT governance and management in an organization [30]. It is composed of principles and practices in reference to the management and governance of a company's IT [30]. In addition, this methodology integrates ITIL practices and ISO standards related to its objective [30].

d) *CMMI-SVC:*

It is a compilation of good practices grouped into a total of 24 process areas for IT service management and 4 process categories, which are: Projects and work management, support, establishment and service delivery, and process management. [32]. In addition, through this model organizations can cover their tasks or activities necessary to establish, manage and deliver the corresponding IT services [32].

C. Software model adoption problem classifier

Melendez et al. [26] performed the Critical Success Factors (CSF) classification based on Bayovar's taxonomy [36]. For our study, new abbreviations were adopted in order to facilitate the contrast analysis of both investigations. Among the FCE classified we have: 1) Organization: Lack of strategies (FES), Absence of resources (FRE), Limited time and financial resources (LTF), Lack of adequate techniques and tools (FTH), IT areas do not contain Sufficient Business Knowledge (NTC), Dependency on Organizational Path and Context (DOR), Complex IT Organizations (OCO), Communication of Results (CRE), Lack of People Management (FGP), Lack of Feedback (FRT); 2) People: Lack of management commitment (FCD), Resistance to change (RCA), Lack of involvement (FIN), Lack of motivation (FMO), Lack of ITSM awareness (FCI), Lack of training (FEN), Lack of skills and abilities (FCH); 3) Processes: Difficulties for the selection of processes (DSP),

Models difficult to adopt in medium and small organizations (MDA), Models without guidelines for their adoption (MSD), Standards, models and complex protocols (ECO), Lack of indicators to measure the results of adoption (FIM), Difficulty to understand the model (DCM); 4) Others: The improvement is not immediately perceived by the clients (MNP), Additional costs incurred in the implementation (CAI), High costs in the GSTI (CEG), Work overload (ATR), Lack of knowledge about the benefits of the model (FCB).

III. STUDY METHODOLOGY

This study was carried out by applying the systematic literature review (SLR) method. The reasons supporting the use of SLR are: its established tradition as a tool for understanding cutting-edge research in technology-related fields; helps understand existing studies and helps readers identify new directions in the field of research; and helps create a foundation for the advancement of knowledge.

The protocol used (Fig. 1) was based on the SLR [1] to define the research questions, search string identification, source selection, study selection criteria, and data mapping. In addition, the recommendations for extracting, analyzing, interpreting, and reporting the findings based on the literature were followed.

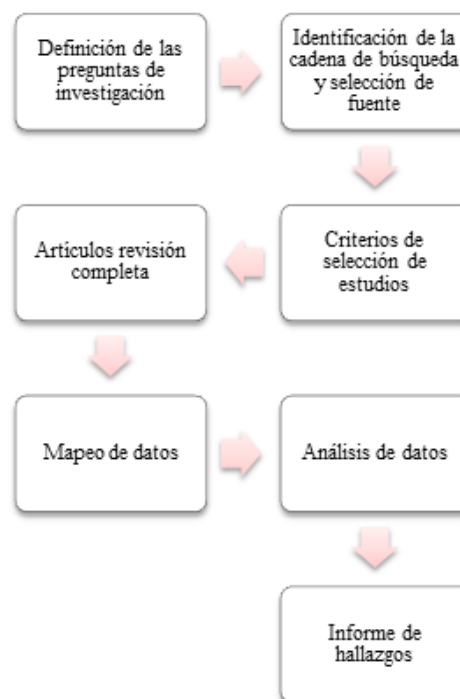


Fig. 1. Protocol used to support the systematic review of the literature.

A. Definition of research questions

The first step was to define the research questions. In order to support the objective of the research, a clear image of the state of the art in the literature on the implementation of the ITIL methodology is presented, the following research questions were raised:

Q1. What main problems did companies encounter when implementing ITIL?

