EGOVERNMENT: INFORMATION SYSTEM FOR THE MONITORING OF INDICATORS AND THEIR IMPACT ON JUDICIAL PRODUCTION - CASE OF PERU

Alberto Johnatan Flor Rodríguez
Universidad Privada de Tacna (Peru)
aljofloro@gmail.com · https://orcid.org/0000-0002-6021-6570
Jon Arambarri
Universidad Europea del Atlántico (Spain)
jon.arambarri@uneatlantico.es · https://orcid.org/0000-0002-6450-8562
Saul Domingo Soriano
Fundación Universitaria Iberoamericana (Spain)
saul_domingo@funiber.org · https://orcid.org/0000-0002-7559-6131

Abstract. The main objective was to determine the effectiveness of the implementation of the fan Information System for the Monitoring of Management Indicators in the increase of sentences or final orders of the civil courts of the Superior Court of Justice of Tacna - 2019. The type of research according to its function is quantitative, from a pre-experimental design with a quasi-experimental subcategory and a longitudinal research cut. All judicial files were taken in the civil courts during the 2018 and 2019 period in order to carry out the evaluation of the effectiveness of the Information System. For the construction of the solution proposal, a simplified methodology of the data extraction, transformation and loading process was used, and for the elaboration of the Information System, the Agile Unified Process methodology was applied. The main conclusion was that the implementation of an Information System for the Monitoring of Management Indicators as an e-Government measure, served to resolve the need for an increase in the issuance of Final Judgments and Orders, having at the end of the experimentation a 3% reduction in the time of qualification of the files, and despite the fact that the time in processing of the judicial files was increased by 4%, it was shown that the number of sentences and final orders had an increase of 165 in the Courts Civilians of the Superior Court of Justice of Tacna for the period 2019 compared to the period 2018.

Keywords: final orders, e-Government, management indicators, sentences, information system.

EGOBIERNO: SISTEMA DE INFORMACIÓN PARA EL SEGUIMIENTO DE INDICADORES Y SU INCIDENCIA EN LA PRODUCCIÓN JUDICIAL - CASO PERÚ

Resumen. El objetivo general fue determinar la eficacia de la implementación de un Sistema de Información para el Seguimiento de Indicadores de Gestión en el incremento de sentencias o autos finales de los juzgados civiles de la Corte Superior de Justicia de Tacna – 2019. El tipo de investigación según su función es cuantitativo, desde un diseño preexperimental con subcategoría cuasiexperimental y un corte de investigación longitudinal. Se tomaron la totalidad de expedientes judiciales en los juzgados civiles durante el período 2018 y 2019 para poder llevar a cabo la evaluación de la eficacia del Sistema de Información. Para la construcción de la propuesta de solución se utilizó una metodología simplificada del proceso de extracción, transformación y carga de datos y para la elaboración del Sistema de Información se aplicó la metodología del Proceso Unificado Ágil. La conclusión principal fue que la implementación de un Sistema de Información para el Seguimiento de Indicadores de Gestión como una medida de e-Gobierno, sirvió para resolver la necesidad de incremento en la emisión de Sentencias y Autos Finales, teniendo al final de la experimentación una reducción de 3% en el tiempo de calificación de los expedientes, y a pesar de que se incrementó el tiempo en trámite de los expedientes judiciales en un 4%, se demostró que la cantidad de sentencias y autos finales tuvieron un incremento de 165 en los Juzgados Civiles de la Corte Superior de Justicia de Tacna para el período 2019 en comparación con el período 2018.

Palabras clave: autos finales, e-Gobierno, indicadores de gestión, sentencias, sistema de información.

Introduction

Measurement or management indicators are used by the governing body of the Judicial Branch to establish management policies appropriate to the institution's mission; among the management indicators we have the production indicator, which is the most relevant for the budgetary support of this government sector.

Judicial Production is understood as the measurement of the procedural acts that end a judicial process in the first instance.

Now then, it is not possible to speak of judicial production without mentioning the procedural burden, which to (Flores, 2018) can be defined as a legal situation instituted in the law consisting of the requirement of a conduct of optional performance, normally established in the interest of the subject himself, and whose omission brings with it a burdensome consequence for him.

This procedural burden, according to (Alata, 2015) generates the delay of civil proceedings, leading to unnecessary delays in the procedural process. For the purposes of this research, it is also taken as a reference that a reform in the civil process is necessary (Alata, 2015), a reform in the Peruvian civil process is necessary, with new trends that can contribute to satisfactorily fulfill the purposes of the process for the solution of the conflict of interests and the elimination of legal uncertainties within a reasonable period of time.

The IT tools add value to the Judicial Office Management, which, for (Penadillo, 2019) presents a positive influence on the treatment of the Procedural Burden, in his study, objectively demonstrates that those offices with an efficient management of this presented a decrease in procedural burden; however, those that did not perform this work efficiently, presented a high procedural burden.

21

After an analysis of the problem, it is shown that the lack of interpretation of the information on the different control points in the processing of a case file causes a decrease in judicial production, together with the increase in the procedural burden that makes it impossible to track a case file in an adequate manner.

