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Web platform for disseminating the scientific production of Scopus-indexed researchers at a university in Lima Norte, Peru

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Abstract

At the Universidad de Ciencias y Humanidades (UCH), the visibility of research is crucial to strengthening collaboration and scientific impact. The lack of adequate technological tools to promote the contributions of its researchers was identified. This project developed an interactive digital totem to facilitate the visibility and recognition of research at the UCH. The methodology used was Design Thinking, which included the phases of Empathize, Define, Ideate, Prototype, and Evaluate. Surveys were carried out on the researchers to find out their needs, which made it possible to create a functional prototype. The interface was developed with React, providing an interactive user experience, while the backend was built with Python and Flask, making it easy to create a robust server. In addition, APIs such as Scopus and a proprietary API based on MongoDB were integrated to manage researchers' information. The results were positive: 100% of respondents felt that the system would increase their interest in research, and 85% highlighted the ease of navigation and relevance of the information. In conclusion, the project fulfilled its objective of promoting research at the UCH, achieving a positive impact on the visibility of scientific production. It is recommended to continue refining the system and adding new functionalities to optimize interaction and expand its reach within the academic community.

Keywords: Real-time dissemination, Research visibility, Scientific production, Scopus-indexed researchers, Web platform.

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1. Introduction

. In the global academic context, the visibility of researchers and the promotion of their scientific contributions have become crucial elements to strengthen collaboration, recognition, and impact in the academic community. In fact, the author

Zimba and Gasparyan [1] states that social networks play a significant role in increasing the presence and visibility of researchers in scientific communities, both nationally and internationally. As institutions seek to position themselves internationally, the author Boulton [2] states that the need to have tools that make scientific work visible and promote global collaboration has become a priority. Institutional tools, such as digital repositories, can significantly improve the reputation and visibility of universities in this context. Many researchers have implemented innovative technologies to enhance the visibility of their work, using digital platforms that allow wider and more efficient access to their publications, as mentioned in the study by Bashir et al. [3].

In this framework, the Universidad de Ciencias y Humanidades has identified the lack of visibility of its researchers as a key problem. The author Degtev [4] states that institutional recognition can be affected if adequate technologies are not used to disseminate scientific production. In other institutions, the author Sotudeh et al. [5] state that the promotion of researchers has increased collaboration between universities and research centers, improving the overall projection of their achievements. In addition, the author Ebrahim [6] also agrees that the use of social networks and digital tools has proven to be crucial to increase the presence and visibility of researchers in scientific communities at the national and international level.

At the national level, the use of technology platforms to promote researchers has shown promising results. The author Rivera and Bocanegra [7] notes that, in particular, the "MAUCHIS" platform, a free artificial intelligence initiative, has contributed significantly to cancer prevention awareness and to providing medical care to vulnerable populations in Peru. In recent years, many Peruvian universities have adopted digital promotion strategies to improve the dissemination of their research, positioning themselves as reference centers in their respective areas [8, 9]. This has led to an increase in the number of collaborations and in the visibility of Peruvian researchers at a global level, as indicated by the authors [10, 11].

At the Universidad de Ciencias y Humanidades, an innovative solution has been sought to improve the visibility of the institution's researchers. With the development of an interactive totem, it is hoped not only to give visibility to scientific contributions, but also to facilitate the interaction of the public with the academic production of researchers [12]. This type of solution has been implemented little in the local context, which places the university as a pioneer in this type of initiative, similar to efforts observed in other institutions, where the creation of interactive tools has increased the visibility of research and improved collaboration in the academic field [13].

Despite the valuable work carried out by researchers from the Universidad de Ciencias y Humanidades, the lack of adequate technological tools limited the impact of their scientific production. To address this challenge, the author Souza et al. [14] state that an interactive totem was developed that integrates specialized hardware with software that queries the Scopus API, displaying up-to-date data on researchers' publications. This system not only includes an interactive slider and a dynamic dashboard based on Highcharts, which allows for attractive and accessible visualization of scientific production, but also enhances the creation and management of research profiles. The author Tramonti et al. [15] also mentions that social media technologies contribute to making the process of scientific dissemination more dynamic, integrating professors and student researchers into a collaborative network. This development not only improves the visibility of researchers but also establishes a dissemination channel that facilitates access to their work.

The methodological approach used in the development of the interactive totem is based on Design Thinking, a user-centric methodology that allows technological solutions to be iterated and adjusted according to the needs of end users. This methodology has proven to be effective in creating educational solutions, encouraging creative thinking, and improving problem-solving skills in students [16]. In particular, the author Pande and Bharathi [17] highlights that a methodological framework that combines Design Thinking with educational robotics classes can foster creative thinking and improve students' abilities to address challenges. This approach has been widely used in the design of technological solutions in academia and business, thanks to its ability to generate innovations adapted to specific contexts [18].