Q2. Considering the ITIL, COBIT, ISO/IEC 20000 and CMMI-SVC frameworks, which ones are suitable for good ITMS management?

Q3. What reference frameworks are usually complementary to ITIL in organizations to improve their GSTI?

B. Search string identification and source selection

The search strategy was structured by selecting the source database and the appropriate search terms. Studies from 2018 to 2021 were used in order to only evaluate research from the last three years. Three online databases that index scientific literature were considered: Scopus, IEEE Xplore and Dialnet.

The search string was designed based on four main concepts related to the researched topics: ITIL (IT Infrastructure Library), ITSM (IT Service Management), problem and the Service Management Model. It was found that there are many synonyms in the literature for the terms "ITSM" and "Service Management Model". Therefore, an exploratory study of the most representative synonyms was carried out. A careful selection of synonyms was then carried out to ensure that the search process had adequate coverage. As a result, the following string with boolean operators was selected:

(ITIL AND (ITSM OR IT Service Management) AND (Problem OR (Framework OR Service management model)))

Note that synonyms for the flagged terms are already present in the displayed boolean string.

Different instances of the search string were created to accommodate different database search syntax rules, but kept the same logical value. In each database, the appropriate options were selected to limit the search process to the set of Title-Abstract-Keyword (TAK) fields. This is an important measure to reduce the number of unrelated or duplicate studies retrieved. Table I shows the initial number of articles found per database.

TABLE I.

TOTAL ARTICLES FOR EVERY DATA BASE

Base de datos	Nro. de artículos
Scopus	2 711
IEEE Xplore	205
Dialnet	52
Total	2 968 artículos

Own Elaboration.

C. Criteria for selecting studies and reviewing articles

The study selection process is diagrammed in Fig. 2. Each step indicates the number of papers remaining as a sample after the corresponding step was executed. The first selection criteria applied was to ensure that only studies with the TAK fields that returned positive results in the Boolean search expression were selected. The information (metadata) available for each article found, in the first step of the selection process, was collected by exporting the results to a spreadsheet. A spreadsheet was developed to analyze the TAK fields and correctly select the jobs.

After this verification, 2,711 works were identified in Scopus, 205 in IEEE Xplore and 52 in Dialnet, giving 2,268 works as an initial sample. Studies published between 2018

and 2020 were filtered, in addition to the fact that they are in their final stage of publication, leaving a sample of 595 studies. As a reasonable number of articles (595) were found, the filter application was limited to journal articles, conference articles or books, leaving 548 articles.

The keyword filter was continued, for which the classification of problems given by Melendez [26] and the most important frameworks of those indicated by Ramakrishnan [25] were taken into account, leaving the sample in 193 studies.

