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METHOD FOR IDENTIFYING THE USE AND OWNERSHIP OF AN ADMINISTRATIVE AND FINANCIAL SYSTEM IN THE HIGHER EDUCATION SECTOR IN COLOMBIA

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ABSTRACT

The research describes a method to identify the functionality and usefulness of the administrative and financial system Gestasoft which allows the Centre for Applied Research in Information Technology Development (CIADTI) as a developer, to define strategic actions for the optimization of management processes in Higher Education Institutions. The objective is to examine the effects and implications of the appropriation of a system with various design features that facilitate and reinforce the strategies for information management in the tasks of enterprise resource planning. A descriptive process is structured by means of a quantitative study with a specific analysis of the variables of use and appropriation of the software through five stages: registration of processes, validation, level of appropriation, analysis of results and generation of reports, with the purpose of evaluating the service for decision-making. The results allow us to identify the processes that are being executed, indicating the percentage and level of use, as well as to generate queries and reports in real-time on the administrative activities of internal and external users to evaluate the level of appropriation of the Gestasoft system. Based on the results, the type of service needed by the institution is inferred, such as: training, total or partial re-implementation of the system, consultancy and new developments or improvements.

INTRODUCTION

The top management of higher education institutions requires that the financial information generated daily in the administrative processes is organized, in a timely manner, for which it is necessary to centralize it in a financial information system such as the Enterprise Resource Planning system (ERP) (Ullah et al., 2018), this system integrates the information from all the areas that generate it.

It has been evidenced that the main success factors are the commitment of top management, project management, integration, change management, after a process of training and implementation of the ERP system Gestasoft (Mahmood et al., 2019) in the Highercation Institutions (HEI) that acquire it, there is not the desired appropriation by the users so that the registration of the information is carried out according to the execution of the process in the HEI, which leads to delays, and the data is not updated at the time they are required, from the generation of an online query to the delivery of reports to internal or external users.

Among the most relevant ones are staff turnover, the institution does not hire enough staff for the execution of the processes, there are also processes that are not defined in the institution according to how they are developed in the system, the information (data) and supports of the processes are not available in a timely manner to be registered in the system.

The application of the method involves continuous monitoring of each of the HEIs that have implemented the Gestasoft system, achieving the use and appropriation by the users, managing the information and executing in real time each of the administrative and financial processes that concern them (Chohan et al., 2017).

The method presented allows quantitatively measure the level of use and level of appropriation in the system, likewise higher education institutions express their observations or needs for the Gestasoft system to fully support the implementation of institutional processes (Soliman & Noorliza, 2020), in this way, a reliable report is generated that can detect in a timely manner what needs to be solved, reinforced or opportunities for improvement can be extracted.

Enterprise Resource Planning System

It is the most valuable way to integrate the data and processes of an organisation to optimise business resources through hardware and software components in order to obtain a unified information system for decision-making (Oltra-Badenes et al., 2018). ERP systems integrate operations in different business units or improve the existing integration, leading to a series of benefits such as cost reduction, improvement of business processes and effectiveness of operations (Cabeza Gordillo & Neira-Tovar, 2019), these transformations are in one way or another associated with successful implementations of technologies or platforms for adaptive optimisation of business processes and aimed at prototyping a data structure to represent, process, analyse and identify computational capacity strategies that could be applied to solve organisational problems.

The numerous benefits for ERP implementation have been on the agenda of organisations for many years included in their mission processes, in control panels and command controls as part of the vision of top management, but are often difficult to execute or implement, or even more so are implemented but have no quality control to optimise business processes (Cabeza Gordillo & Neira-Tovar, 2019). On the other hand, there are methods for implementing an ERP that we can mention without going into detail, such as: Accelerated SAP, Applications Implementation Methodology (AIM), SureStep or the Systematic Help for an ERP Acquisition (SHERPA) (Oltra-Badenes et al., 2018), the latter analyses a specific and very detailed methodology, which does not comment on the project team and the profiles that must participate in it, in addition to having functional criteria that could be updated during the implementation and operation, a situation that is deepened in the proposed research by means of requirements engineering to categorise the variables that affect the functioning of the ERP system in higher education institutions (Valencia et al., 2019)

Information Systems Higher Education Institutions (HEIs)

With the implementation of various information systems (IS) and the advantages they represent, academic and administrative processes are modernised in HEIs, simplifying the management of all the activities of the departments in order to provide a better service, a situation that generates added value for those organisations that require the visualisation of their processes through quality management systems (QMS) and high institutional, the efficiency of the implemented information system is evident accreditation (Cuadrado et al., 2020). In terms of senior management (Laudon & Laudon, 2016) describe the information system as "a set of interrelated components that collect (or retrieve), process, store and distribute information to support the decision-making and control processes in an organisation" (p. 15), then an information system provides support for decision making, to identify problems, to analyse customer traits and needs, to analyse organisational processes and the need to generate new products.

