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The use of Design Thinking Method in applied research to integrate the library in distance learning platforms with a learning object

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The use of Design Thinking Method in applied research to integrate the library in distance learning platforms with a learning object

El uso del Método Design Thinking en la investigación aplicada para integrar la biblioteca en plataformas de educación a distancia con un objeto de aprendizaje

Purísima Centeno Alayón[1]

ABSTRACT

This work aimed to integrate the most in-demand library services and resources in distance education platforms through the creation of a learning object for the Natural Sciences Faculty, at the University of Puerto Rico, Río Piedras Campus. For this object, the Design Thinking Method was applied, which consists of the following steps: empathizing, defining, ideating, prototyping, and testing. The research approach was mixed. Some information was gathered from participatory observation and netnography, as qualitative methodologies, to identify the needs of the academic community. In addition, the visits statistics to the Centro de Información y Tecnología web pages were considered from the quantitative perspective to contrast them with the findings of the qualitative part. The study found that the resources and services with the greatest demand were journals, databases, remote access, and interlibrary loan. Identifying needs early on helps design solutions that satisfy the user. When applying the Design Thinking Method and, in its first step, empathy considered the library services needs from the beginning. This helped the rest of the steps of the method to be responsive to the needs and to make an informed decision. The product, a learning object, responded to the needs of the Natural Sciences Community, but can be reusable by other organizations by making the necessary adjustments as needed.

Keywords: *Academic libraries, Learning objects, Virtual learning environments*

RESUMEN

Este trabajo tuvo como objetivo integrar los servicios y recursos bibliotecarios más solicitados en las plataformas de educación a distancia mediante la creación de un objeto de aprendizaje para la Facultad de Ciencias Naturales, de la Universidad de Puerto Rico, Recinto de Río Piedras. Para este objeto se aplicó el Método de Design Thinking, el cual consta de los siguientes pasos: empatizar, definir, idear, prototipar y probar. El enfoque de la investigación fue mixto. Para identificar las necesidades de la comunidad académica, se recopiló información a partir de la observación participativa y la netnografía, como metodologías cualitativas. Además, se consideraron las estadísticas de visitas a las páginas web del Centro de Información y Tecnología desde la perspectiva cuantitativa para contrastarlas con los hallazgos de la parte cualitativa. El estudio encontró que los recursos y servicios con mayor demanda fueron las

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revistas, las bases de datos, el acceso remoto y el préstamo interbibliotecario. La identificación temprana de las necesidades ayuda a diseñar soluciones que satisfagan al usuario. Al aplicar el Método Design Thinking, desde su primer paso, la empatía consideró las necesidades de los servicios bibliotecarios desde el inicio. Esto ayudó al resto de pasos del método a responder a las necesidades y a tomar una decisión informada. El producto, un objeto de aprendizaje, respondió a las necesidades de la Comunidad de Ciencias Naturales, pero puede ser reutilizado por otras organizaciones haciendo los ajustes necesarios según las necesidades..

Palabras clave: *Bibliotecas académicas, Objetos de aprendizaje, Entornos virtuales de aprendizaje.*

1. INTRODUCTION

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Academic libraries support educational and academic activities in institutions of higher education through the provision of collections, services and user education that support teaching, learning and research to help students to succeed in their learning experience (Curzon, & Quiñónez-Skinner, 2016, p. 1-13). Integrating access to library services and bibliographic resources into distance learning courses is necessary to provide an enriching teaching-learning experience (Gibault, 2018, p. 193). The presence of an online library to facilitate curricular support can be achieved through the presence of a learning object.

The learning object is a unit designed with a didactic purpose and support for teaching that has, among its advantages, the possibility of being integrated into various distance platforms to facilitate the teaching-learning process. Once produced, a single object can be included in many courses at once to facilitate, in this case, the integration of the library's services and bibliographic resources into distance education platforms, to support research from the location where teaching is offered.

A learning object (LO) is a reusable digital educational material or content (Wiley, 2000), cross-platform, for which a navigation menu can be created. It can be presented in various formats such as: .html, .pdf, .doc and .jpeg, among others. Also, it must include metadata with descriptions so that other professors who access it can read a summary about the object, its instructional objective, its reuse permissions, the name of the author and the need of any prior knowledge or requirement (Monje, 2017b) before deciding to download it. The inclusion of metadata is useful to facilitate the retrieval of information in systems that exchange information.