The aim is not only to implement an information system that allows to increase judicial production, but also to contribute to the increase of decisions on the merits in an optimized time, which translates into an increase in the number of judgments or final orders in the Civil Courts of the Superior Court of Justice of Tacna, in order to improve the service of administration of justice in this Judicial District.

Therefore, the development of a Software System for the Monitoring of Indicators is justified through the application of statistical data analysis techniques in order to have a positive impact on the increase of productivity, which will allow, as a consequence, to reduce the procedural burden.

The development of this project seeks to determine if the implementation of an Information System for the Monitoring of Indicators has a positive impact on the increase of the judicial production of the civil courts of the Superior Court of Justice of Tacna. In order to demonstrate it, we proceeded with the development and implementation based on the increase of the issuance of Judgments and Final Orders, which are part of the judicial production but which correspond to the identification of procedural acts that issue decisions on the merits of the conflict.

The information was obtained from the records of the Integrated Judicial System. These data were found immersed in four databases of records of procedural acts and statistical milestones; likewise, some records as an interpretation of instances or processes that could not be obtained directly, for which a methodology of simplified application of the process of extraction, transformation, and loading of data was followed; thus, agreeing with (Valero, 2016), which presents these data as a stepping stone to originate information which combined with the "know-how" is a source of knowledge and allows improving competitiveness.

As part of the methodology used, three phases were proposed for the ETL application: prerequisite phase, main phase, and an alternative phase.

For the construction of the Information System, the Agile Unified Process (AUP) was used, which was described by (Congacha & Noboa, 2019) as a version of the Rational Unified Process (RUP) in conjunction with the application of agile techniques, which allowed describing in a simple and easy way the stages and models of software development.

Background

In his thesis entitled " Methodological proposal for the detention of Outliers in the statistical information system of the Judicial Branch of the Republic of Peru, 2013," he (Huamaní, 2016) proposes a methodology that allows detecting anomalous data in the registration of information in the Statistical Information System of the Judiciary of the Republic of Peru, in a scenario with production incentives (RA. N° 155-2012-P-P-PJ) as an alternative to the random methods used by decentralized control bodies. It is hypothesized that the optimal performance in the detection of contextual outliers depends on its treatment as a local and not global object depending on the degree of isolation, with respect to its closest neighborhood.

22

Using the local outlier factor technique, it is determined that for k=70 nearest neighbors, the detection model proposed reaches levels of 61.82% in precision and 97.72% in accuracy. This study served to obtain the approach for the detection of anomalous data in the information registry of the Integrated Judicial System by means of a local treatment of the data and not global, where we will try to demonstrate that the application of the proposed system will improve or serve as a catalyzing factor for the speed in the processing of judicial files.

We also took as a reference what was described by (Srikanta & Luan, 2017) in their article, who generally describe the concepts and applications of data analytics in the context of production for unconventional reservoirs. Topics discussed here under key concepts in data analytics include predictive modeling methods, missing variable handling model evaluation and validation, automatic model parameter fitting, and variable importance. Key features of a number of representative features are summarized and observations are made regarding the current state of practice with respect to limited model evaluation, restricted number of alternative models, ignoring data imputation, and omitting variable importance. Finally, some comments are presented on how the past may not be prologue for predictive model applications. The correlation of this study with this research lies in the application of the data analysis model for the application of techniques to analyze the information to be obtained from the general repository in order to standardize and improve the measurement of progress with respect to established productivity indicators.

Definitions

Judicial Branch of Peru: It is defined in (Judicial Branch of Peru, 2021) as a branch of the state that, in its functional exercise, is autonomous in political, administrative, economic, disciplinary, and independent in jurisdictional matters, subject to the Political Constitution of Peru.

No jurisdiction exists, nor can it be instituted, that can fulfill this same task, with the exception of military justice and arbitration bodies.

The Judicial Branch is, in accordance with the Constitution and the laws, the institution in charge of administering justice through its hierarchical bodies, which are the non-lettered Peace Courts, the lettered Peace Courts, the Superior Courts, and the Supreme Court of Justice of the Republic.

The operation of the Judicial Branch is governed by the Organic Law of the Judicial Branch, which establishes its organizational structure and specifies its functions.

This law defines the rights and duties of the magistrates, who are in charge of administering justice; of the parties, who are those who are being judged or who are requesting justice; and of the jurisdictional assistants, who are the persons in charge of providing support to the work of the members of the judiciary.

The Organic Law of the Judicial Branch currently in force originated in Supreme Decree No. 017-93-JUS, enacted on May 28, 1993 and published on June 2 of the same year. It consists of 304 articles, 1 Sole Complementary Provision and 33 Final and Transitory Provisions.