Information systems are considered a technical tool for self-assessment used by a university government team as a requirement to support its administrative efficiency through integration with information technologies, which requires planning and allocation of strategies to support the quality standards aimed at maintaining the vision of the business, in order to guarantee the continuity of the technological activities developed by HEIs, so that a level of processing of HEI information is required to identify, among others, the amount of assets, processes and mission activities, all this to establish the potential risks and to be able to mitigate the contingencies that may arise (Cevallos et al., 2018). The demand by governments towards higher education institutions to increase the quality and efficiency of training and administrative tasks, generated a new paradigm whereby institutions seek to improve their processes to increase their competitive advantages over others, which facilitates the fulfilment of institutional objectives, support for logistical and administrative functions, cross-cutting processes and decision making with the purpose of integrating IS in the development of ERP implementation projects.

The document is organized as follows: Chapter 2 presents the methodology used, with the functional structure of the questionnaire and the phases of the system. Chapter 3 presents the results with the level of use in different higher education institutions. Chapter 4 presents the conclusions of the research.

METHODOLOGY

The research approach applied was quantitative, based on the data collection, the variables that can be weighted are defined, being necessary to quantify them for the analysis of the results, based on a specific study problem which is to identify the use and appropriation of the Gestasoft system, the scope is descriptive, because it allowed a specific analysis of the variables that were determined of Use and Appropriation, by means of a measurement instrument, figure 1 summarises the methodology (Pineda & Alvarado, 2008).

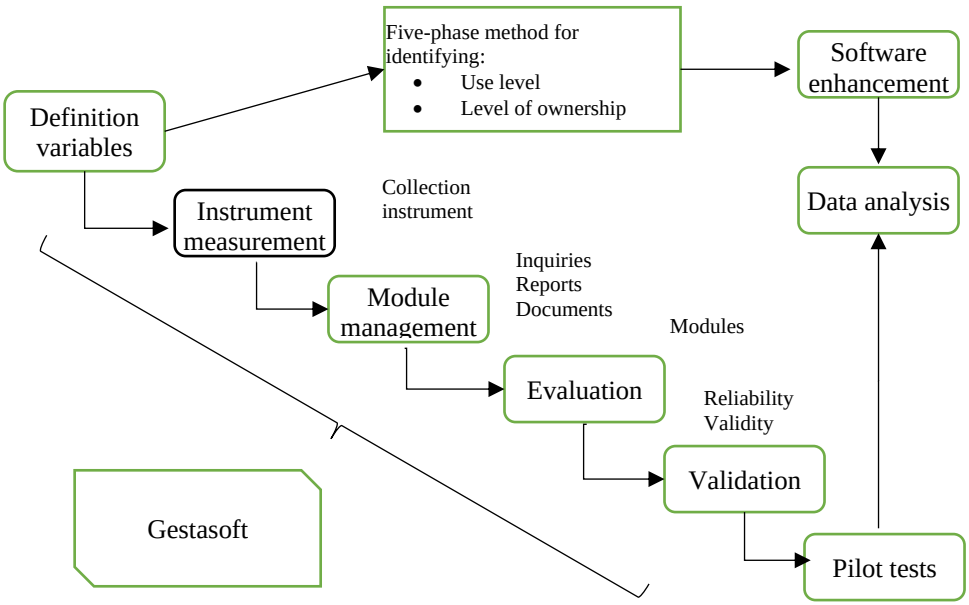

Figure 1. Methodological scheme of the research.

The research design is non-experimental, allowing data to be collected on events that have already taken place, since the HEIs that have already undergone a process of training and implementation of the Gestasoft application were surveyed, assuming that they have been using the system for a reasonable period of time. The population or sample defined are the HEIs of the public and private sector at national level, which have implemented the Gestasoft system and additionally have an active support contract with the University of Pamplona, the sample size was calculated by applying the type of simple random sample, which corresponds to the probabilistic class.