Developing learning objects is a complicated task because it implies the mastery of the content, the pedagogy to develop them and the use of process models.
A learning object is a reusable educational material (Wiley, 2000) due to its interoperability feature which allows it to be integrated, downloaded and reintegrated into distance education platforms such as Blackboard and Moodle. Each object is accompanied by sequence instructions, as well as metadata, in a compressed file with instructions to be interpreted by computers.

Academic libraries support for the curricula of higher education institutions and, in distance environments or mediated by alternative technologies, the quality of library services, both their bibliographic resources and their

services, is expected to be similar or equal to those offered in the face-to-face modality (Association of College and Research Libraries, 2016). For this reason, the development of a learning object that integrates the library is a practical way to facilitate research and access to bibliographic resources from the same environment in which it is taught.

The Covid-19 pandemic caused the physical distancing of all humanity since the last weeks of march, 2020. This situation led educational institutions to continue the teaching-learning exercise remotely or mediated by alternative technologies, and education activities had to reinvent themselves in record time to give continuity to the educational plans initiated. The library supports curricula and, as such, should be embedded in remote, at distance, online or alternative technologies-mediated activities to support the academic community.

This article presents the use of Stanford's Design Thinking Method in the development of a digital product to meet the information needs of students in the teaching-learning exercise in virtual learning environments available from distance educational platforms (Learning Management Systems). The main objectives of the study were identify the most requested library resources, identify the most used library services, discover the most visited library webpages, and integrate the library in distance learning platform.

2. THEORETICAL FRAMEWORK

Design Thinking is a method used to design solutions to problems oriented to the user-customer relationship (Uebernickel et al., 2020, p. 16). The starting point comes from the identification of the user's needs of a product or service to develop a solution that fit those identified needs (DINNGO, 2012). This method began at Stanford University, California, in the 70's (Uebernickel et al., 2020, p. 20) and consists of five steps that are: empathize, define, ideate, prototype and test.

Through the use of the Design Thinking Method products can be developed meeting the real users' needs through user-centered design, a term that began in the 80's in reference to the creation of usable and accessible products (Norman & Draper, 1986). This method has been used in user experience interface design for prototyping to meet student needs at Jenderal Soedirman University (Ilham et al., 2021, p. 25), and in the design of IdeIn web application to support online classes in Indonesia (Nasution & Nusa, 2021, p. 25).

Integrating the library into a distance education platform presupposes getting into the science of design as there is a pragmatic value due to the need to solve a problem.
This project began with the COVID-19 pandemic when teaching had to use alternate technologies to continue instruction. This presented a challenge to provide library resources and services to students to support their research activities. Through the science of design, knowledge can be produced and applied to address situations involving the construction of artifacts creatively to design something useful (Cuno et al., 2012, 116).

To integrate the library into a distance education platform, the Design Thinking Method was applied, which, in its first step, requires the obtaining of data that comes from research to contextualize a product to the needs of a unit or organization. This work was applied to users of the Centro de Información y Tecnología (CITec), at the Natural Sciences Faculty, University of Puerto Rico, Río Piedras Campus in which the author works.

3. METHODOLOGY

3.1 Approach

The study approach was mixed because quantitative and qualitative methods were used to identify user needs. The research design was exploratory because it sought to identify the needs of information resources and services most required by users.

3.2 Study population

The case study was to find out which resources and services were most in demand by users at the Centro de Información y Tecnología, School of Natural Sciences, Rio Piedras Campus, University of Puerto Rico. To identify them, all requests and complaints related to services or resources that were sent to the library's e-mail, received by telephone calls, the reference services report, and the statistics of visits to the different pages of the Centro de Información y Tecnología were included, for which there was a commitment to confidentiality regarding e-mails and telephone calls.

3.3 Collection techniques

Several techniques were used in this study to collect information. Unstructured observation was one of them and the notes were compiled in 4 field diaries. A reference services report was consulted and statistics of visits to the Centro de Información y Tecnología's web pages were used.

3.4 Analysis processing

A notebook was used to classify observations from field diaries, email requests, phone calls, and the reference report into two categories: resources or services. The information was then cross-checked against web page visit statistics to select those most frequently requested.

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4. RESULTS AND DISCUSSION

4.1 Empathize

The first step of the Design Thinking Method is to empathize. This step requires recognizing for whom a technological solution is being designed and what problem it will solve. This involves inquiring about the audience and their needs. To do so, participatory observation and netnography were used. Participatory observation occurs when the researcher participates in the activities in a given scene (Creswell & Guetterman, 2019; Gay et al., 2012), while netnography is a research method in the digital environment based on the analysis of perceptions, social behaviors and interactions in a given period of time (Kozinets, 2014).

