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## Developing a Structured Framework for Information and Knowledge Audits in Organizations

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### ABSTRACT

This work presents an integrative methodology for information and knowledge (I+C) auditing for organizations, made up of seven stages with a hybrid approach, aimed at reviewing the I+C management strategy and policy, identifying, inventorying and map these resources and their flows, as well as assess the processes associated with their management. It integrates the diagnosis and evaluation of R&C management jointly; It allows its planning and execution with a lower expenditure of resources and brings additional benefits to the team of auditors and their preparation prior to the execution of the audit, by having a methodology and a unique and flexible instrument, which can adapt to the specific characteristics of any organization .

**Keywords:** Information and knowledge (I+C) audit; information management; knowledge management; diagnosis and evaluation of I+C.

### INTRODUCTION

Information audits (IA) appeared in 1987 and were linked to Library and Information Sciences. Starting in 2000, they focused on evaluating information management (IG) policies and automated systems in the business field. In the last five years, they have moved towards network-based systems and machine learning



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in educational and business environments. Its leading authors come from China, the United States, Great Britain and Spain.<sup>1</sup>

These audits provide a greater understanding of organizations and their capabilities,<sup>2</sup> focus on explicit assets, and identify whether there is redundancy, duplication, inconsistency and incompatibility in the GI system.<sup>3</sup> They evaluate the informational competencies of their members<sup>4</sup> and the quality and use of information services in a web environment,<sup>5</sup> in addition to the generation, protection and management capabilities of intellectual capital,<sup>6</sup> and identify the barriers that prevent the exchange of information and knowledge.<sup>7</sup>

Knowledge audits (KA) appeared in 1994 and were also linked to Library and Information Sciences at the beginning. Starting in 2000, they focused on measuring intellectual capital in the government sector and in academic institutions. In the last five years, eight new approaches have appeared, aimed at analyzing how knowledge is developed and protected as a function of organizational learning, and their leading authors come from China, the United Kingdom, the United States, Bulgaria and Australia.<sup>8</sup> Its definition is emerging as an important diagnostic tool to evaluate the behavior of processes linked to knowledge within a professional group or in an organization, and determines how it is exchanged and transferred, what its typology and topology is, and how it is appreciated and valued. Both audits are generally applied when organizations are unaware of how information and knowledge management (I&C) processes behave; where these resources are located internally and in their environment to preserve, share and reuse them. Furthermore, when performance indicators decrease or when there is a



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tendency not to socialize them. Its results benefit both the organization and its members.

In both topics, works dedicated to the critical analysis of the most recognized methodologies have been published and there is a wide range of case studies. After analyzing 13 AI and 14 CA methodological proposals, it was found that both processes have similarities and differences. Among the great similarities is the tendency to carry out audits with hybrid approaches that undertake actions that converge towards common objectives such as: evaluating the state of information management (IG) and knowledge management (KM) and the establishment of a comprehensive policy that promote the culture of learning and professional development, examine the systems designed to manage these resources, as well as propose redesigns in management policies and evaluate whether the strategies for IG and KM correspond to the requirements of key processes and promote the generation of knowledge.<sup>9</sup>

Among other objectives, both audits identify and represent internal and external information flows and networks of knowledge and experts; They evaluate the effective use of the organization's R&C resources as a competitive advantage and whether the information services satisfy the current needs of its members; They assess the costs and benefits of these resources and analyze how the processes of creation, acquisition, retention, distribution, transfer and reuse of I&C occur. While the main differences are given by their approach, since some analyze the processes, others the resources, and others the strategies. In addition, there are those that have a hybrid approach that covers more than one of the previous directions.



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Among the most significant methodological approaches of AI, taking into consideration the level of application in various contexts and case studies, the depth in the description of the stages, the techniques and instruments used and because they are more flexible and comprehensive, are those of Orna and Villardefrancos Álvarez , the methodologies of Soy Iaumatell , Buchanan and Gibb , Henczel and the González-Gutián procedure .<sup>10-</sup>

<sup>15</sup> In the case of AC there are the methodologies of Burnett and others, that of Cheung and others, that of Pérez Soltero and others, the method of Jurinjak & Klicek , and the models of Hylton and Ganasan and Dominic .<sup>16-21</sup>