The purpose of applying the measurement instrument is to be able to express and configure with the data the state of use of the Gestasoft system based on the processes, queries, reports and supporting documents that according to the daily activities and direct contact with the application can make the data visible in a

quantifiable way that contribute to the improvement of the services offered by CIADTI (Vera et al., 2020). Likewise, to identify the appropriation by the user of the system to ensure that the information is obtained in a complete and timely manner, when required through the reports and supporting documents generated in each of the processes.

The variables that were defined to measure are the Level of Use and Level of Appropriation of the Gestasoft administrative and financial system, considering the characteristics of functionality; for the Level of Use, the execution of the processes developed in the Gestasoft system is estimated, identifying the management and quality of the information registered in the system in real time and for the Level of Appropriation, the reports and support documents generated by the system when executing each of the processes are taken as resources, where it is guaranteed that they are continuously consulted by the users according to the administrative needs.

Once the measurement variables had been defined (Hurtado de Barrera, 2010) the source information corresponding to the processes, queries and support documents of the Gestasoft system was collected for each of the modules: accounting, budget, warehouse and inventories, payment and treasury, invoicing and portfolio, contracting and human talent.

In order to identify and define the processes, it was necessary to have access to the documentation of user manuals and process descriptors (Romero et al., 2018) made by the CIADTI testing area, as well as verifying on a Gestasoft system testing site, for university institutions in the public and private sectors. For the queries and supporting documents it is evident that each of the Gestasoft system modules has a range of pre-designed queries according to the information management and execution of each of the processes, therefore, an exhaustive review of the main queries that contribute to the identification of the appropriateness of the system was carried out (Castaño & Castillo, 2021).

Due to the fact that HEIs are located in different cities nationwide, the application of the measurement instrument is defined as online (Figure 2).

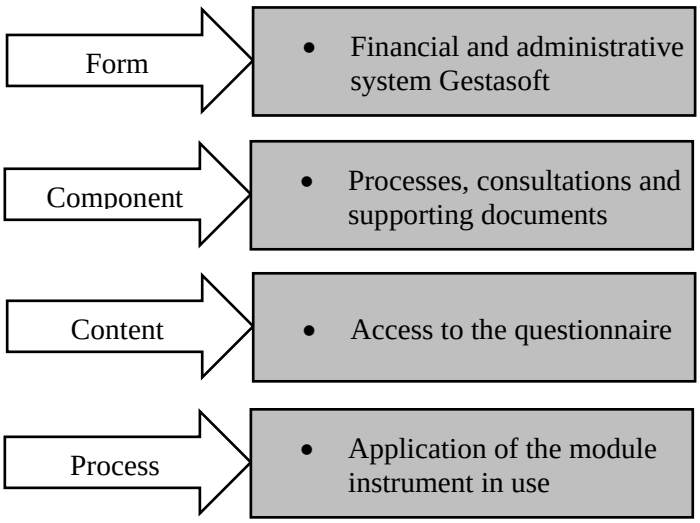

Figure 2. Functional structure of the questionnaire**.**

In the case of the form, this contains each of the modules that make up the Gestasoft administrative and financial system, through the Google Drive tool, in order to make them independent and so that they can be filled out simultaneously by users from the same or different institutions (HEIs).

In the component, each of the questions that make up the questionnaire is presented, involving the main information on processes, consultations and support documents for each of the modules with which each of the variables of the level of use and level of appropriation of the system will be measured, which is made up of different types of questions of a mandatory nature to ensure complete completion. The content page with the design of the measurement instrument allows access to the questionnaire of each of the modules of the Gestasoft system, which is available on the web portal of the technological support area of CIADTI, considering the time of application of the instrument. Finally, the processing phase is oriented towards the institutions applying the instrument as indicated above, to be filled in only once in order to avoid redundancy of data and to be processed by the leader responsible for the module accompanied by the users of the system. Companies and educational institutions must certify all their processes, becoming socially responsible while incorporating software-based re-engineering systems for the optimisation of their human and financial resources. (Álvarez-Silva et al., 2020; Rodríguez–Téllez & Pacheco-Sánchez, 2019).