Productivity: According to (Seville, 2016), productivity can be defined as an economic measure that calculates how many goods and services have been produced for each factor used during a given period; likewise, it aims to measure the efficiency of production for each factor or resource used, i.e., the fewer resources or inputs used to

23

produce the same number of products, the greater the productivity and the greater the efficiency. This is usually represented by the formula:

$$\frac{Obtained\ production}{Amount\ of\ factor\ used} = Productivity$$

In agreement with the present article, and in agreement with (Sevilla, 2016), we can also define productivity as the relationship between results and the time it takes to achieve them. Time is often a good denominator, since it is a universal measure and beyond human control. The shorter the time it takes to achieve the desired result, the more productive the system is.

Production in the Judiciary: Productivity in the Judiciary is monitored by the National Commission of Judicial Productivity and to define the guidelines, Directive No. 013-2014-CE-PJ called "Integrated and Updated Guidelines for the Operation of the National and District Commissions of Judicial Productivity and the Office of Judicial Productivity" was made official by Administrative Resolution No. 419-2014-CE-PJ dated December 17, 2014.

This measurement is made by counting the number of judgments and final orders (i.e., the procedural acts that determine the solution of the dispute), measured by area, type of instance and spatiality, the latter is determined in Administrative Resolutions No. 174-2014-CE-PJ, 170-2016-CE-PJ, 186-2016-CE-PJ, recently modified in part by Administrative Resolution No. 395-2020-CE-PJ.

Of the documents mentioned above, only some items were modified, maintaining the form of measurement and, in some cases, even the measurement standard.

It should be established that, for the present study given that a study of the years 2018 and 2019 is made, in view of the implementation of this tool, what is indicated in Administrative Resolution No. 186-2016-CE-PJ will be taken.

Information System: A system is a set of components that interact with each other to achieve a common goal. Although there is a great variety of systems, most of them can be represented through a model formed by five basic blocks: input elements, output elements, transformation section, control mechanism and objectives. As shown in Figure 1, resources access the system through the input elements to be modified in the transformation section. This process is controlled by the control mechanism in order to achieve the set objective. Once the transformation has been carried out, the result leaves the system through the output elements.
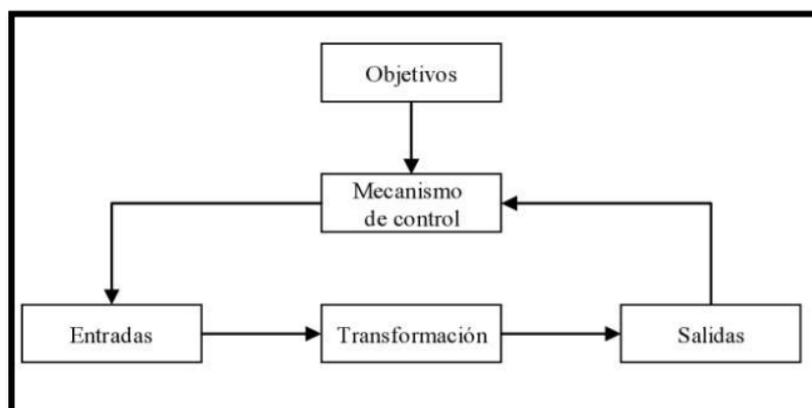
Figure 1. General Systems Model

Note: Source: (Fernandez, 2006)

Extraction, Transformation, and Loading Process (ETL): By means of the knowledge hierarchy, it is possible to relate data with information, knowledge, and wisdom. Figure 2 represents this hierarchy in which we can see how the different levels are related.
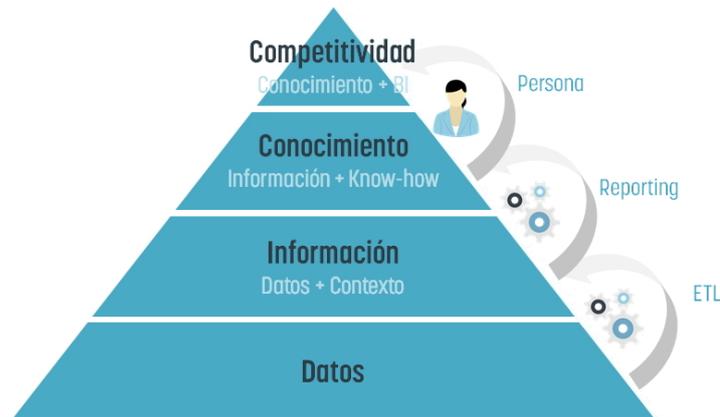

Figure 2. Knowledge Hierarchy

Note: Source: (Valero, 2016)

From the starting point, formed by the initial data set, the ETL processes that will give useful value to these data are developed, obtaining information from them. In the next step, the data, previously loaded in a repository designed for this purpose, are exploited by means of reporting tools, obtaining knowledge from them. Finally, and not always included in the knowledge hierarchy, we find wisdom, which consists of the ability to make decisions through the interpretation of the knowledge obtained through the generated reports.

To achieve this information, it is necessary to correctly design the corresponding ETL processes in each case. The following is a brief description of the process:

Extraction: This phase consists of obtaining data from the sources of origin. The data can have different origins, whether they are Relational Databases, Non-Relational Databases, files, etc.