To record participatory observation a field diary was developed with the purpose to identify possible needs to use them as a base of a technical solution. The diary notes were created with Google Form. Notes were gathered from Monday through Friday for four weeks in February 2020, in the library reference area. Each time, when a user came to ask questions, an online form was filled with their needs.

In March 2020 began the COVID-19 pandemic. Students, professors, and employees continued working at a distance, and the university had to use alternatives technologies to continue bringing the educational services. From March through September, Empathized Step used netnography, or digital ethnography to gather information about the student's and professor's needs. Emails from students and from professors with their requests were considered, and meetings with professors. Their requests were analyzed to identify needs and found similar questions from both groups related with information resources and library services.

The findings were contrasted with the CITec web page statistics for the period beginning in January to September 2020, available through the Google Analytics service, to verify if visits were like user's requests. Table 1 shows the usage of the most visited pages ordered from most to least visited.

TABLE 1
MOST VISITED WEBPAGES

VISITED PAGES	SESSIONS
Journal page	1,374
Database page	541
EndNote Web page	455
Remote access page	197
Open access database page	38
Virtual reference page	33
Interlibrary loan page	20

Source: Own elaboration based on data from Google Analytics.

The information collected from the field diary, the mails, the meetings and the statistics of the most visited pages helped to identify the most requested resources and services needed in environments mediated by alternative technologies or at a distance. With the information gathered were identified these resources and services: journals, databases, electronic books, remote access and interlibrary loan.

4.2. Define

The second step consists of specifying for whom a technological solution will be developed. This precision comes from the analysis of the notes taken in the field diary and the messages exchanged with students and professors from their emails and from telephone conversations or video calls. The importance of defining is that the decision making on what should be included in a product will be based on the knowledge collected during the application of the research methodologies used.

Defining means not making assumptions because the success of the product to be developed will depend directly on the analysis of the results and findings applied in the previous step. This stage is of great importance because it will help clarify what is needed so the next stage is dependent on what is determined in this one.

From the research applied in the first step, it was found that the most requested online services and resources, were remote access to databases, electronic journals, electronic books, and interlibrary loan applications. These needs invite us to rethink the presence of the library in distance education platforms to support research as part of the support provided to the curriculum through quality digital resources and online services, and coincides with a usability study by Gibault (2018) in which he concludes that student-centered experiences should be prioritized.

4.3. Ideate

After identifying those services and resources of greatest use for the academic community, it is necessary to think about various possibilities that facilitate their access from a distance education platform. This means that potential technological solutions must be identified and contrasted with the budgetary and digital possibilities of the human resources responsible for developing and maintaining them. Also, it should be considered how sustainable the identified technological solution is.

This step sought a technological solution to allow the presence of the library without participating as a professor or teaching assistant. This led to finding a solution which was a material that could be given to the professor in which the learning object could be added as a teaching material of the course.
The selection made in the Ideate Step was to make a learning object that includes the services mostly requested by students and faculty combined with the most visited pages of the library. To create the learning object, the eXeLearning program was used. This is a free download and free to use program (open source) with a worldwide community of developers who keep the platform updated and with access to forums in various languages

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(Monje, 2017a).

4.5. Prototype

This step consists of giving tangible form to the proposed technological solution. The first step of the prototype is to make a detailed list of the contents to be included which is in essence, access to information resources and services of CITec. The list of resources and services should include links to facilitate access from the distance education platform. After having the list with their respective links, the sequence in which they will appear in the learning object must be organized before starting to build it. This step also considers the appearance that the object will have, the selection of colors and templates to be used, the selection and inclusion of images and the writing for the contents.

The prototyping process requires creating, previewing, uploading to the institution's distance learning platform, in this case Moodle, visualizing and repeating the process until the learning object is considered ready to share with users. This implies that there must be a test environment before integrating it as part of a course. Once in the Moodle platform it is important to select if you want that the object open in a new page or in the same page. This learning object opens on the same page to support the students while studying. In Moodle, library learning object was verified to see if it looks like the one developed on eXeLearning software and if the links were working.

Prototyping means, in this context, making and testing the technological solution, and validating it with the users if the selection resonates well with the needs of the users. This learning object that integrates the library was tested in three courses aimed at students in the Faculty of Natural Sciences during the academic semester from August to December 2020.