The requirements that are considered for the measurement instrument to be valid are reliability and validity. Reliability of a measurement instrument refers to the degree to which its repeated application to the same individual or object produces the same results, and validity, in general terms, refers to the degree to which the instrument is valid (Sürücü & Maslakçi, 2020), refers in general terms, to the degree to which an instrument actually measures the variable it is intended to measure (Pineda & Alvarado, 2008).

This requirement was evidenced in the application of the pilot test and was subsequently ratified by obtaining the expected results in the other institutions that progressively accepted the application of the instrument. The validation of the content of the questionnaire was carried out by experts with experience in the development of this type of software.

The application of the pilot test was carried out with the IES, University of Pamplona, which is the matrix where the Gestasoft system was developed and the first to be implemented, in order to identify the perception of the leader and users of each unit and in turn ensure the clarity of each of the questions of the instrument that allows the entry of the data to be analysed. For the level of use, the use is defined as a percentage of the total number of developed processes identified in each of the modules, which are subject to evaluation by the HEI users, who are the ones who indicate whether the process applies or not in the institution, in the case that it does or does not apply, In the opposite case, where the user states that the process does not apply to the institution, they indicate it with the option "The institution does not manage this process" and the process will not be included in the calculation of the total average of the module.

The level of use for each module is calculated based on the sum of the percentages of the processes developed per module divided into processes that apply to the institution. The total percentage of the level of use of the system is calculated based on the percentage results of each module divided by the number of modules acquired and implemented by the institution.

In the case of the level of ownership, it is the calculation of the average percentage according to the reports and queries indicated by the HEI users that are generated directly from the system when considering the total of the relevant queries and reports designed in each of the modules. The total percentage of ownership of the system is calculated on the basis of the percentage results in each of the modules and averaged.

If the percentage in a module generates a zero value in the previous item, it must be validated if it is equal in the level of use, which indicates that the institution does not have the module installed and therefore it is not included in the calculation of the total percentage of the system.

Method for the identification of the use and appropriation of the Gestasoft administrative and financial system in HEIs.

The method was defined by means of 5 phases which are executed in a systemic and structured way in order to obtain a diagnosis of the current state of the execution of the processes in order to be able to identify in a timely manner the problems of the management of the system by each client, as shown in figure 3.

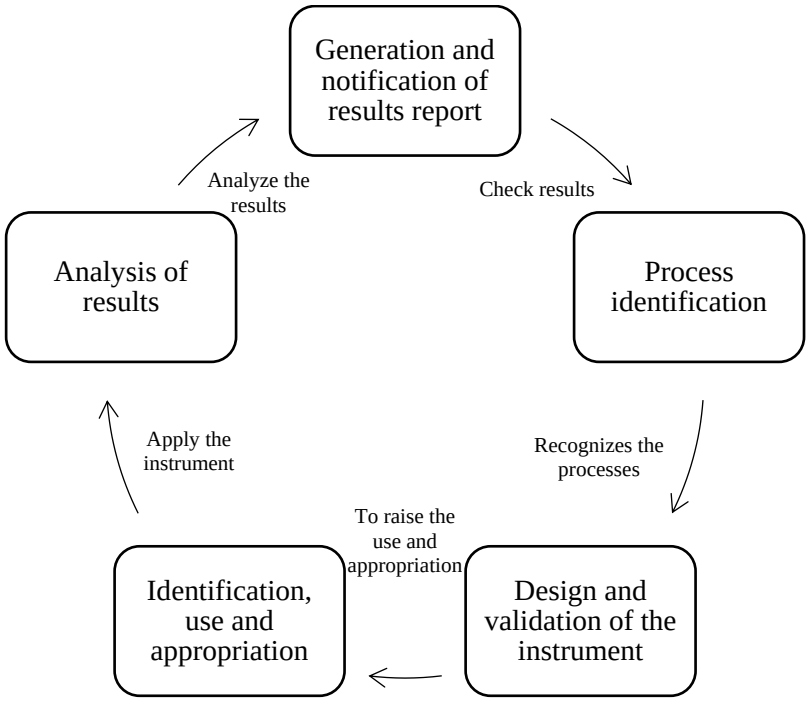

Figure 3. The five-phase approach of the Gestasoft System.

Each of the phases, their objectives, activities and expected results are detailed below.