In the literature on these topics, methodologies are not reported that allow evaluating the state of R&C management jointly.<sup>22</sup> The scientific literature, experience and accumulated knowledge on AI is approximately thirty years old, but there is still no universally accepted methodology to carry it out.<sup>23</sup> For their part, QA methodologies and their field of application vary widely in the literature and, despite the development achieved by KM, there is still no globally accepted procedure for evaluating systems designed to manage knowledge.<sup>24</sup> Furthermore, despite the popularity and importance of KM and its diagnosis for an organization, there is still no generic definition or model to carry out initiatives of this type, the first step of which is the audit.<sup>24</sup>

Although the two processes have similarities, there is no procedure that integrates both audits into one, but rather several methodologies, models and approaches appear. Hence, there is sufficient objective evidence on the feasibility and convenience of carrying out the design of a practical, flexible and well-founded methodology that includes the best and most widespread practices, through which



I&C audits can be carried out jointly. and that provides the tools, instruments and models necessary for its execution. In this sense, the work presented aims to design an integrative information and knowledge audit methodology for organizations. This study was part of a broader investigation that formed the doctoral thesis of one of the authors, defended at the Faculty of Communication and Documentation of the University of Granada, Spain.

## **METHODS**

Analysis-synthesis was used to examine the AI and AC processes as a whole and independently for each of its stages and components, and their relationships were detected; the historical-logical to check the evolution of these themes and their behavior chronologically; that of induction-deduction to conceive the proposal of a methodology that integrates both audits, taking as reference the main similarities and differences of the preceding methodological approaches; the systemic-structural to address the processes involved in these issues, with a comprehensive overview and, at the same time, its components and relationships, with a systemic approach. In addition, documentary analysis to locate theoretical and conceptual references in the various sources of information available.

## **RESULTS**

### **CHARACTERISTICS OF THE METHODOLOGY**

- It has a logical sequence of the structure and interrelation of the aspects that make it up.



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- It can be applied to the universe of organizations in a specific sector or adapted to others (business, scientific, academic, research, non-profit and public, among others), and incorporate modifications and adjustments in the stages and actions, which makes it contextualizable.
- It can cover the organization as a whole, an area or a process and is aimed at evaluating resources, strategies and R&C management processes; that is, it has a hybrid character.
- Its application implies the participation of the members of the organization from the beginning to the end of the audit and promotes a reflective process about what people do, how they do it, what results they obtain, what the search, selection, and analysis skills are. and evaluation of R&C and what role is assumed in the construction of new knowledge.
- Its application benefits the organization and its members; hence its retributive nature.
- Ensures systematic control and surveillance to improve the I&C management system, and benefits feedback, through recurring audits.
- It must be understood within the philosophy of continuous improvement, since it generates in the organization a capacity for permanent change in R&C management.
- It has a formative nature, since during its application collaborative attitudes, professional skills are manifested and autonomy and critical reflection are developed.

## **STAGES OF THE INTEGRATIVE METHODOLOGY OF THE R&C AUDIT**



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The methodology consists of seven stages ( Fig.  ), each of which has its objective defined, the actions that comprise it, the tasks to carry them out, the techniques to use and the partial results to achieve.

## **Stage 1. Organizational analysis**

*Objective:* Form the audit team, know the strategic aspects of the organization and its position in relation to GI and CG.

*Techniques to use:* Document analysis, surveys, exploratory interviews, informal meetings (personal and group) and participatory observation.

*Results:* Report on the analysis of strategic documentation; report with the deficiencies detected in the strategy and policy related to R&C and, if none exist, recommendations will be prepared that will form part of the final report. Document with detailed description of the equipment.

*Actions:*

1. Form the team and familiarize it with the organization. They can be internal or external auditors but, due to the complexity of the process, it is advisable to use a multidisciplinary team.

*Main functions:* Conduct interviews, determine the elements of analysis, process the information collected and responsibly assume the code of ethics or the internal regulations of the organization .

2. Perform organizational strategic analysis (top-down); characterize the organization and define its type, mission, objectives and goals; hierarchical and geographical structure (specify processes, functions, activities, interrelationships and forms of coordination and control); review and select key processes to detect



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where improvement in I&C management levels is required; analyze the R&C management policy and strategy and determine the scope, content and updating.

## **Stage 2: Planning the I&C audit**

*Objective:* Plan the audit and motivate workers.

*Techniques:* Document analysis, surveys, exploratory interviews, informal meetings (personal and group) and participatory observation.

*Results:* Document with the audit planning, the schedule by stages, the distribution of team tasks and the techniques and instruments to be used in the process.