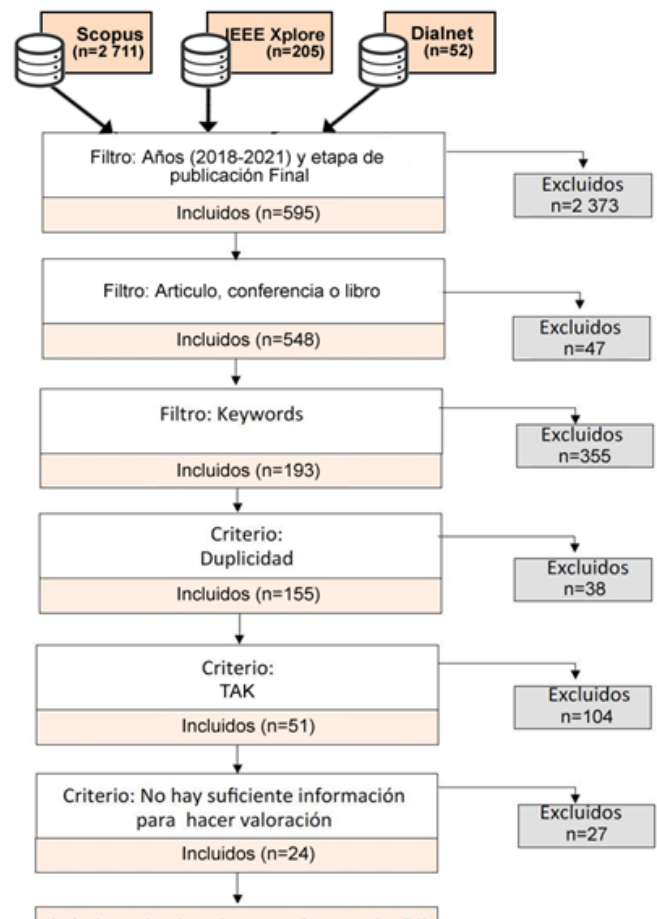


Fig. 2. Studies selection Process

Continuing the protocol, duplicate studies were searched for with the help of Excel. The existence of 38 duplicate works was excluded, leaving 155 studies. Then, the TAK fields were carefully evaluated. This evaluation discarded many works not related to the research topic, leaving 51 studies as a sample.

Finally, the complete publication of the studies was sought, leaving a final sample of 24 works available in their entirety.

The excluded studies (27) were evaluated and classified according to their degree of affinity with the research. It was found that 15 works presented a high degree of affinity, 3 presented medium affinity and 8 low affinity. In addition to that, it was also classified according to its degree of affinity with questions Q1, Q2 and Q3, resulting in 7, 17 and 10 respectively. Only the Cronholm (2018) study was unclassifiable on the assessments described. To summarize, we highlight the importance of the following articles:

Blumberg (2019), Blonders (2018), Quiroz (2019), Rubio (2018), Vargas (2020) and Veronica (2018).

Concluding this section of the research, we noted a considerable drop in the number of studies since it began with an initial sample of 2,268 papers and ended with 24 final articles.

D. Data Mapping

Data mapping of the selected articles was performed after they had been fully reviewed and analysed. Taking into account the research questions, the general categorization is: RQ1 - Problematic, RQ2 - Framework and RQ3 - Complementary. This categorization in turn is subclassified as follows:

- For RQ1 - Problematic, the Melendez classification [26] is used, which we adapt in Table II. The abbreviations were modified in order to facilitate the new classification.
- For the RQ2 - Framework, the Ramakrishnan classification [25] is used. In this ranking we consider ITIL, ISO/IEC 20000, COBIT and CMMI-SVC as the main ones.
- Finally, for RQ3 - Complement, we classify the studies according to which ITSM model is complemented in parallel with ITIL in the organization. Of these GSTI models, we consider ISO/IEC 20000, COBIT and CMMI-SVC as the main ones.

IV. DATA ANALYSIS

The distribution of the studies in three years (2018-2020) provides a general perspective on the management of IT services: its problems and models (see Fig. 3).

Analyzing the distribution, the year 2019 denotes a growth of 3% in the investigations of IT Service Management, in the analysis of problems generated by implementing ITIL and in the management models commonly complemented to the latter for the optimization of GSTI. Otherwise, the year 2020 shows a 3% drop in this type of research. We understand this percentage as null because it is not representative.

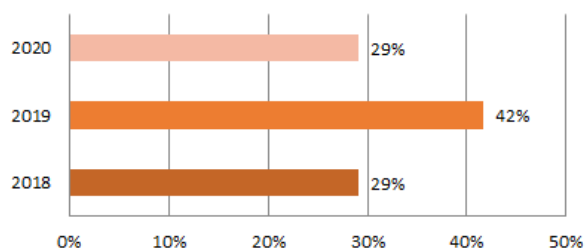


Fig. 3. Temporal distribution of research studies.