The importance of this work lies in the fact that it represents a strategic advance for the university, making it the first institution to implement a technology of this type to promote its research at the local level. Solutions that integrate interactive hardware and software have proven to be effective in increasing the visibility and impact of academic production. The author Memon et al. [19] note that integrating design-based learning and project-based learning into software engineering courses significantly improves student performance and engagement, resulting in a more dynamic academic environment. This technology not only strengthens the positioning of the university but also facilitates collaboration and knowledge exchange between researchers, creating a more collaborative and efficient academic ecosystem. In addition, the author Gennis et al. [20] stresses that the use of interactive technologies can positively influence student satisfaction and academic performance, further reinforcing the need to adopt such innovations in the educational field.

The main objective of this study is to evaluate the impact of the interactive totem on the perception of university researchers. According to the author Pedersen et al. [21] exposure to university researchers through video recordings leads to significantly more positive perceptions about the research compared to a control group. To measure changes in the public's perception of research at the Universidad de Ciencias y Humanidades, surveys will be conducted before and after the implementation of the totem pole. Likewise, it seeks to determine if this technological tool has significantly contributed to improving the visibility of scientific production and has enhanced the academic prestige of the institution, similar to what has been observed in previous studies on the improvement of academic perception through exposure to interactive initiatives.

The project to promote the visibility of researchers at the Universidad de Ciencias y Humanidades is based on the Design Thinking methodology, which prioritizes the needs of end users. Throughout the five phases of Design Thinking (Empathize, Define, Ideate, Prototype, Evaluate), the team developed an interactive system that presents the researchers' scientific output. In the Empathize phase, surveys were conducted with researchers to identify their challenges and expectations, which made it possible to define the lack of visibility as a key problem. During the Ideate phase, solutions such as an interactive slider and a dashboard were proposed. The final prototype, developed with technologies such as Python, Flask, React, and MongoDB, shows the profiles of the researchers, their scientific publications, and statistics, with real-time integration through APIs such as Scopus. The tool makes it easy to visualize data using interactive charts with Highcharts.js, improving accessibility and encouraging collaboration. According to Parizi et al. [22], Design Thinking helps to empathize with users by putting their needs at the forefront, which drives the exploration of problems and innovative solutions in software development and allows for the creation of user-centric tools that effectively respond to their demands.

In addition, the document is structured into six chapters. In Chapter I, the importance of the visibility of researchers in the academic field is introduced, and the context of the project is established. Chapter II addresses the empathy and definition phase, where the needs and challenges of researchers are identified through surveys. In Chapter III, the ideation phase is presented, generating ideas for the development of software that promotes research. Chapter IV details the prototyping process, where a functional prototype is created that reflects the characteristics of the final product. In Chapter V, the results of the validation of the prototype are shown, highlighting its positive impact on the perception of scientific production. Finally, Chapter VI concludes that the objective of the project has been successfully fulfilled, highlighting the relevance of the web system that was shown in the digital totem for the promotion of research and collaboration between researchers from the Universidad de Ciencias y Humanidades.

2. Literature Review

The literature review focuses on the development of software for the promotion of researchers at the Universidad de Ciencias y Humanidades. Previous studies on academic evaluation criteria, the use of emerging technologies in education, and tools that facilitate the visibility of research will be analyzed, thus providing a context for the implementation of a system that improves the promotion of academics in this institution.

The work of Scopus [23] establishes that the academic criteria for promotion and tenure in faculties of biomedical sciences highlight the predominance of traditional criteria, such as the number of publications and the impact of journals. The methodology used included a comparative analysis of evaluation policies in various universities. The results indicate that innovative criteria, such as data sharing and open access publishing, are little considered. This suggests that a rigid approach could hinder the adoption of more open and collaborative scientific practices. The conclusions indicate that, in order to advance biomedical research, it is crucial to reevaluate the evaluation criteria and consider models that promote transparency and access to data. This research is relevant to the study in question, as it raises the need for a change in academic assessment to facilitate a more collaborative environment in science.

Likewise, Mekterović et al. [24] he states that research on automated grading systems highlights the impact of emerging technologies on education. Using a methodology based on controlled experiments, we analyzed how the implementation of machine learning algorithms can improve accuracy in trial evaluation. The results indicate that, by reducing the workload of educators, a more objective and efficient evaluation is achieved. The conclusions underline that this transformation in educational evaluation could serve as a model to optimize processes related to the promotion and tenure of academics, which is related to the interest in integrating technology in academic evaluation.