Transformation: Consists of performing the necessary calculations. For example, if we have "number of clients" and "number of women" as a source, and we need to know the percentage of women who are clients, a calculation is needed to obtain the desired metric. If we need to adapt the format of a field for later exploitation, it would also be done here.

Loading: In this part of the process the data from the transformation phase are dumped into the target system. At this point, a direct dump can be made, keeping a storage history with the insertion date, or the data can be overwritten with the new information.

25

Figure 3. Example of an ETL Process

Note: Source: (Valero, 2016)

Agile Unified Process (AUP) Methodology: The Agile Unified Process (AUP) is a simplified version of the Rational Unified Process (RUP) developed by (Ambler, 2006). The AUP describes an approach to application development that combines concepts of the traditional unified process with agile techniques, with the objective of improving productivity.

In general, the Agile Unified Process is an intermediate approach between XP (Extreme Programming) and Rational's Unified Process, and has the advantage of being an agile process that explicitly includes activities and artifacts that most developers are already somewhat accustomed to. Many organizations are wary of XP because it seems too lightweight: XP does not specify how to create some of the artifacts that managers need, which is somewhat of a setback because XP is generally considered a good agile process.

The Agile Unified Process consists of four phases that the project goes through sequentially. These phases are, as in the Rational Unified Process, initiation, elaboration, construction, and transition.
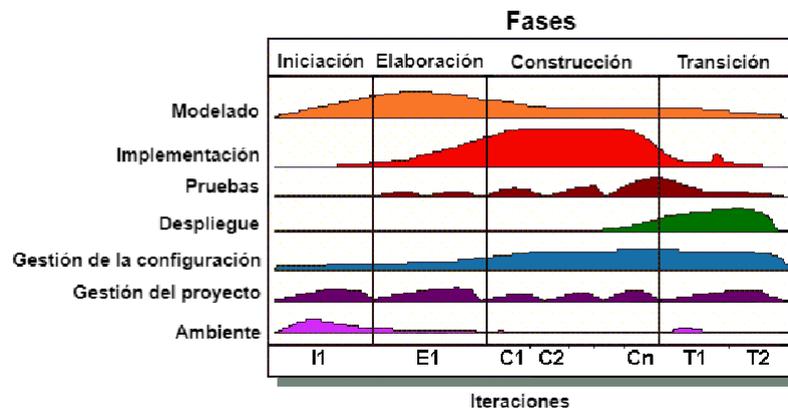

Figure 4. **Phases and Disciplines of the AUP Development Methodology**

Note: Source: (Ambler, 2006)

It was decided to use the AUP (Agile Unified Process) methodology because of its simple and easy to understand approach to software development, using popular techniques and concepts that allow streamlining software development without compromising its quality. For this purpose, use case diagrams were generated and a definition of the requirements of the web application was made, as well as acceptance tests were applied to ensure its correct operation.

26

In addition, it is noted that this development methodology is consistent with Administrative Resolution No. 089-2019-CE-PJ, which formalizes Directive No. 002-2019-CE-PJ, called "Directive of Software Life Cycle Processes in the Judiciary," in accordance with "NTP-ISO/IEC 12207:2016-Software and Systems Engineering. Software Life Cycle Processes 3rd Edition."

General Objective

Determine the effectiveness of the implementation of an Information System for the Monitoring of Indicators in the Increase of sentences or final orders of the civil courts of the Superior Court of Justice of Tacna - 2019.

Specific objectives

Check whether the delay in the issuance of final orders is due to the lack of adequate follow-up of court files.

Demonstrate the effectiveness of the implementation of the Information System in terms of the increase in the issuance of Judgments and Final Orders in the judicial production of the Civil Courts of the Superior Court of Justice of Tacna.

Method

Data collection and analysis plan

Since this work was carried out by subsequently evaluating the result of the implementation of the Information System for Indicator Tracking, the data collection for analysis was from the historical and obtained from the Information System at the end of the evaluated periods (2018 and 2019).

Likewise, the implementation of the Information System required the application of the process of data extraction, transformation, and loading, which were carried out twice a month during the 2019 period; for this, a process was established in conjunction with those responsible for the areas of statistics and the IT area of the Superior Court of Justice, in order to be able to make the statistical cuts and obtain the necessary data from the databases of the Integrated Judicial System.

The activities were carried out on a biweekly basis and were as follows:

Table 1
Activities related to information gathering.

No.	ACTIVITY	DURATION	PERIODICITY
1	Statistical pre-closing	35 min.	On the 15th of each month
2	Final monthly closing	50 min.	On the 5th business day of each month
3	DB Query	10 min.	At the end of each closure
4	Data consolidation and transformation	25 min.	After each consultation
5	Data upload to the Information System	10 min.	Finalizing the transformation

Note: Source: Own elaboration.

These activities are repeated every month throughout the 2019 period, as they allow providing the necessary information to the Indicator Monitoring Information

27

System to fulfill its objective, it should be established that the implementation of this tool does not replace any of the tools already available to the Judiciary.