Phase 1: Identification of processes.

This initial phase aims to identify the administrative and financial processes designed in the Gestasoft system in each of the modules that can be analysed to ensure the use and appropriation by users. Likewise, the queries that are pre-designed in the system and the support documents generated when executing each of the identified processes, so that they can be evaluated to obtain the information proposed in this method.

The objective of this phase is to verify the processes that make up the GESTASOFT administrative and financial information system.

The activities are based on: 1) identifying each of the processes developed in the GESTASOFT system involving the different administrative and financial modules that comprise Accounting, Budget, Warehouse and Inventory, Invoicing and Portfolio, Payroll and Treasury, Human Resources, General Services, Contracting, 2) selecting the most relevant queries generated from the execution of each of the administrative and financial processes by module, 3) identifying the supporting documents generated by each of the processes related to each module.

Generating as results: Designed Processes, Queries and Reports, Support Documents of the GESTASOFT system.

Phase 2: Design and validation of the measurement instrument.

Based on the inputs obtained in the first phase of processes, consultations and support documents, a measurement instrument is constructed that involves questions that allow information to be obtained that shows the level of use and appropriation that users have in the Gestasoft system, as well as the different reasons why an institution is not working on a process or generating reports from the Gestasoft system. Its content is subject to validation by experts as shown in figure 4 with knowledge in the development and management of this type of software. And the mechanism for the application of the measurement instrument is defined, seeking the necessary strategies to ensure that users have access in a practical way and that participation is satisfactory.

Its objective is to design and validate a measurement instrument based on the processes, consultations and supporting documents to identify the use and appropriation of the Gestasoft administrative and financial system.

The activities are based on: 1) creating a questionnaire per module involving the developed processes, consultations and support documents of the Gestasoft system, which meet the objectives of this degree project to identify the use and appropriation of the system, 2) validating the questionnaire by experts, 3) pilot testing for validation of the questionnaire, 4) defining and building the tool that facilitates the application of the measurement instrument in HEIs. The results

are evidenced by: the measurement instrument and the measurement instrument application tool.

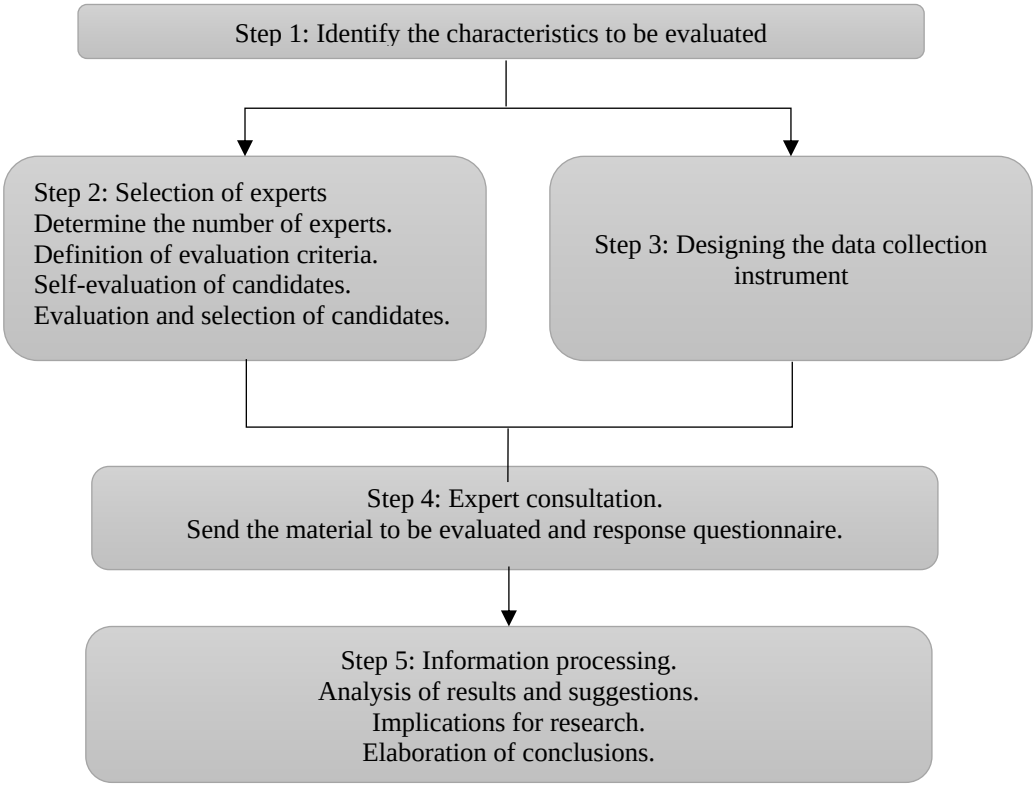

Figure 4. Application of the proposed method**.**

Phase 3: Identification of use and ownership.