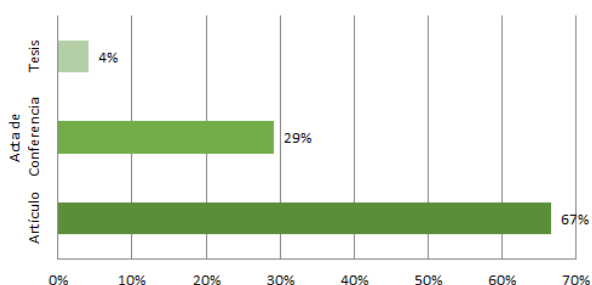


Fig. 4. Distribution by publication type.

TABLE II.

CLASIFICACION OF USUAL PROBLEMS WHEN IMPLEMENTS ITIL.

Problematics	
Description	Abrev.
Organization	
Absence of strategies	FES
Absence of resources	FRE
Limited time and financial resources	LTF
Absence of proper techniques and tools	FTH
IT areas do not have enough business knowledge	NTC
Dependence on the trajectory and context of the organization	DOR
Complex IT organizations	OCO
communication of results	CRE
Absence of personnel management	FGP
Absence of feedback	FRT
Person	
Absence of management commitment	FCD
Resistance to change	RCA
Absence of involvement	FIN
Absence of motivation	FMO
Absence of ITSM awareness	FCI
Absence of training	FEN
Absence of skills and abilities	FCH
Process	
Difficulties in selecting processes	DSP
Models difficult to adopt in medium and small organizations	MDA
Models without guidelines for adoption	MSD
Complex standards, models and protocols	ECO
Lack of indicators to measure adoption results	FIM
Difficulty understanding the model	DCM
Others problematics	
The improvement is not quickly perceived by customers	MNP
Additional costs incurred in implementation	CAI
High costs in the GSTI	CEG
Work overload	ATR
Lack of knowledge of the benefits and/or the model	FCB

Melendez [26] study adaptation [26].

Continuing with the analysis, most of the articles discovered are from journal articles. In fact, 16 papers (67%) are articles published by journals, 7 papers (29%) are conference proceedings, and 4% represent a thesis. Therefore, it is reasonable to expect a growth in the number of publications on this topic in journals.

In addition to evaluating the temporal distribution of the articles, another important aspect is the verification of the consistency of the selected keywords in the considered articles. This was done by verifying the most representative keywords among all the synonyms of each of the sets indicated in the search string. All search string keywords found in each paper TAK were counted. As a result, the total number of visits per keyword was calculated. Table III shows the number of studies with each keyword present (hits per keyword) and the percentage of the 24 sample papers with the keyword. Note that the sum of the number of visits does not total 24. Also, the sum of the percentages of all the keywords for each different concept does not total 100%. This is because many articles have more than one synonym present, causing it to be counted more than once.

TABLE III.
KEY WORDS HIT.

Concepto	Palabras claves	#Hits	%Papers
ITIL		19	79%
Gestión de Servicio de TI	ITSM	5	21%
	IT Service Management	24	100%
Problema		11	46%
Modelos de Gestión de Servicio	Framework	18	75%
	Service management model	8	33%

Sample of a Table footnote. (Table footnote)

Thus, it is possible to indicate the most representative keyword for each concept: IT Service Management and Framework. In fact, a search string using only those keywords would result in more than 20,000 results, which would correspond to more than 700% of the initial sample size of the present study.

V. RESULTS

The following subsections present the results of each research question.

RQ1. *Main issues when implementing ITIL in an organization*

RQ1 is answered following the taxonomy shown in Figure 5.