Activities contained in the proposed practical solution

For a better understanding and to set the development of this project, a context diagram of the solution is presented first, which will allow to focus on how the project was conceived for its implementation.
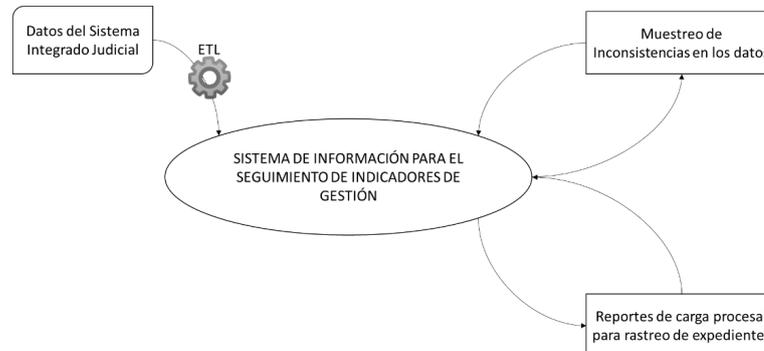

Figure 5. Context Diagram of the Proposed Solution

Note: Source: Own elaboration.

As can be seen from the Context Diagram, the activities are related to two processes, one of them is the extraction, transformation, and loading of data from the sources of the Integrated Judicial System (composed of 4 Databases), and the second process is the interpretation of the information obtained. In this second process, a list of inconsistencies and the procedural load reports will be obtained, which will be used for the tracking of files for their production.

For the ETL process, a model has been developed that, in addition to including the possibility of referencing different data sources, also proposed the detection and correction of inconsistencies, ensuring the integrity of the data that feed the repository of the proposed Information System.
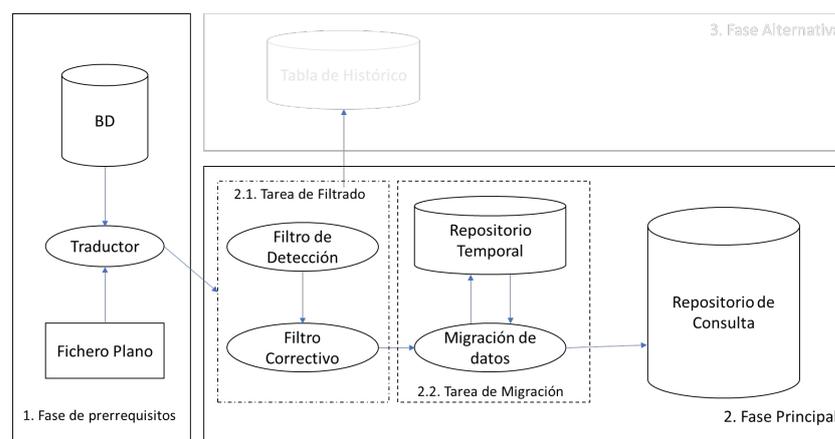

Figure 6. Proposed ETL model

Note: Source: Own elaboration.

28

Prerequisites Phase: The proposed model identifies different data sources, which can be flat files and structured data repositories (databases). These sources could present errors in their acquisition. Therefore, it is necessary to pass them through a previous process that has been called "Translator," which seeks to structure the data to present a standard form in the next phase.

Main Phase: The main phase consists of two processes or tasks, called Filtering Task and Migration Task, in which the structure obtained from the Translator process will be processed once again and, if necessary, the respective corrections will be made in order to proceed with the migration of the data to the Query Repository, which will be the data warehouse on which the Indicator Tracking Information System will act.

Alternative Phase: As an alternative phase, the activity of storing the history is proposed, which, as its name indicates, will store the information related to the errors, which could be the description, corrected value, position of the error, date, and time when the error was calculated.

In this phase, and alternatively, indicators related to the quality of the data to be transformed can be stored. These can be the Real Quality and Theoretical Quality of the data.

$$Real\ Quality = \frac{Total\ number\ of\ valid\ records}{Total\ number\ of\ records}$$

$$Theoretical\ Quality = \frac{Total\ number\ of\ valid\ recors}{Theoretical\ measurement\ value}$$

The methodology for obtaining, transforming and loading data has been explained up to this point, but the methodology used specifically in the construction of the Indicator Monitoring Information System must also be specified, whose construction was based on the application of the AUP methodology, which consists of four phases: initiation, elaboration, development, and closure.

Iterations - consisting of each unit of time used for software development - were applied and lasted between one to four weeks. Each iteration of the development life cycle includes:

Initiation Phase: in this phase the external entities in which the system interacts (actors) are identified, and the purpose of this interaction is defined. It is achieved through the description of the system's use cases, resulting in an overview of the project requirements.

Elaboration Phase: here the project plan is elaborated and the strategies for the management of risks that may arise during implementation are established. It is necessary to have a holistic view of the system in order to define the functional and non-functional requirements of the system and its main stakeholders.

Development Phase: in which the characteristics of the system are developed, and the segments of the solution are integrated.

Transition Phase: in this phase, the corresponding tests are carried out and feedback is given to correct errors.