4.6. Test

This last step consists of presenting the product that will be used by the final recipients, in this case, undergraduate and graduate students of the Natural Sciences Faculty at the University of Puerto Rico. This product consists of digital educational content, in the form of a learning object, to be integrated into distance education platforms. This object is a compressed file (.zip) in a Shareable Content Object Reference Model (SCORM) format, downloadable from a web page or repository that hosts it, and contains machine-readable instructions that tells the distance education platform the metadata and the sequence of the object's pages.

Testing was available, as part of the course, in the distance platform Moodle used in Río Piedras Campus. Students can access library resources and services as part of a course from the left course menu. Professors that want to include the library in a Moodle course have to visit CITec Information Literacy webpage[2] or the Repositorio Digital Institucional UPR[3], and download the learning object. Then, in Moodle, they have to add an SCORM activity, attach the downloaded file and save it.

2. https://www.upr.edu/biblioteca-uprrp-cn/competencias-de-informacion/

3. https://repositorio.upr.edu/handle/11721/2874

There are some technological skills and knowledge required to include the library in courses on platforms such as Moodle or BlackBoard. These skills and knowledges are downloading a compressed file (.zip) in SCORM format, adding a type of activity called SCORM in Moodle, assigning title to the activity, describing it and attaching the downloaded file.

The contents of this learning object respond to the identified needs, from Step 1 (Emphasize), related to remote access to databases, electronic journals, electronic books, and interlibrary loan applications. The content design of the *Centro de Información y Tecnología* library learning object is show in the Figure 1.

FIGURE 1
LEARNING OBJECT INITIAL PAGE

Source: Own elaboration

The home page of the learning object that includes a navigation menu with the services and resources identified in Phase I, Empathize, of the Design Thinking Method. At the bottom of the image, the virtual reference chat button is shown to facilitate real-time learner consultation.

Other images of the learning object, product of the application of the Design Thinking Method, are included as an annexes.

5. CONCLUSIONS

The Design Thinking process method promotes a systematic sequence that allows to discover needs through the application of research methodologies. By applying research techniques through the selection of tools that allow information to be collected, the first step of empathizing is facilitated, from the documentation of situations, to propose solutions that respond to the specific needs of users. This is the most important step to be able to design

products that solve real problems.

This research found that the more requested resources were journals and databases; also, the more requested services were remote access and interlibrary loan. The technical solution, the Library Learning Object, combines the user's needs in an object that can be integrated as part of the course. This facilitates the support of student's research in the same place in which they study.

One size fits all alternatives can partially solve problems or needs, but they are not necessarily adaptable to the needs of a unit or organization. This example applied to the integration of libraries in online platforms - for distance courses, remote, online, or simply mediated by alternative technologies - facilitates the presence of the library, its resources, and services, to support the academic research of undergraduate and graduate students in courses offered at the Natural Sciences Faculty.

The creation of a learning object makes it easier for professors to integrate it into their teaching-learning experiences in distance education platforms. The professor can integrate the library into the course with basic technological skills such as editing a file. This addition to the course benefits students because they have, within the reach of a click, the possibility to ask and access directly to the bibliographic resources and services of the library.

The nearby academic community benefits from the possibility to reuse this type of learning object due to its flexibility to readjust to particular needs and its corresponding contents if, after applying research techniques, the findings coincide with the service needs and documentary typologies of this learning object. This reusability reduces the creation time of an object if the information structure were to fit the needs of other information units. This learning object is available at the CITec web page[4].

This solution implies that the learning object must be updated every academic semester because it links to subscription bibliographic resources that may change according to the contracts of publishers and higher education institutions. It is recommended, in order to continue to meet the needs of users, to incorporate a form to receive suggestions from users, from the learning object itself, to obtain information that promotes future studies and new designs to better serve the academic population.

6. REFERENCES

Association of College and Research Libraries. (2016). *Standards for Distance Learning Library Services*. http://www.ala.org/acrl/standards/guidelinesdistancelearning

Creswell, J. W., & Guetterman, T. C. (2019). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (6th ed.). Pearson Education Inc.

Cuno, A., Mauricio, D., & Rodríguez, F. (2012). Aspectos de las Ciencias de lo Artificial. In *Congreso Internacional de Computación y*

4. https://www.upr.edu/biblioteca-uprrp-cn/competencias-de-informacion/

Telecomunicaciones (COMTEL) (pp. 116-120). Universidad Inca Garcilaso de la Vega. http://repositorio.uigv.edu.pe/handle/20.500.11818/853

Curzon, S., & Quiñónez-Skinner, J. (2016). Academic Libraries. In J. D. Mcdonald & M. Levine-Clark (Eds.), *Encyclopedia of library and information sciences* (4th ed., pp. 1-13). CRC Press.