This phase is the core of the application of the measurement instrument where information is captured to determine whether there is use and ownership, as well as the percentage or cause of non-use by HEIs of the Gestasoft system, ensuring that the questionnaire is managed with the utmost responsibility and sincerity required by the process, an example of the level of ownership is shown in table 1.

Table 1. Example of Ownership Level

No	SOFTWARE MODULE	LEVEL OF OWNERSHIP
1	Queries warehouse and inventory module	56%
2	Accounting module queries	83%
3	Recruitment module queries	67%
4	Queries billing and portfolio module	10%
5	Enquiries to the payment and treasury module	88%
6	Budget module queries	85%
7	Queries general services module	20%

8	Human talent module queries	88%

The main objective is to apply the measurement instrument to public and private sector HEIs to identify the use and ownership of the Gestasoft Financial and Administrative system.

Its implementation is carried out through the following activities: 1) consulting with the responsible areas in CIADTI if the higher education institution has an active technological support contract or if the application of the instrument is feasible, 2) defining the times of application of the measurement instrument, 3) consulting the contacts that lead the HEI process for the application of the measurement instrument, 4) making the request for the application of the instrument to the leaders of each administrative and financial unit that manage the application, 5) accompaniment and follow-up to guarantee the response of the measurement instrument, 6) verification of the response of the HEIs in each of the questionnaires by module. The results of the phase are certified with: Completed measurement instruments to determine the levels of use and appropriation of the Gestasoft administrative and financial system.

Phase 4: Analysis of the results of the application of the instrument.

It ensures the appropriate management of the information so that the results generated achieve the objectives set by the HEIs that acquired the system, determining its use and appropriation. Therefore, the following is a list of the items set out in the report generated by the processing of the information. For this purpose, the following analysis is used: 1) level of use by module and level of total use of the Gestasoft system, 2) processes that the institution does not currently manage in the system for each module, indicating the causes, 3) level of user ownership of each of the modules to acquire or consult information, 4) total ownership of the system based on consultations and reports, 5) processes that are not being executed in real time, 6) what reports the system generates for internal and external users and 7) general observations on the part of the user. The objective is to analyse the results of the application of the instrument.

This phase is based on activities such as: 1) tabulating the results of the questionnaires for each of the modules, 2) processing the data to comply with the items defined in the report submitted to CIADTI and 3) analysis of the results. The authentication of the results is supported by: analysis files of the data collection for the calculation of the Levels of Use and Appropriation of the administrative and financial system Gestasoft.

Phase 5: generation and reporting of results.

Finally, it is important that CIADTI is aware of the results generated by the application of the instrument in the previous phase in order to know the status of the use of the Gestasoft system and to provide the precise support and type of service required by the institution. The objective of the phase is to generate a report of the results of the application of the instrument identifying the use and appropriation of the administrative and financial system.

In this cycle, activities are carried out such as: 1) generating a report on use and appropriation and 2) delivering a report to the leader of the Gestasoft administrative and financial system process, so that the final product of the report is evidenced for each HEI, indicating the degree of satisfaction and compliance.

Method validation

The validation of the method was carried out through expert judgement, applying the Individual Aggregates Method (Almanasreh et al., 2019), which consists of each expert making a direct assessment of each aspect consulted in relation to the topic under evaluation (Hanea et al., 2022).

RESULTS

The process of identifying the use and appropriation of the administrative and financial system implemented in the HEIs that currently have an active contract was carried out, applying the method to obtain the results in table 2 of the Gestasoft system.