For the creation of the Information System, PHP and Javascript were used as programming language, it was built using the IDE Visual Studio Code and its database engine was PostgreSQL.

The Information System for the Monitoring of Management Indicators was deployed on a virtualized server, counting this deployment as another activity. It was configured with an Ubuntu Server 18.04 operating system, 4 Gb. of RAM memory and

29

two dedicated processors as well as a disk segment with 1 Tb of capacity, sufficient characteristics for the good performance of this system.

In order to run the application, we have an Apache 2 application server and a PostgreSQL 9.4 database engine. This being the detail of the deployment, we will proceed to the next part which is the operation of the system itself.

Once the data is transformed, it is loaded into the repository, so that the Information System can interpret the data, presenting a list of inconsistencies, which are those files that have errors in their history due to missing variables. The variables are used to track the files by stages.

These inconsistencies will help us so that those in charge of the jurisdictional bodies can correct them, either by adding or eliminating the variables entered, so that the ETL process can be carried out again to obtain consistent information and generate reports with a lower error rate.

Finally, after loading the data and processing it in the Information System, the necessary reports are obtained as follows:

	N° expediente	Estado	Acto procesal	Mes - Año	Fecha registro	Tiempo transcurrido	Secretario	Juzg:
1	00003-2021-0-2301-JR-CO-02	NUEVOS ADMITIDOS	AUTO ADMISORIO	11 - 2021	2021-11-02	26 dias	RODRIGUEZ TANTA, JORGE - TRAMITE	
2	00005-2021-0-2301-JR-CO-02	NUEVOS ADMITIDOS	AUTO ADMISORIO	5 - 2021	2021-05-18	6 meses 10 dias	RODRIGUEZ TANTA, JORGE - TRAMITE	
3	00006-2021-0-2301-JR-CO-02	NUEVOS ADMITIDOS	AUTO ADMISORIO	9 - 2021	2021-09-10	2 meses 18 dias	CABALLERO ROLDAN, MAXIMO - TRAMITE	
4	00009-2021-0-2301-JR-CO-02	NUEVOS ADMITIDOS	AUTO ADMISORIO	5 - 2021	2021-05-18	6 meses 10 dias	CABALLERO ROLDAN, MAXIMO - TRAMITE	
5	00011-2021-0-2301-JR-CO-03	NUEVOS ADMITIDOS	AUTO ADMISORIO	7 - 2021	2021-07-15	4 meses 13 dias	DIAZ PLATA, JESSICA ROXANA	
6	00014-2021-0-2301-JR-CO-01	NUEVOS ADMITIDOS	AUTO ADMISORIO	5 - 2021	2021-05-17	6 meses 11 dias	CABALLERO ROLDAN, MAXIMO - TRAMITE	
7	00016-2021-0-2301-JR-CO-02	NUEVOS ADMITIDOS	AUTO ADMISORIO	5 - 2021	2021-05-18	6 meses 10 dias	RODRIGUEZ TANTA, JORGE - TRAMITE	
8	00022-2021-0-2301-JR-CO-04	NUEVOS ADMITIDOS	AUTO: MANDATO DE EJECUCION	11 - 2021	2021-11-17	11 dias	RODRIGUEZ TANTA, JORGE - TRAMITE	
9	00024-2021-0-2301-JR-CO-02	NUEVOS ADMITIDOS	AUTO ADMISORIO	5 - 2021	2021-05-18	6 meses 10 dias	RODRIGUEZ TANTA, JORGE - TRAMITE	
10	00030-2021-0-2301-JR-CO-02	NUEVOS ADMITIDOS	AUTO ADMISORIO	8 - 2021	2021-08-05	3 meses 23 dias	RODRIGUEZ TANTA, JORGE - TRAMITE	

Figure 7. Report of files for issuance of Final Order

Note: Source: Indicator Tracking Information System.

These reports show the data necessary to identify the file numbers, the status of the last procedural act, the date, the time elapsed, and the court clerk in charge of the file, sufficient data to determine the status of each file, and with this it is possible to request the file in order to generate the ex officio procedural acts to achieve the issuance of the final judgment or order that puts an end to the judicial process.

Statistical analysis

According to (Carrasco, 2019), the validity of an instrument means that it measures the variables of the study with objectivity, precision, veracity, and authenticity.

For this research, indicators related to the fulfillment of stages in the files were proposed, with an evaluation of the time it took to pass between each one of them, as well as an additional indicator that will make a direct comparison between the number of sentences and final orders issued in the periods to be compared.

30

For the descriptive analysis of the results, the tables with the results of the pre- and post-tests are shown. A detailed analysis of the data in each of the tables is presented below.

Table 2
Statistical indicators of the research

Indicator	Pre-Test (Average)	Post-Test (Average)
KPI 1: Time in the qualification stage of a file	26.72 days	26.07 days
KPI 2: Time to issue final judgment or order	171.13 days	178.08 days

Note: Source: Own elaboration.

From the study conducted, it is observed that indicator 1 related to the time in the qualification stage decreased from 26.72 days to 26.07 days due to the fact that the tool contributes to the tracking of files; likewise, indicator 2, time for issuing final judgments or orders, increased from 171.13 days to 178.08 days.