On the other hand, Cui et al. [25] he also agrees that the research presenting a recommender system based on collaborative filtering aims to improve the personalization of learning in various contexts, including education. The methodology of the article involves the development and testing of a recommendation model called TCCF, which uses the temporal correlation coefficient and an improved K-means with cuckoo search (CSK-means). Not only does this system group similar users together to provide quick and accurate recommendations, but it also takes into account the variability in user preferences over time. The results revealed that the accuracy of recommendations improved by 5.2% compared to previous methods, suggesting that personalization is crucial to improving academic outcomes, which is directly linked to the need to adapt education to current market demands.

In addition, learning analysis tools, such as CADA and LADA, are discussed in research that emphasizes their usefulness in learning design [26, 27]. CADA focuses on providing teachers with insights into student engagement and speech patterns in online discussions, allowing them to adjust their teaching strategies in real time. On the other hand, LADA supports academic advisors through comparative and predictive analytics, which improve decision-making in difficult cases. Both studies highlight the importance of aligning these tools with pedagogical needs, which is crucial to optimizing educational decision-making.

User-centered design is presented as a key element to improve institutional repositories, addressing usability and accessibility [28]. The methodology includes surveys and interviews with users to identify the most common problems in the use of these platforms. The results indicate that a user-centered approach can facilitate the search and retrieval of information. The conclusions highlight the need to improve these platforms to maximize their effectiveness, which is relevant to the study on information management in academic environments.

Finally, van Leeuwen et al. [29] reveals that the use of predictive analytics dashboards is presented as an effective strategy to maximize student outcomes. Systematic research shows that implementing these tools improves transparency and informed decision-making among study advisors. The results indicate that students who are monitored through these dashboards have superior academic performance. The conclusions suggest that these tools can be vital in promoting scientific production and academic performance, aligning with the interest in improving educational assessment.

In addition, Barker et al. [30] research addresses the relevance of developing services that ensure that data is findable, accessible, interoperable, and reusable, principles known as FAIR. Through a case analysis approach, current initiatives in the field of research are evaluated, revealing that the implementation of these principles can significantly improve collaboration and facilitate access to data. The findings suggest that promoting data interoperability and accessibility fosters a culture of effective collaboration among researchers, underscoring the need for a data environment that supports cooperation in scientific projects.

Likewise, Ifenthaler and Yau [31] research reveals that capitalizing on learning analytics dashboards allows for timely and data-driven interventions. The methodology used includes the evaluation of use cases in which these tools have been implemented. The results show significant improvements in student achievement, highlighting the importance of using data to inform educational decision-making. This connection underscores the growing interest in the use of analytical technologies to optimize assessment and support for at-risk students.

Finally, García-Peñalvo et al. [32] research explores the role of artificial intelligence in education, highlighting its potential to personalize learning and improve efficiency in educational management. The methodology used included a systematic review of recent studies on the implementation of AI in educational settings. The results reveal that AI-based recommendation systems can tailor educational resources to students' individual needs, thereby optimizing their learning. The findings emphasize that the integration of AI can transform education, enabling a more learner-centric approach. This research relates to work by underscoring the relevance of technology to personalize the educational experience and improve academic outcomes.

In conclusion, the research analyzed highlights the importance of integrating innovative technologies to promote scientific production. Approaches such as the use of dashboards, data analysis platforms, and FAIR data principles are essential for improving visibility and collaboration in research.

3. Methodology

In this section, we will present how the design thinking methodology will be used to develop software focused on the promotion of researchers at the Universidad de Ciencias y Humanidades. The five phases (Empathize, Define, Ideate, Prototype, Evaluate) that will guide the project from start to finish will be detailed. The process includes the collection of information through surveys conducted by the development team, with the active participation of the researchers, who will respond to provide relevant data. Based on their answers, the team will propose the best solutions to properly reflect the researchers' work in the application. Finally, researchers will review the proposed design and decide whether it is satisfactory or requires improvement, thus ensuring that the tool meets their needs and expectations for academic visibility.

3.1. Design Thinking

Design Thinking is a highly creative methodology dedicated to problem-solving and is one of the most important tools for user experience (UX/UI) designers, demonstrating efficiency in the design of products and services. This methodology has been key in the development of technologies that promote visibility and recognition in academic environments, such as software for the promotion of researchers. The Design Thinking approach effectively improves user experience and interface design in academic campus systems, achieving a 100% success rate in web applications and 90% in mobile applications [33]. This allows innovation in each project and improves the processes suggested by users and customers, ensuring that the solutions are adaptive and focused on their needs.