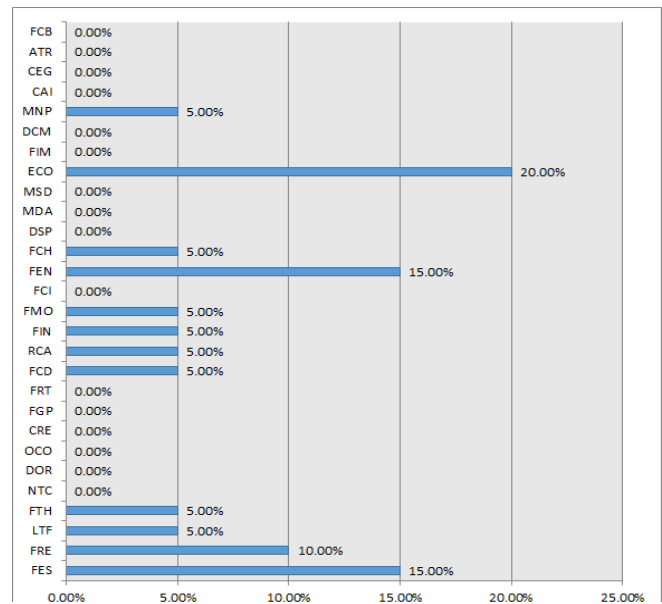


Fig. 5. Recurring problems implementing ITIL (2018-2020).

We can note that there are many problems that the literature did not address, so a new graph was made considering only those problems found in the studies (Fig. 6).

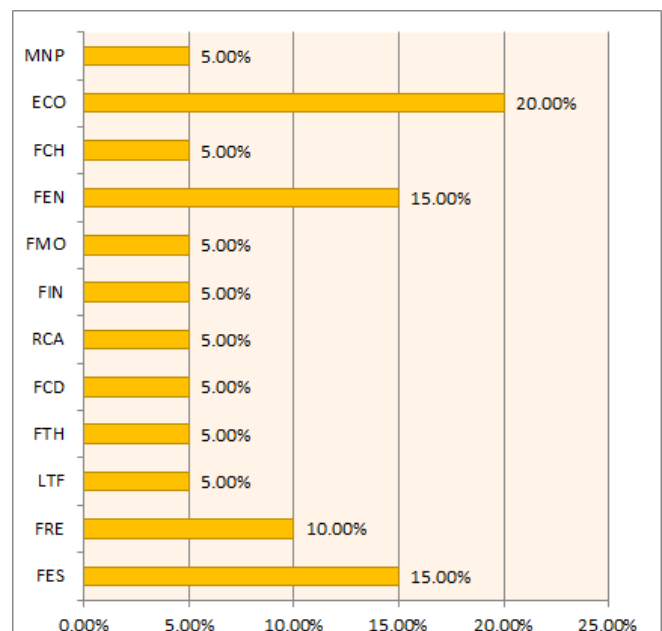


Fig. 6. Recurring problems implementing ITIL vers. 2 (2018-2020).

We note that the most recurring problem is ECO (Complex standards, models and protocols) with 20%, followed by FES (Lack of strategies) and FEN (Lack of training) with 15%, FRE (Lack of resources) with 10% and Finally, LTF (Limited time and financial resources), FTH (Lack of adequate techniques and tools), FCD (Lack of management commitment), RCA (Resistance to change), FIN (Lack of involvement), FMO (Lack of motivation), FCH (Lack of skills and abilities) and MNP (The improvement is not quickly perceived by customers) with 5%.

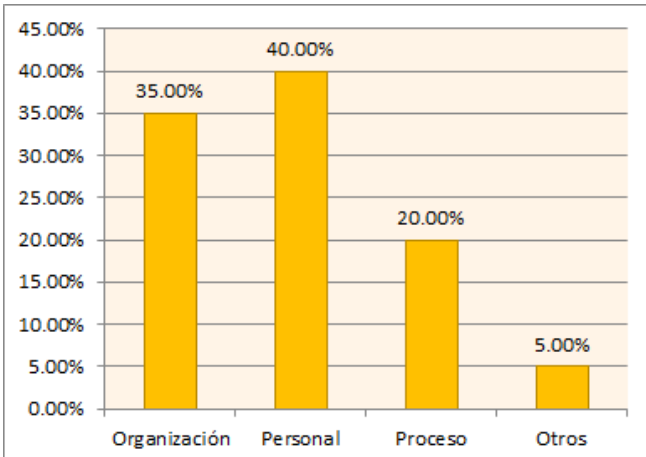


Fig. 7. Recurring problems implementing ITIL by categories (2018-2020).