DINNGO. (2012). *Design Thinking en Español.* https://www.designthinking.es/

Gay, L. R., Mills, G. E., & Airasian, P. (2012). *Educational research: Competencies for analysis and applications* (10th ed.). Pearson College Division.

Gibault, M. J. (2018). Organization of materials and accessing the library in blackboard: A learner-centered usability study. *The Journal of Academic Librarianship, 44*(2), 190-195. https://doi.org/10.1016/j.acalib.2018.02.008

Ilham, H., Wijayanto, B., & Rahayu, S. P. (2021). Analysis and design of user interface/User experience with the design thinking method in the academic information system of jenderal soedirman university. *Jurnal Teknik Informatika (Jutif), 2*(1), 17-26. https://doi.org/10.20884/1.jutif.2021.2.1.30

Kozinets, R. V. (2014). *Netnografia: Realizando pesquisa etnográfica online*. Penso Editora.

Monje, A. (2017a). *eXeLearning 2.1. Tutorial de la nueva versión de la herramienta - Manual.* eXeLearning.net. http://exelearning.net/html_manual/exe20/

Monje, A. (2017b). *iDevices y área de trabajo.* eXeLearning 2.1. http://exelearning.net/html_manual/exe20/idevices_y_rea_de_trabajo.html

Nasution, W. S., & Nusa, P. (2021). UI/UX Design Web-Based Learning Application Using DesignThinking Method. *ARRUS Journal of Engineering and Technology, 1*(1), 18-27. https://doi.org/10.35877/jetech532

Norman, D. A., & Draper, S. W. (1986). *User centered system design: New perspectives on human-computer interaction.* Lawrence Erlbaum Associates.

Uebernickel, F., Jiang, L., & Brenner, W., Pukall, B., Naef, T., & Schindlholzer,B. (2020). *Design thinking: The handbook. World Scientific Publishing Co.*

Wiley, D. A. (2002). Connecting learning objects to instructional design theory: A definition, a metaphor, and a taxonomy. In *The Instructional Use of Learning Objects* (pp. 3-23). Association for Educational Communications & Technology.

7. ANNEXES

1.THEMATIC GUIDES

Thematic guides (tertiary source that groups resources by topics) facilitate searching of information grouped by the academic disciplines offered in the Faculty of Natural Sciences (Biology, Chemistry, Computer Science, Environmental Sciences, Mathematics, Nutrition and Physics).

Guías temáticas

Las guías temáticas son recursos de información agrupados por disciplinas o temas. Están diseñados para facilitar la recuperación de información por estudiantes que aún están conociendo los recursos de información que les brindamos en el CiTec. En ellos se incluyen recursos recomendados de libros, artículos de revistas y bases de datos, entre otros. Te invitamos a darles una miradita (abren en una página externa).

- Biología
- Ciencias de Cómputos
- Física
- Genética de Drosophila
- Marie Curie
- Matemáticas
- Nutrición
- Química

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Anterior | Siguiente

Source: Own elaboration

2.ELECTRONIC BOOKS

Electronic books by disciplines offered at the FCN. This is a section that identifies databases containing e-books, divided by topics, to facilitate their access remotely. Links to these resources addresses the academic community through the proxy to authenticate with their institutional credentials.

Libros electrónicos

Estos son los libros electrónicos que puede acceder agrupados por disciplinas académicas de la Facultad de Ciencias Naturales:

Disciplina académica	Libros electrónicos
Biología	Springer Link, Safari*, SDGOnline
Ciencias Ambientales	SDGOnline
Ciencias de Cómputos	Safari
Física	Springer Link, Safari
Matemática	Springer Link, Safari
Nutrición	Taylor and Francis eBooks (Antes CRCnetBase)
Química	Springer Link

* Safari Books requiere, si es la primera vez, que se registre en la plataforma O'Reilly.