The Design Thinking approach focuses on understanding the challenges presented by the user by identifying their main needs, desires, and concerns. To achieve this, this methodology requires observing and analyzing user behavior to implement continuous improvements, integrating a collaborative approach that prioritizes good design practices. The Design Thinking process is broken down into five fundamental stages: empathize, define, ideate, prototype, and evaluate. These phases allow for iteration and refinement of technological solutions aligned with institutional objectives, ensuring effective and user-centric development. Involving end users in this process is crucial to identify the most relevant issues and develop effective solutions [34]. In addition, the approach makes it easier for designers to better understand learners, allowing them to interact more successfully in online learning environments [35].

In the context of the Universidad de Ciencias y Humanidades, the adoption of this methodology has facilitated the development of an interactive totem that combines hardware and software to maximize the visibility of researchers, promoting effective and accessible interaction with the institution's scientific production. Figure 1 presents the general diagram of the stages involved.

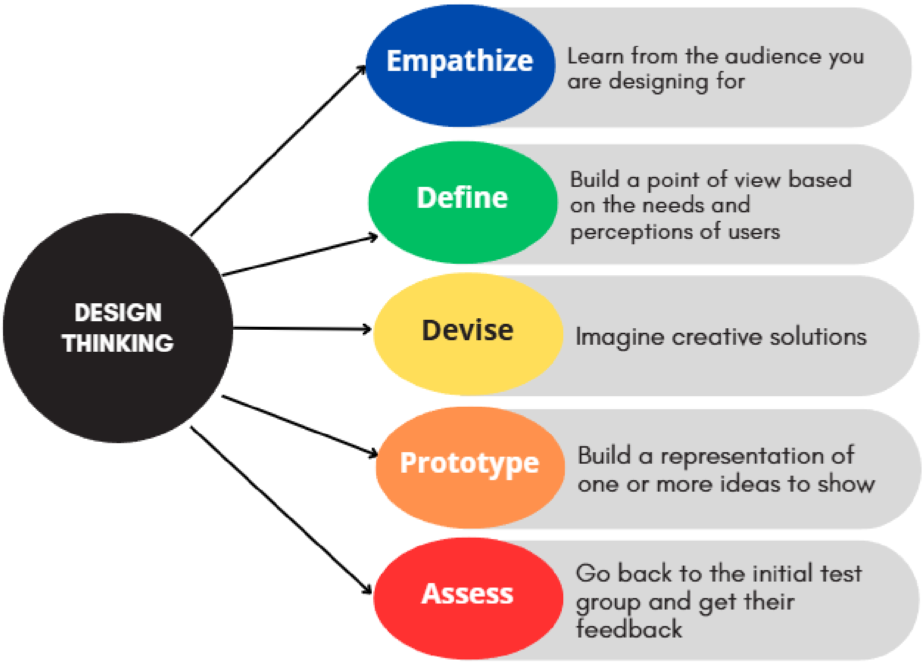

Figure 1.
Methodology design thinking.

3.2. Empathize

This is the first stage of the methodology, dedicated to conducting research and surveys to understand the needs and perceptions of researchers at the Universidad de Ciencias y Humanidades (UCH). Through a form designed to collect information on the scientific production and visibility of researchers, it seeks to identify their main challenges and expectations. Table 1 presents the key questions included in the survey, which were formulated to delve into aspects such as familiarity with researchers, the importance of scientific production, and the perception of its impact on society. Participants' responses are critical to addressing their needs and seeking effective solutions.

Table 1.
Key survey questions.

ID	Question
Q1	What is your relationship with the Universidad de Ciencias y Humanidades?
Q2	How familiar are you with the researchers at UCH?
Q3	Are you aware of the specialization or research area that any UCH researcher focuses on?
Q4	How important do you consider scientific production for the reputation and development of UCH?
Q5	How would you rate the impact of UCH's scientific production on society?
Q6	Do you believe the university should monitor the growth in scientific production of its researchers in more detail?
Q7	Do you consider it useful for the university to provide periodic reports on the growth in scientific production of its researchers?
Q8	How relevant do you consider the number of scientific publications as an indicator of growth in scientific production?
Q9	How relevant do you consider the number of citations received as an indicator of growth in scientific production?
Q10	Do you have any suggestions on how to promote researchers and the scientific production of UCH?

3.3. Define

In this phase, an analysis of the responses collected in a survey carried out among people related to the Universidad de Ciencias y Humanidades (UCH) is presented. The purpose of this survey was to understand the perception and familiarity of the respondents with respect to the scientific production of the university. The most relevant results are presented below, which will serve as a basis for future decisions and actions in the field of research and scientific communication.

From the data collected, several key problems and needs were identified that affect the visibility of the scientific production of UCH researchers and their interaction with the academic community. These problems and needs are grouped into the following points:

50% of respondents feel unfamiliar with UCH researchers, while 29.2% feel somewhat familiar. In addition, 29.2% of respondents do not know the university's research areas, indicating a lack of visibility of scientific production within the institution.