In Fig. 7, the problems related to Personnel are the most recurrent with 40%, followed by the problems related to the Organization with 35%, problems related to the Process with 20% and finally, the problems related to Others with 5%.

RQ2. Appropriate frameworks for a good ITSM

The RQ2 is answered according to the frameworks found in the literature, therefore it was classified as follows (see Fig. 8):

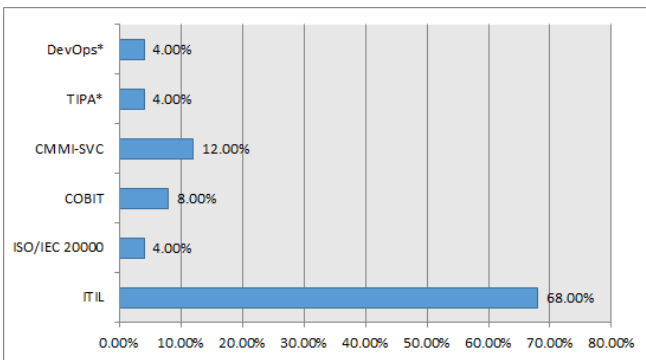


Fig. 8. Appropriate frameworks for a good ITSM (2018-2020).

To focus on the frameworks indicated in the question, a new graph was created (Fig. 9).

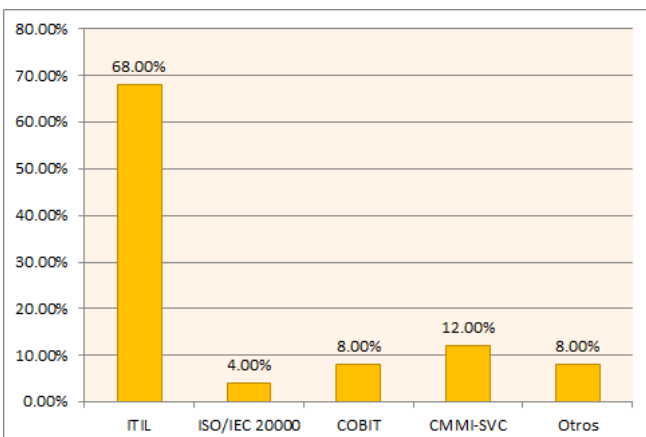


Fig. 9. Frameworks used for get good ITSM vers.2 (2018-2020).

We note that the most implemented framework in companies is ITIL with 68%, followed by CMMI-SVC with 12%, COBIT with 8% and finally, ISO/IEC 20000 with 4%.

RQ3. Complementary frameworks to ITIL to improve the GSTI of organizations

RQ3 is answered according to the ITIL complementary frameworks found in the literature, therefore it was classified as follows (Fig. 10):

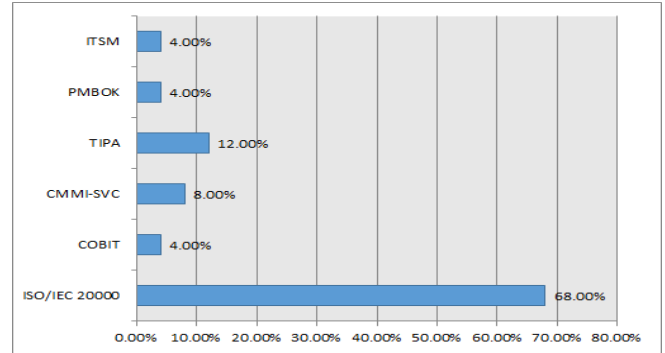


Fig. 10. Frameworks complementarios a ITIL (2018-2020).

To focus on the most used frameworks, a new chart was created (Fig. 11).