*Actions:*

1. Define objectives, scope, time and resources for the audit, the behavior of the GI and GC processes, the analysis of corporate policy and culture, the identification and representation of I&C resources, the behavior of its flows, as well as the accessibility, availability and valuation of resources based on the organization's key processes and tasks.
2. Review the results of previous audits to take into account the deficiencies and recommendations previously noted and check if they were resolved.
3. Adapt the instrument and questionnaires to be used in the interviews.

*Characteristics of the instrument:* It contains semi-structured questions with different measurement scales concerning the qualities of the I&C resources accessed, taking into account how they impact organizational performance. It analyzes general aspects of the respondents, followed by 19 statements about organizational issues. The different types of I&C resources are included below so that you can indicate which ones are required in daily performance and which are the most used. In addition, how often they are identified or located, acquired or



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captured, created and developed, shared and distributed, retained or preserved and used. Below it contains statements related to each strategic R&C management process and respondents evaluate them as efficient or effective. Seven qualities of the resources are then reflected to evaluate them on a scale of (unimportant, important and very important) and an assessment is also requested, depending on whether they add value to the organization's products and services and their productivity, efficiency and effectiveness. The last group of statements aims to know how I&C flows behave between different areas.

4. Determine the population and sample. It is recommended to take into account the criteria of the statistician who is part of the audit team or the selected consultant to choose the selection method.

5. Prepare the final documentation of the stage with the audit planning, the schedule by stages, the distribution of tasks among the team members and the techniques and instruments that will be used.

### **Stage 3. I+C management processes**

*Objective:* Identify and evaluate the processes of creation, acquisition, retention, distribution, transfer and reuse of I&C in the organization.

*Techniques:* Group work, observation, interviews, documentary analysis, questionnaires and review of I+C services supported by information and communication technologies used in the organization.

*Results:* Partial report with the analysis of the strategic I+C processes.

*Actions:*

1. Evaluate the behavior of the I+C management processes. For the purposes of this research, the classification of knowledge processes from Probs et al.<sup>26</sup> was



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taken and adapted to the processing of information, in order to relate and unify its analysis based on determining how R&C is identified, acquired, , records, retains and stores; how it is used, communicated or transferred; how people share and how R&C-related activities impact organizational performance.

2. Check whether the processes correspond to the standards and procedures instituted by the organization or by an external regulatory entity and determine if they are aligned with organizational objectives and goals.

3. Prepare the final documentation of the stage with the report on the analysis of the strategic I+C processes, which will serve as the basis for stages 4 and 6.

## **Stage 4. Inventory of R&C resources**

*Aim.* Carry out an inventory of R&C resources internal and external to the organization and value them in relation to needs.

*Techniques.* Consultation with experts, interviews, questionnaires and direct observation. The support of a database management system will be useful to incorporate the identified and located resources with their description.

*Results.* Database with the inventory, the directory of experts and the partial report with the analysis of the inventory where unmet needs appear.

*Actions:*

1. Identify, characterize and inventory R&C resources, with knowledge of the current state and the methods used for their management. The definition of InfoMap information resource categories will be taken as a basis: sources, services and systems.<sup>27</sup> They will be considered as:

- *I+C Resources* : Those that facilitate the identification, acquisition, storage, treatment, use, transfer and reuse of I+C to improve key processes and individual,



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group and organizational performance. They cover all types of I+C, whether explicit or not, that the organization manages, contained in various media and documents, networks, experts and consultants, software, services and technological equipment for its management. They can be at the same time sources (due to their content), services (due to their objective) and systems (due to their operation) or they can be classified independently into one of these categories. Define whether they are your own or internal or external. In many cases a duality occurs and they can be internal and external at the same time.

- *I+C sources*: A site, repository or person who fulfills the role of expert, advisor or consultant, who due to their knowledge, capabilities, attitudes, aptitudes and skills is identified as a fundamental source of I+Ca. Also the knowledge made explicit in magazines, books, web pages, CD-ROMs, videos, process or procedure manuals, standards and regulations, networks of experts, advisors, social networks in general, databases, among others (all sources internal or external, automated or not, documentary or non-documentary, to which members of the organization can access).

- *I+C services*. Activities established to identify, acquire, store and disseminate I&C that involve assistance in the search process or access to information. They can be manual or automated and generated inside or outside the organization. Information services will analyze the way information is used and distributed, the efficiency and effectiveness of the service, the relevance and accuracy of the information, its reliability, timeliness, etc. It will be investigated whether these satisfy the needs of internal and external customers.