62.5% of those surveyed consider that scientific production is very important for the reputation of the UCH. However, the lack of visibility of these achievements could be limiting the recognition of the university at the national and international levels.

83.3% of those surveyed believe that the university should monitor the growth in the scientific production of its researchers in more detail. This suggests the need for a tool to monitor and visualize advances in scientific production.

A high percentage of respondents (66.7%) considered that periodic reports on scientific production would not be useful. However, they suggested the implementation of an interactive system, such as a slider or a dashboard, that shows the scientific production of researchers. This type of tool could improve the visibility and impact of the scientific production of the UCH.

3.4. Devise

In this phase, the objective is to generate and explore various solutions to address the identified problem: the lack of visibility of scientific production at the Universidad de Ciencias y Humanidades (UCH). After defining the needs and challenges in the previous phase, the following solutions are proposed that could help improve the visibility of scientific publications and foster collaboration among researchers.

Table 2.
Ideas.

ID	Idea
I1	Interactive platform to display scientific publications.
I2	Dashboard to monitor the impact of publications.
I3	Interactive slider to showcase researchers' achievements.
I4	Recommendation system to promote collaboration.

3.5. Prototype

In the prototyping phase, the aim is to materialize the solutions devised during the previous phases of the process. Using the needs and challenges identified in the Empathize and Define phases, as well as the ideas generated in the Ideate phase, a functional prototype is created that reflects the design and characteristics of the final product. This prototype not only serves as a visual and functional representation of the tool but also allows the proposed solutions to be tested and adjusted.

In this case, the prototype includes an interactive slider and a dashboard that visually presents the scientific production of researchers from the Universidad de Ciencias y Humanidades, with the aim of improving visibility and access to relevant data. During this phase, iterations were carried out based on user testing, seeking to optimize the experience and ensure that the tool responds to the expectations of end users.

3.5.1. Tools and Technologies

The prototype was developed using a set of tools and technologies that allowed for the creation of an interactive and scalable solution. On the backend, Python was used with the Flask framework to handle HTTP requests and manage server logic. The Scopus API was integrated using the requests library to obtain information about researchers, such as their documents and scientific production. In addition, a custom API was created with MongoDB to store additional information about researchers, such as their degrees and image paths, which are stored in AWS S3.

On the frontend, React was used to create a dynamic and interactive interface. Navigation between researchers is done through a slider developed using a custom component that allows both an automatic change every 20 seconds and the option of manual scrolling. This slider interacts with the backend API to display real-time data. For the interactive charts in the dashboard, Highcharts.js was integrated, which allowed the visualization of data related to scientific production, total documents, and researchers. In addition, React Router was implemented for navigation between different sections of the page, including a link to the university's dashboard, which displays the graphs and general statistics.

3.5.2. System Architecture

In this section, diagrams describing the architecture of the system are presented, detailing how the different components of the system are structured and communicated. The diagrams illustrate the interaction between the frontend, backend, external APIs, and storage services, providing a comprehensive view of how the solution works as a whole. The diagrams used to represent the key aspects of the system are described below.

As can be seen in Figure 2, this diagram shows the main components of the system and how they communicate with each other. It visualizes the relationship between the frontend (developed in React), the backend (with Flask), and the external APIs that are consumed, such as the Scopus API to obtain data from researchers and the MongoDB API for academic degrees and images stored in AWS S3. In addition, the diagram includes the connections between the system and the databases, illustrating the way data flows and is managed within the architecture.

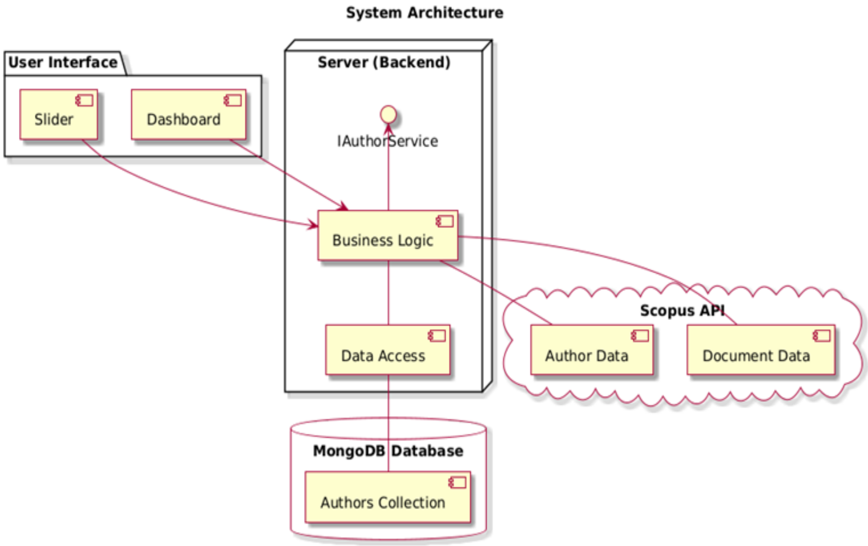

Figure 2.
Component diagram.