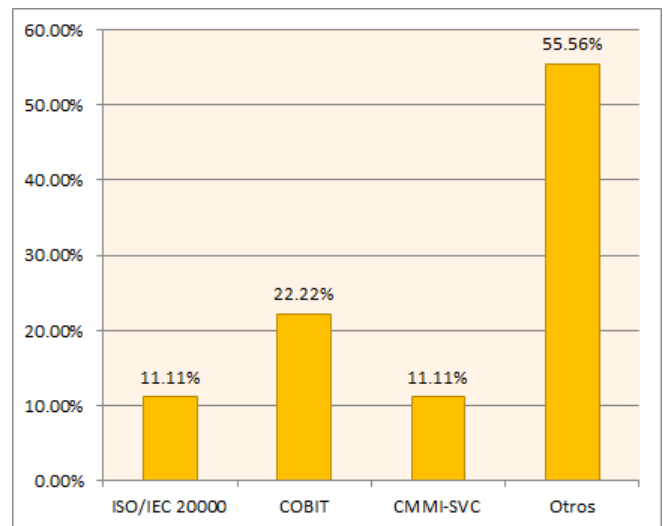


Fig. 11. Appropriate ITIL Frameworks vers. 2 (2018-2020).

In Fig. 11, the framework commonly complemented to ITIL is COBIT with 22%, followed by ISO/IEC 20000 and CMMI-SVC with 11.11%.

VI. RESULTS DISCUSION

To complement RQ1's response, a comparison of the problems encountered when implementing ITIL with respect to previous years (2006-2017) and the current problem (2018-2020) was made. In the Personnel category, an 8% increase was obtained in the evolution of the timeline, having qualified personnel continues to be very important and a key factor for the ITIL implementation to be successful. At the organizational level, there was an increase of 5% with respect to the problem of resource, time and financial limitations, which makes having a dependency and decision of the scope that the ITIL implementation will have (see Fig. 12).

It is seen that most problems depend on the organization where the model is adopted, the processes that are created and the people who use it. Therefore, these problems are key to solve when trying to adopt GSTI models.

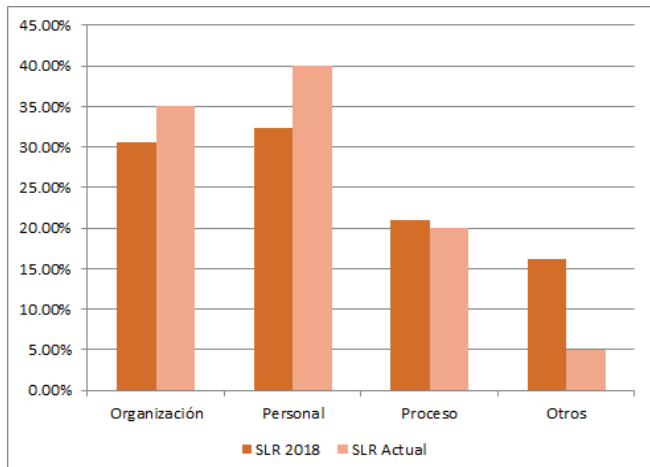


Fig. 12. Comparison of the problems encountered when implementing ITIL by categories (2006 - 2020).

During the evolution of ITIL, some difficulties arose in its implementation, such as the following most relevant problems (Fig. 13): In the Person category, the commitment must be present in the management or senior management of an organization to support any action that is related to the improvement of processes or adoption of models, development of skills, competencies, training, which can be developed previously, during admission and in the deployment of processes, can generate motivation, greater participation of personnel and minimize resistance to change.