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- *I+C systems*. Technological tools to generate, encode and transfer I&C, computer networks, Intranet, Internet and computer applications. Learning and electronic commerce systems, systems to manage workflows, and online consultation. The systems, services and networks that support I+C management will be identified and assessed, in order to adequately support, process and transport I+C to the entire organization and those involved in decision making.

2. Classify or categorize R&C resources. To organize the set of resources that can be detected, which can vary and increase depending on the type of organization and its characteristics, Table 1 proposes a general classification, taking into account the purpose for which they are designed, starting from the classification of type of documentation from Artiles Visbal,<sup>28</sup> adapting it to the purposes of this investigation. In this way, a categorization of R&C resources is proposed into four fundamental types: I) Normative or regulatory, II) On processes and procedures, III) Strategic and managerial and IV) Support for production and R&D+ i ( box ).

3. Inventory tacit knowledge, determining quantity, categories, academic training, personal qualification and location; *know how* , skills and abilities to perform daily tasks, level of experience and key competencies, training, learning and future development. This information will be organized and coded in a medium for dissemination. A staff directory will be prepared with their academic titles; skills, level of experience and key competencies; training and learning opportunities.

4. Inventory explicit knowledge, establishing number, types and categories of documented knowledge (patents, procedure manuals, processes, etc.). Locate them within the organization and in the systems that contain them, determining how they



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are accessed, how they are organized, who currently uses them and how often they do so. Check the purpose, relevance and quality of knowledge.

5. Analyze I+C needs. Contrast them with existing inventory levels. Investigate the users of I+C services and how they are segmented according to the functions or processes in which they participate, as well as evaluate the degree of user satisfaction with respect to the I+C they receive. It is recommended to list a group of topics, to determine the most necessary for daily performance and to inquire about the courses or training that are required.

6. Prepare the final documentation of the stage with the results of the inventory analysis, the inventory database and the directory of experts.

## **Stage 5. Valuation and costs of R&C resources**

*Objective:* Evaluate the impact of R&C resources on the organization according to their qualitative and quantitative assessment.

*Techniques:* Consultations with experts, interviews, application of questionnaires, direct observation and review of economic documentation.

*Results:* Partial report with the qualitative and quantitative assessment of the resources.

*Actions:*

1. Assess internal and external R&C resources considering how they impact the productivity, effectiveness and financial position of the organization. Furthermore, in adding value to processes, products, services and results related to development, research and innovation. The value of the information will be assumed, understood as that attributed to the production or acquisition of information by organizations, people or entities and that delivered in the form of products or services.<sup>27</sup>



2. Approximate analysis of the value of R&C in relation to the cost of its management. It is important to know how much is invested in each internal and external R&C management process, from its selection and acquisition, processing, storage, to its dissemination and use. This can affect the allocation of financial resources for each process, which increases the efficiency and effectiveness of R&C management.
3. Analysis of R&C costs. This is complex, except in organizations dedicated only to managing I&C, or in which the audited areas constitute a cost center within the general accounting. But most organizations do not give a commercial character to the creation of I&C, especially when their clients are exclusively internal; They do not assign the value it has, nor the costs associated with its creation. From this perspective it is difficult to evaluate the operational efficiency of R&C management. However, for-profit organizations have updated accounting records for any of their operations, projects or processes, since cost analysis is essential for their profitability and competitiveness.
4. If the R&C activity in the organization is not self-financed, it is advisable that the audit team carry out economic analyzes to achieve the proposed objectives. Once carried out, they will be able to issue criteria on the difficulties encountered that influence the decrease in the qualitative and quantitative value of R&C resources.
5. Prepare the final documentation of the stage with the qualitative and quantitative assessment of the I+C resources.

## **Stage 6. I+C flows and maps**



**Objective:** Represent and analyze the flows and maps of internal and external R&C and the networks of core producers of knowledge and expertise.

**Techniques:** Interviews, observation of daily performance, review of archival documents and use of computer applications for the graphic representation of flows, maps and networks.

**Results:** Tables, maps and graphs with the representation of the flows, social and knowledge networks of the audited area, and partial report with the results of their analysis.

**Actions:**

1. Prepare the I+C flows of the organization, area, function or audited process with the subprocesses that make it up, considering who delivers the information, where, what it is used for, who is responsible for its registration, where it is stored or its records, how frequently, what output it generates and to whom the information received is delivered.
2. Take as a basis Itami<sup>29</sup>'s classification of information flows into: environmental (coming from the environment); internal (that which transits within the organization) and corporate (that which is sent abroad). To represent them, the data flow diagram technique can be applied. It is suggested to use software, although they can be represented through tables and later this data is taken to a graph. The level of detail of the flows will depend on the size of the audited area and the complexity of its activities and processes.
3. Analyze the behavior of I+C flows, identifying and pointing out internal distribution and exchange channels. It is important to evaluate the corporate culture



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in relation to the communication and transfer of I&C, automated systems and computer applications that support it, use and management of technologies for key processes; whether measures exist and are applied to protect the information.