As you can visualize in Figure 3, the sequence diagram describes the flow of interactions that occur when a user interacts with the slider in the interface. This diagram shows step-by-step how the frontend requests the data from the backend, which in turn queries the Scopus and MongoDB APIs to obtain information from the researcher. It also describes how API responses are handled and how data is processed before being sent back to the frontend for visualization. This diagram illustrates the temporal order of operations that enables dynamic interaction with the system.

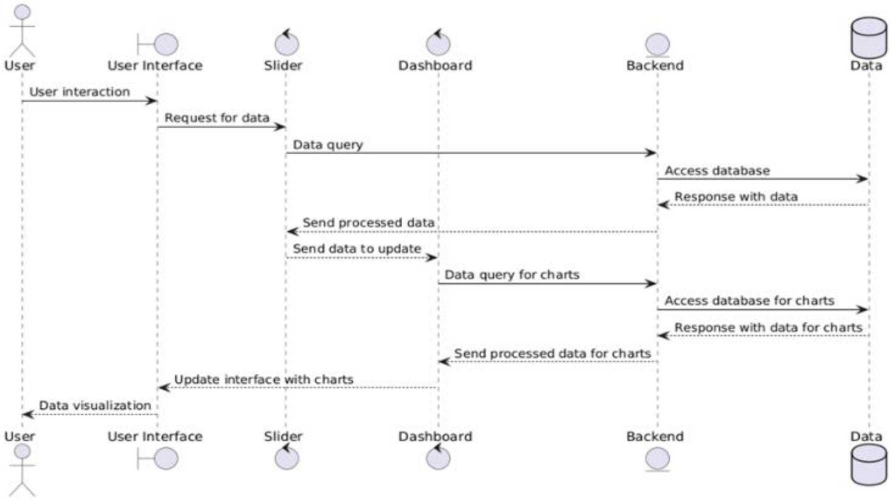

Figure 3.
Sequence diagram.

As shown in Figure 4, the flowchart provides a visual representation of how data moves through the system, showing key decisions and processes, from data input to final output. In particular, it illustrates how users interact with the system to query information about researchers, how data is retrieved from external APIs and databases, and how images stored in AWS S3 are managed. In addition, the diagram shows how this data is presented to the end user on the frontend. Overall, this diagram makes it easy to understand system operations sequentially, from the start to the completion of a task.

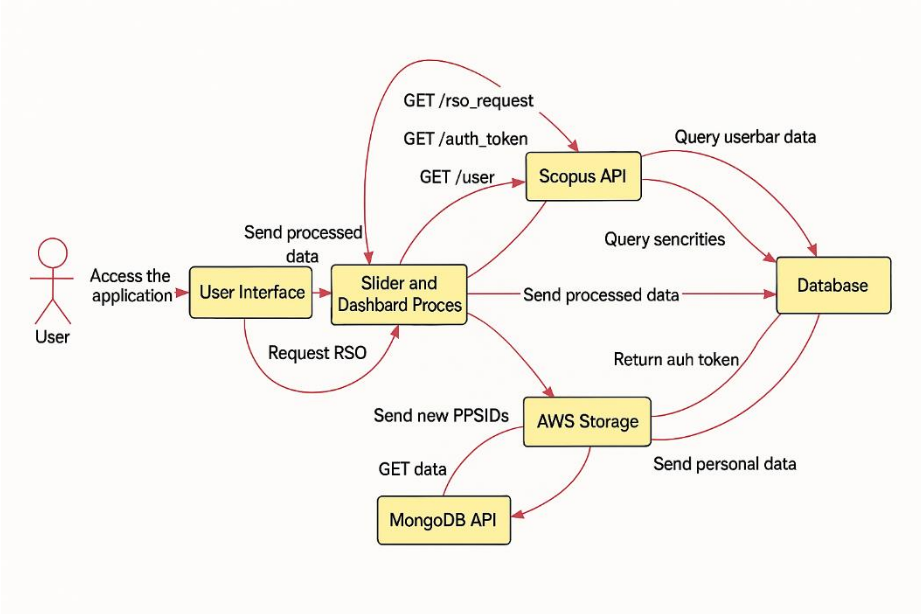

Figure 4.
Flowchart.