Source: Own elaboration

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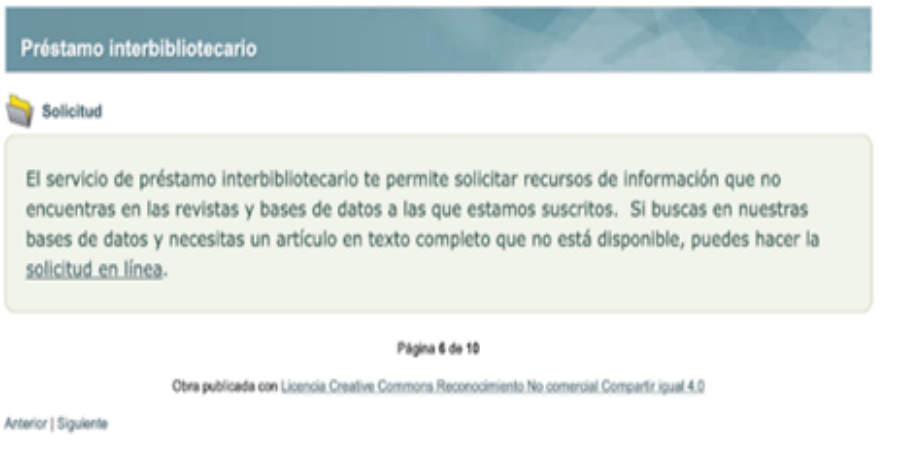
3. REMOTE ACCESS

Remote access to databases and journals allows users to enter remotely, to all the resources provided by the institution. It is a good option for those who already know what they are looking for and where to search for it.

Source: Own elaboration

4.INTERLIBRARY LOAN

Interlibrary loan for resources that aren't available at the campus. The learning object provides access to the online service application form designed in Google Forms.



Source: Own elaboration

5. METASEARCHER

Metasearch (makes it easy to search for information from a single resource). This section helps students who are still developing their information-seeking skills. It allows them to search, simultaneously, in the library's catalog and in all the journals that the Río Piedras Campus has subscribed to.

Source: Own elaboration

6. CONTACT INFORMATION

The Contact section provides information from the library's social networks so they can follow us in different platforms for news and updates.

Source: Own elaboration

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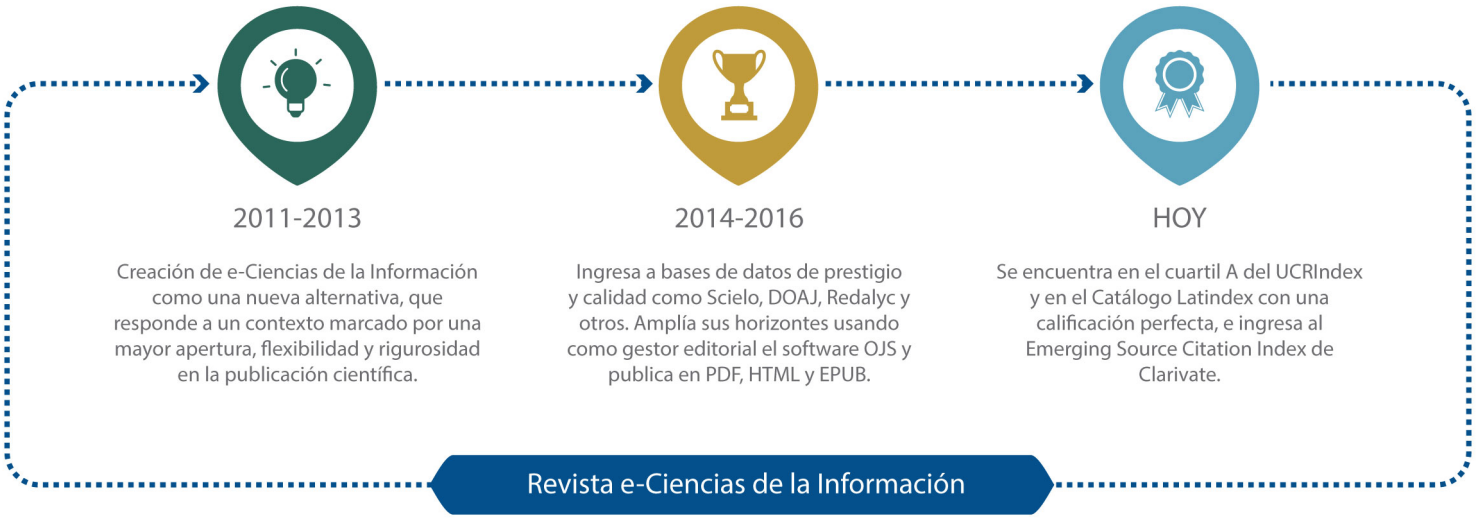

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