Table 2. Level of Use and Ownership

Higher Education Institution (HEI)	**Sector**	**Level of use**	**Level of appropriation**
Research and development university	Private	43%	35%
Maria cano university foundation	Private	65%	56%
Juan de castellanos university foundation	Private	69%	55%
Claretian university foundation	Private	54%	53%
Catholic university foundation of the north	Private	68%	33%
Escuela superior tecnológica artes débora arango	Public	42%	41%
Antonio jose camacho educational institution	Public	54%	42%
Furnace of cundinamarca	Public	69%	58%
University of pamplona	Public	67%	62%
University of the pacific	Public	69%	61%
Average		60%	50%

It is evident that no institution has a total level of use and ownership of the Gestasoft system, however most are in a range equal to or above 60% usage, which is a good indicator post implementation of an ERP system (Soliman & Noorliza, 2020). As for the level of appropriation, it is relatively consistent according to the level of use, however, not all the processes are being executed, which means that the information required to comply with the reports to internal and external users of the institution is not being provided in a complete manner, nor is it known through the system, the real state of the financial information of the institution that allows to generate timely solutions to the problems that are detected (Setyono & Arnandiansyah, 2018).

The results of the application of the method generate a sheet with very complete and reliable information detailing the status of each process and each module,

which is included so that HEIs can qualitatively make their observations or suggestions for the improvement of the execution of processes.

Having a method to help determine the percentage of usefulness of the application makes it easier for the institution's management to know the processes that need attention, so that they can be implemented and continuous monitoring of the implementation of the system can be carried out, achieving quality information and reports in a timely manner, so that the method presented meets the expectations raised to capture the use and appropriation of the Gestasoft administrative and financial system.

In the implementation and commissioning of ERP systems, people (users and clients) and processes must be approached in a systemic way so that through technology a digital transformation can take place in HEIs as an imperative need to be competitive so that they can generate reports and reports in real time, so that consequently the management processes can be developed, facilitating the management of both physical and human resources in an effective and efficient way.

It is recommended that a tool be designed to facilitate the management of the measurement instrument and the processing of the results, and that the necessary strategies be sought to encourage higher education institutions to fill in the instrument. It is also advisable to review what additional services can be offered to higher education institutions so that they have the independence to acquire and apply the knowledge of the use of the tool, which leads to ownership of the system. According to table 2, there is no level of use higher than 60% and a level of ownership higher than 50% of the average for the institutions in question, a situation that should be improved by means of a crash plan so that users and the entire organisation can make the most of the resources provided by ERP tools.

The five-step method facilitates the monitoring and diagnosis of problems with the customer in a focused way so that it is possible to evaluate the percentage of use of the ERP system from the moment of verification, recognition, planning and analysis of the results in order to achieve the objectives proposed by the management or to be able to make optimal use of the application.

CONCLUSION

An ERP is the backbone for processing financial information automatically, making it more efficient and less error prone and a reliable source for decision making. The importance of acquiring the necessary knowledge at the implementation stage of an ERP ensures effective use and subsequent appropriation, without neglecting the fact that users must continue to learn post-implementation, which is a relevant factor in order to be maintained.

One of the most important contributions of the research is that it helps CIADTI as a provider of the Gestasoft administrative and financial information system, have a tool to detect the current status in the use and appropriation of the system, allowing in the first instance the improvement of the post-implementation service, in such a way that HEIs continue to execute the processes and that the

management of financial information is centralised in this system, creating dependence on it, in order to improve the levels of use and appropriation, making customers feel satisfied with the acquisition of the product.

The main causes of non-use of the information system is the lack of knowledge of the tool, where in most cases the current users are not those who were initially in the training and implementation processes and have not had adequate internal training to receive the position, therefore, do not have an efficient management of the system, with the proposed research method identifies the need for training and updates to these new users and permanent users, which in the future become experts in the system to achieve a correct appropriation.

In general, it is considered that the administrative and financial information system Gestasoft is a robust system that meets the characteristics to support all the administrative and financial processes of an HEI, taking into account that the causes of non-execution of the processes are different from the fact that the process in the system is not developed according to the reality of the institution. Within the research process, the application of the method was applied in each institution evaluating all the modules that make up the Gestasoft system Budget, Accounting, Warehouse and Inventory, Contracting, Payroll and Treasury, Human Resources, Invoicing and Portfolio, however, this method can evaluate and analyse a single module if required.

This method not only allows to identify the use and appropriation in the Gestasoft administrative and financial system, but can also be used to evaluate other ERPs, with the aim of successful implementations in other types of companies.

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