3.5.3. Prototype Development

In this phase, the interactive prototype was implemented with the aim of showcasing the scientific production of researchers from the Universidad de Ciencias y Humanidades. The system consists of two main components: the frontend, developed in React, and the backend, managed by the Flask framework.

On the frontend for the user interface, an interactive slider was designed that allows automatic and manual navigation between the researchers' profiles. Each profile displays information about the researcher, such as their name, degree, scientific publications, and an associated image, which is stored in AWS S3. The slider also connects to the backend to get real-time data from the Scopus and MongoDB APIs. The slider also has the ability to switch automatically every 20 seconds or manually through user interaction.

Figure 5 shows the prototype of a slider where the profile of a researcher is displayed. Each slider card includes key information such as the researcher's full name, academic degrees, the total number of citations they have received, and the number of scientific papers produced. In addition, an image of the researcher is included, providing a detailed and accessible view of their academic and scientific achievements. Following this information, a graph is presented that visualizes the areas where the researcher has had the greatest scientific production, highlighting their contributions in different disciplines.

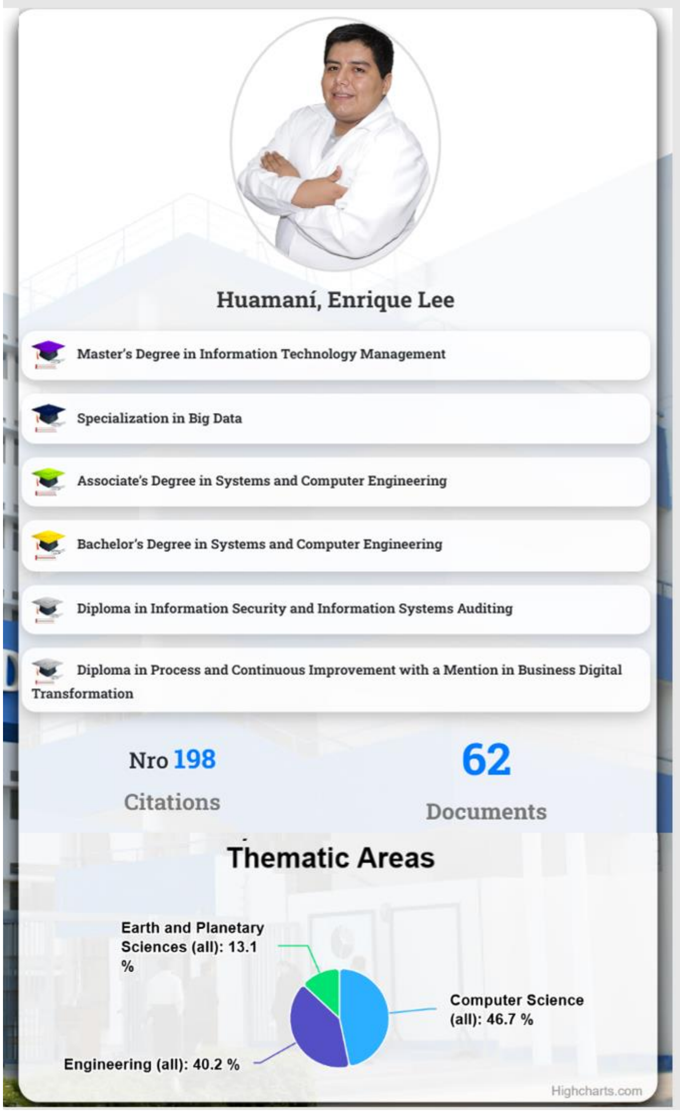

Figure 5.
Researcher Slider Prototype.

Figure 6 presents the prototype of a dashboard that shows a bar graph with the top 5 researchers by the total number of citations they have received. In this case, it is observed that the researcher Alva-Mantari, Alicia, occupies the first place with 251 citations. This dashboard allows you to easily compare the influence of authors within the university's academic community, providing an overview of the most-cited researchers.