Table 3
Comparison in the number of sentences / final orders, 2018 and 2019 periods

JUDGMENT	FINAL JUDGMENTS/ORDERS 2018	FINAL JUDGMENTS/ORDERS 2019
1st Civil Court	371	390
2nd Civil Court	309	412
3rd Civil Court	355	377
4th Civil Court	335	356
TOTAL	1370	1535

Note: Source: Electronic Statistical Form

Finally, it is presented that, during the 2019 period in the civil courts of the Superior Court of Justice of Tacna, 1535 final decisions on the merits (Judgments and final orders) were recorded; this in comparison to the 2018 period, there is an undoubted increase.

Results and discussion

After the application of the problem analysis and the solution proposal, we proceeded to the implementation of the Information System, which was developed in PHP language with a PostgreSQL database engine and deployed on a server of the institution.

Taking the data collected from the statistical analysis, we have that for indicator 1: Time in the stage of qualification of a file, there was a reduction in the time average, going from 26.72 days to 26.07 days, having a reduction per hours in the qualification on average.
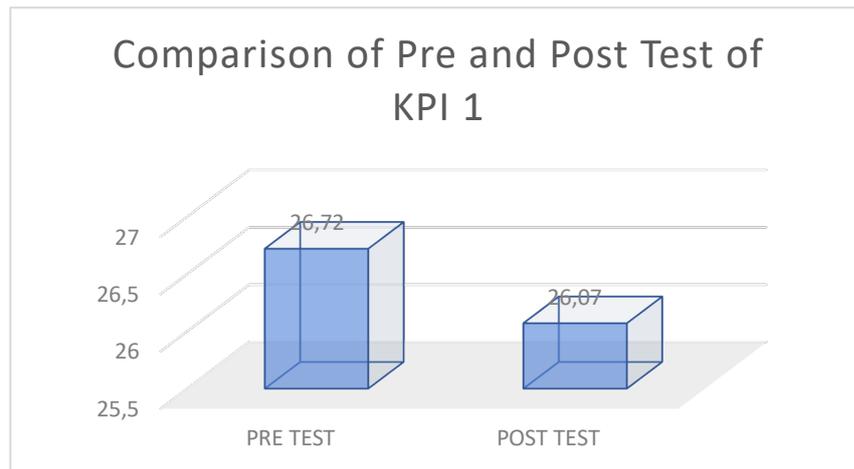
31

Comparison of Pre and Post Test of KPI 1

Figure 8. Average time to finish the Qualification stage of a file

Note: Source: Own elaboration.

The application of this tool, which, although its first conception is focused solely on increasing the number of sentences and final orders, has managed to boost the files from their initial stage, which is the qualification, in such a way that it generates a larger set of files in procedural load that after a well-managed process are ready for the issuance of a sentence.

The dispersion of the time elapsed for a file in the qualification stage in the pre-test was 136% and in the post-test 123%, which denotes a decrease in the dispersion, thus indicating the order in the qualification of files, a point that indirectly coincides with the object of implementation of the information system.

On the other hand, in the verification of indicator 2: Time to issue a sentence or final order, which measures the average time elapsed between the admission of a case to the processing stage, and its conclusion in the first instance (sentence or final order) was 171.13 days in the pre-test phase and 178.08 days in the post-test phase, which could be considered a negative result; however, this should be contrasted with the following indicator that measures the number of total sentences and final orders in both phases.
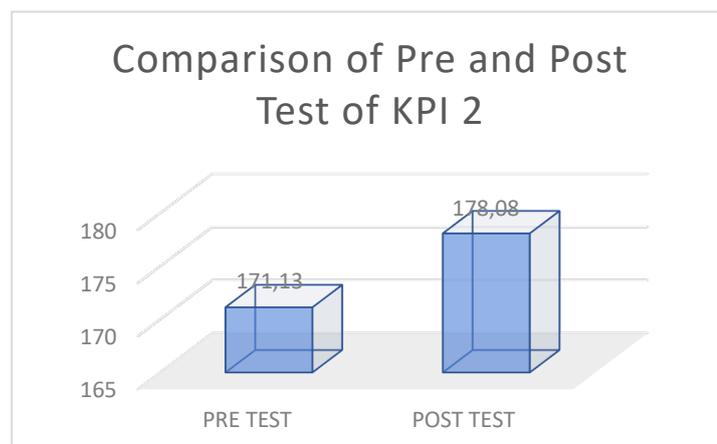
Comparison of Pre and Post Test of KPI 2

Figure 9. Comparison of the time a file spends in the processing stage.

Note: Source: Own elaboration.

It is necessary to review the dispersion of the data, which shows a decrease from 126% to 120%, thus providing a concordance that the application of the Information System for Monitoring Indicators allows an adequate flow of processing of judicial files.

To corroborate the result explained in indicator 2, the summary of indicator 3 is shown, which reviews the number of sentences and final orders issued in both the pre-test and post-test phases, previously shown in Table 3.