4. Represent and analyze social networks, detecting important groups and experts in the organization, those who work in isolation, where there is greater exchange of I&C and where there are difficulties. Mapping tools such as Ucinet, Netdraw or Pajek, among others, can be used. These networks will be included in the annexes of the final report.

5. Prepare I+C maps according to the characteristics of the resources identified in the inventory. They can be about skills, processes, information, knowledge, relationships, documentary and technological. It is useful to make tables that help in the subsequent preparation of maps. Knowledge topographies can also be made.

6. Evaluate R&C gaps and duplications.

7. Prepare the final documentation of the stage, with the results of the analysis of flows, maps and networks. In addition, a group of tables, maps and graphs with the representation of the flows, social and knowledge networks of the audited area.

## **Stage 7. Final report and recurring audit**

*Objective:* Analyze and interpret the results of each stage and prepare and present the final audit report.

*Techniques:* Team meetings to seek consensus on the aspects evaluated.

*Result:* Final report with the results of the audit.

*Actions:*

1. Analyze quantitatively and qualitatively interpret the results in stages by comparing the data and information resulting from the surveys, the application of



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the instrument and what was verified in the individual interviews, observation and research carried out in the areas.

2. Prepare the final report using simple language in a clear and concise manner, including graphs, tables and maps for better understanding. It will contain an index with the internal structure and will begin with an Executive Abstract (1-5 pages) with the type of audit, methodology used, objectives, execution time, team that performed it and main results with their recommendations. Next, and following the order that appears in the index, the Final Report will be detailed in full with the following structure:

*Introduction:* With the characterization of the organization or audited area, objectives, scope of the audit, fulfillment of planned tasks, planned schedule, name of each stage, description of the team, balance of resources assigned at the beginning of the process and those that are actually used, causes that motivated the audit and where the request to apply it comes from.

*Results:* With the main results obtained through a quantitative and qualitative assessment of the positive aspects and the problems, deficiencies or difficulties detected, which can be represented through tables, graphs and maps.

*Conclusions:* With the main deficiencies, difficulties or barriers detected in relation to R&C management.

*Recommendations:* In correspondence with each problem detected.

*Annexes:* With graphs and tables, the final inventory of resources, and maps that were not included in other sections of the report. This report is the conclusive synthesis of the partial results of each stage and will contain the aspects that negatively affect the diagnosed situation and will recommend possible solutions.



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3. Present the final report to senior management for approval and after approval, report the results of the audit to the members of the organization through an oral presentation, a seminar, a workshop or through the corporate Intranet.
4. The I&C audit will be carried out with a frequency between two and five years and senior management will determine when and where it will be applied, regardless of the time period recommended in this methodology.
5. It is suggested to carry out recurring audits within a period of one year after the previous one, and verify compliance with the recommendations made in the previous audit.

## **FINAL CONSIDERATIONS**

In the bibliographic review carried out to carry out this research, it was possible to verify the diversity of methodologies, models and approaches developed to audit information (13 proposals) and to audit knowledge (14 proposals) led by Great Britain and the United States. However, research on these two scientific domains is also carried out by authors mainly from China, Spain, Bulgaria and Australia.

The methodology presented integrates the diagnosis and evaluation of information and knowledge management together, and offers a more comprehensive, comprehensive and systemic vision of the management, generation, use and conservation of R&C resources and their impact on the results to be achieved by the organization. It is planned and executed with a lower expenditure of resources and brings additional benefits for the auditor teams and their methodological preparation prior to the execution of the audits, by having a methodology and a



unique and flexible instrument, which can be adapted to the specific characteristics of any organization.

This methodology was applied in an organization dedicated to research and scientific, technological and environmental services in the province of Holguín, belonging to the Ministry of Science, Technology and Environment of Cuba. The results obtained were favorably recognized by its senior management and by the experts who carry out the investigative processes. The proposal remains a group of recommendations that will contribute to improving the productive and scientific results of this center. These results make up an article that will continue this work.

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## **Authors' contribution**

All authors contributed to the conception and design of the study, data analysis and final writing.

## **Conflict of interests**

The authors declare that there is no conflict of interest in this article.

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