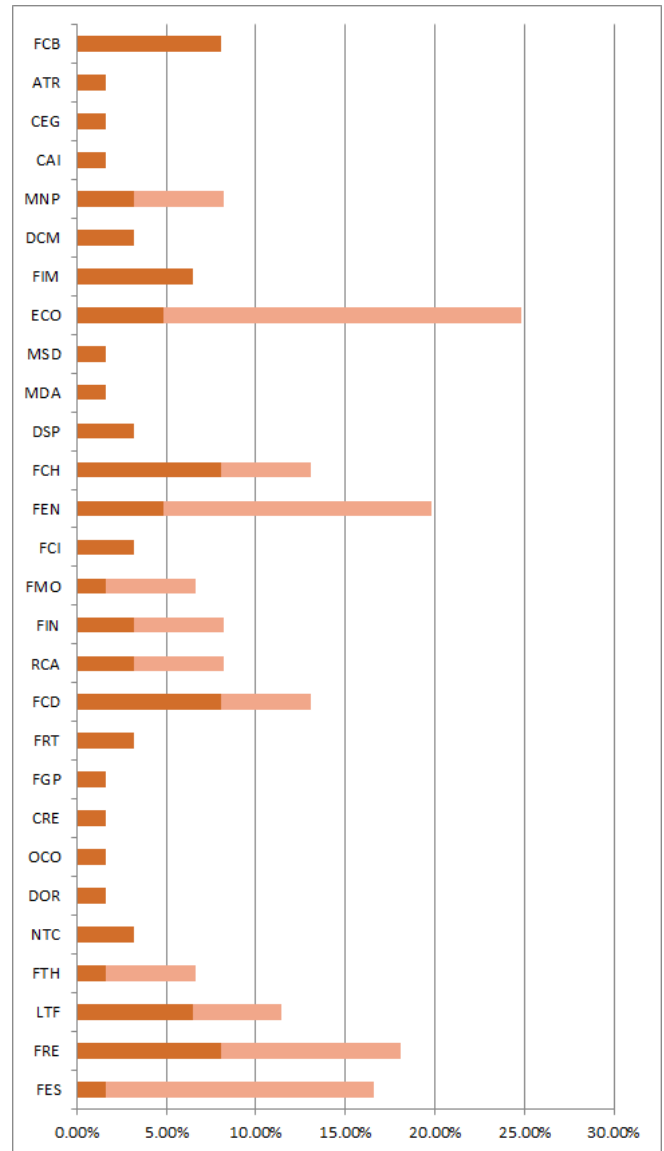


Fig. 13. Implementing IITL problems evolution (2006 - 2020).

On RQ2, the articles have mostly had a widespread implementation of ITIL in their organizations. This is denoted by the significant increase of 39% more than in previous years, which indicates that said implementation is due to the assigned focus and it is because it is based on the creation of value for the client (Fig. 14).

Finally, on RQ3 we rescue that the ideal complement to ITIL is COBIT. This makes sense since both rescue good practices and IT governance within an organization (Fig. 11).

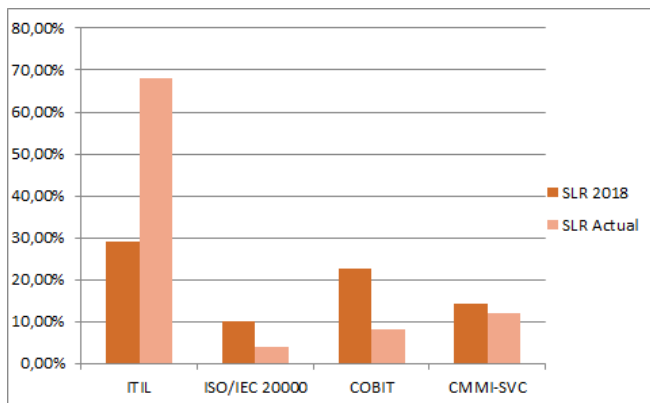


Fig. 14. Comparison of the most used Frameworks for good IT Service Management (2006 - 2020).

VII. CONCLUSIONS

According to the systematic mapping of articles that propose a management model based on the ITIL methodology, we can conclude that the organization adopts GSTI models, which includes having resources such as: people, time and finances, so that an organization should consider that an adoption project implies an initial investment according to their needs.

ITIL improves and facilitates internal and external communication allowing solid and orderly growth of any IT organization.

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