The number of sentences and final orders issued ranged from 1,370 in the pre-test phase to 1,535 in the post-test phase, in accordance with the dispersion indicators, which generate an increase in the number of sentences or final orders issued after tracking the files according to the consistency of the information and reports provided by the Information System for the Follow-up of Management Indicators.

From the results obtained in this study, which establishes that there is a positive relationship between the implementation of an information system for monitoring indicators and the increase in the issuance of judgments and final orders in the civil courts of the Superior Court of Justice of Tacna, in relation to what was stated by (Penadillo, 2019). This information system acts as a support tool in the management of judicial dispatch, and, as has been demonstrated, it has increased the issuance of sentences and final orders in the civil courts of the Court.

Along the same lines, we agree with (Neyra, 2015), who refers that the development of Information Technologies is necessary to contribute to transparency and improve the coverage and quality of attention to the justiciable. It is shown that this implementation is related not only to the increase of productivity, but it also translates into the maximization of attention with the same number of resources, thus increasing the quality of attention to the justiciable.

Conclusions

This research allowed the implementation of an Information System for the Monitoring of Management Indicators as an e-Government measure, providing a solution to the problem of the low issuance of Judgments and Final Orders, having at the end of the experimentation a reduction of 3% in the qualification time of the files, and, although the processing time increased by 4%, it was shown that the number of judgments and final orders had an increase of 165 in the Civil Courts of the Superior Court of Justice of Tacna.

In this observation, it was determined that there is no way to track the files by stage, nor is there a measurement that compares the civil courts in the different stages of the judicial process; likewise, they do not know how much procedural load there is or what files could be available for the issuance of final judgments or orders if they are not in their possession.

It has been demonstrated that, with the use of the Information System for the Monitoring of Indicators, there has been an increase in the number of Judgments and Final Decisions, which are judicial resolutions that contain decisions of the judges on the merits of the process, thus increasing the production that solves the problems of the population. In this sense, it is concluded that this System has effectively achieved a positive impact on the Administration of Justice in the Civil Courts of the Superior Court of Justice.

33

References

Alata, M. (2015). *Carga Procesal en el Poder Judicial y la Implementación de un Proceso Civil Común en el Perú*. [Tesis Doctoral] Universidad Andina Néstor Cáceres Velasquez. Juliaca, Perú. http://repositorio.uancv.edu.pe/handle/UANCV/647

Ambler, S. (2006). *The Agile Unified Process*. http://www.ambysoft.com/unifiedprocess/aup11/

Carrasco, S. (2019). *Metodología de la Investigación Científica.* San Marcos E I R LTDA.

Congacha, A., & Noboa, C. (2019). *Desarrollo de un sistema informático aplicando la metodología aup, para optimizar la gestión de trámites académicos en la universidad Nacional de Chimborazo.* Universidad Nacional de Chimborazo. Obtenido de http://dspace.unach.edu.ec/handle/51000/6121

Fernández, V. (2006). *Desarrollo de sistemas de información.* http://hdl.handle.net/2099.3/36751

Flores, M. (2018). *Análisis predictivo de la producción judicial de los juzgados de familia del poder judicial de Tacna 2016-2017 utilizando simulación de Montecarlo.* Universidad Nacional Jorge Basadre Grohman. http://repositorio.unjbg.edu.pe/bitstream/handle/UNJBG/3177/1372_2018_flores_calle_mm_fain_informatica.pdf?sequence=1&isAllowed=y

Huamaní, C. (2016). *Propuesta Metodológica Para La Detención De Outliers En El Sistema De Información Estadístico Del Poder Judicial De La República Del Perú.* Universidad Nacional de Ingeniería. http://cybertesis.uni.edu.pe/handle/uni/4589

Neyra, A. (2015). *Ingreso y produccion de expedientes judiciales, y su relacion con la carga procesal en el distrito judicial de Junin.* Universidad Nacional del Centro del Perú.

Penadillo, P. (2019). *Influencia de la Gestión del Despacho Judicial en la Carga Procesal del Poder Judicial de Huánuco*. [Tesis Maestral], Universidad Nacional Hermilio Valdizán. Huánuco. http://repositorio.unheval.edu.pe/bitstream/handle/UNHEVAL/5362/PDCC00125P41.pdf?sequence=1&isAllowed=y

Poder judicial del Perú. (2021). *Poder Judicial del Perú*. https://www.pj.gob.pe/wps/wcm/connect/cij/s_corte_suprema_utilitarios/as_home/as_cij/as_investigacion_publicacion/as_buenas_practicas

Sevilla, A. (2016). *Economipedia Haciendo fácil la economía.* https://economipedia.com/definiciones/productividad.html

Srikanta, M., & Luan, L. (2017). Application of Data Analytics for Production Optimization in Unconventional Reservoirs: A Critical Review. *Unconventional Resources Technology Conference.* Texas. https://doi.org/10.15530/URTEC-2017-2670157

Valero, M. (2016). *Bigeek*. https://blog.bi-geek.com/que-es-una-etl/