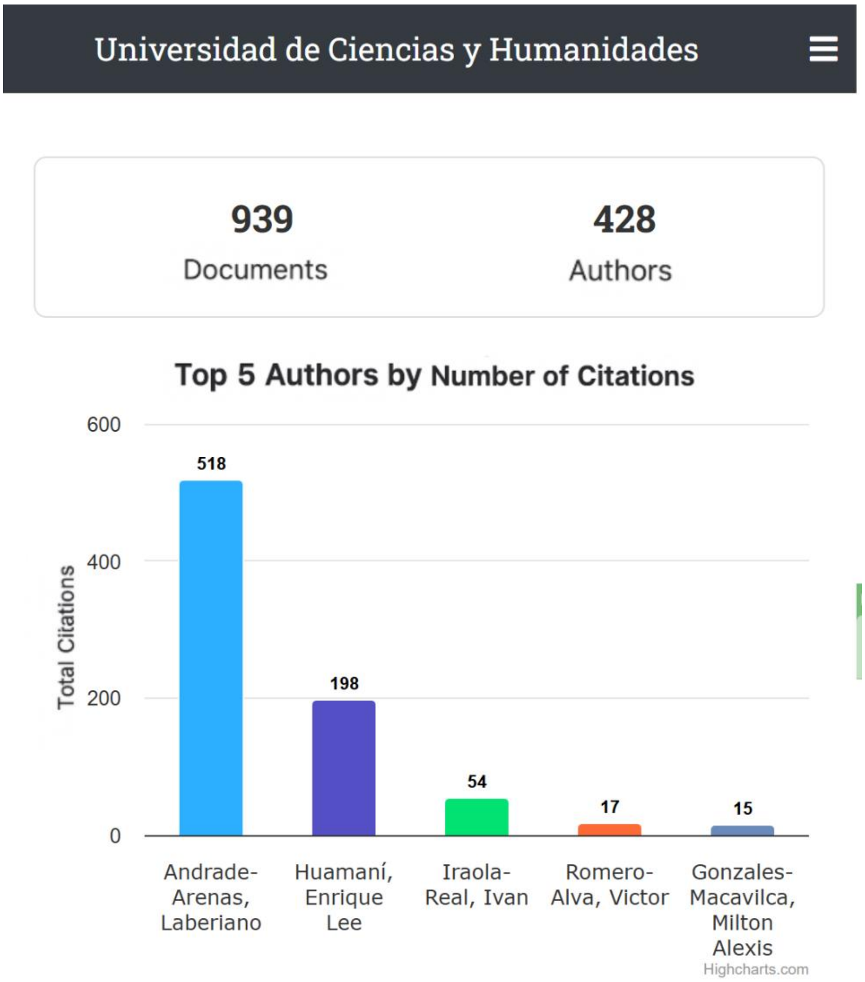

Figure 6.
Researcher Appointments Dashboard.

Figure 7 illustrates the prototype of a bar graph showing the number of published papers per author, highlighting researcher Roman Gonzales Avid as the leader with 180 papers. This graph provides a clear view of the performance and productivity of researchers in terms of scientific output, allowing the impact of authors to be compared according to their number of publications.

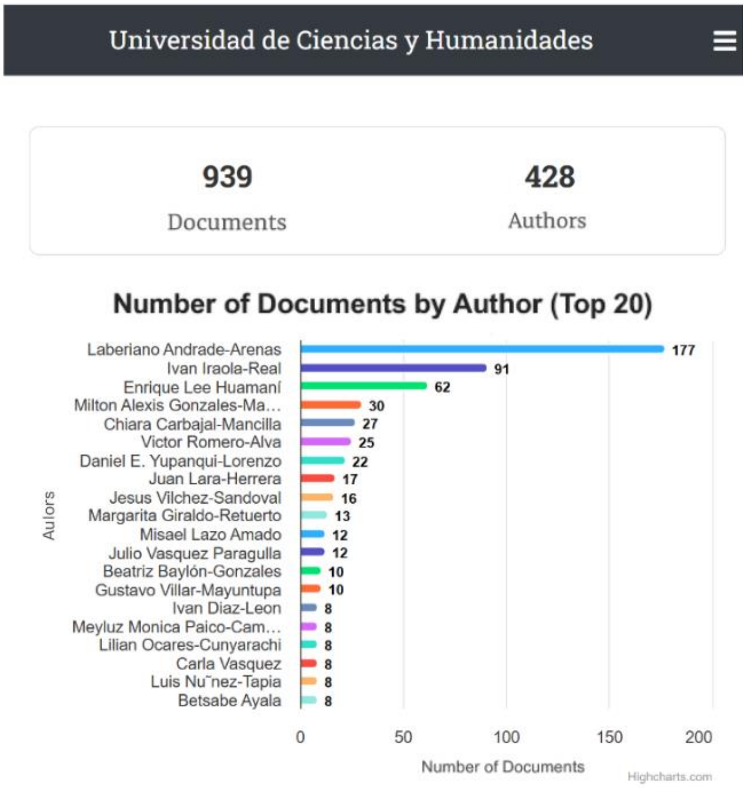

Figure 7.
Number of Documents per Author Dashboard.

Figure 8 presents the prototype of a distribution graph that visualizes the areas of specialization with the greatest scientific production within the university. The graph highlights that Engineering leads with 29.7% of the total scientific production, followed by Computer Science with 27.3%. The other areas of specialization complete the rest of the distribution, showing a detailed picture of where research efforts are concentrated at the university. This graph facilitates the identification of the most active and relevant areas in terms of scientific production.

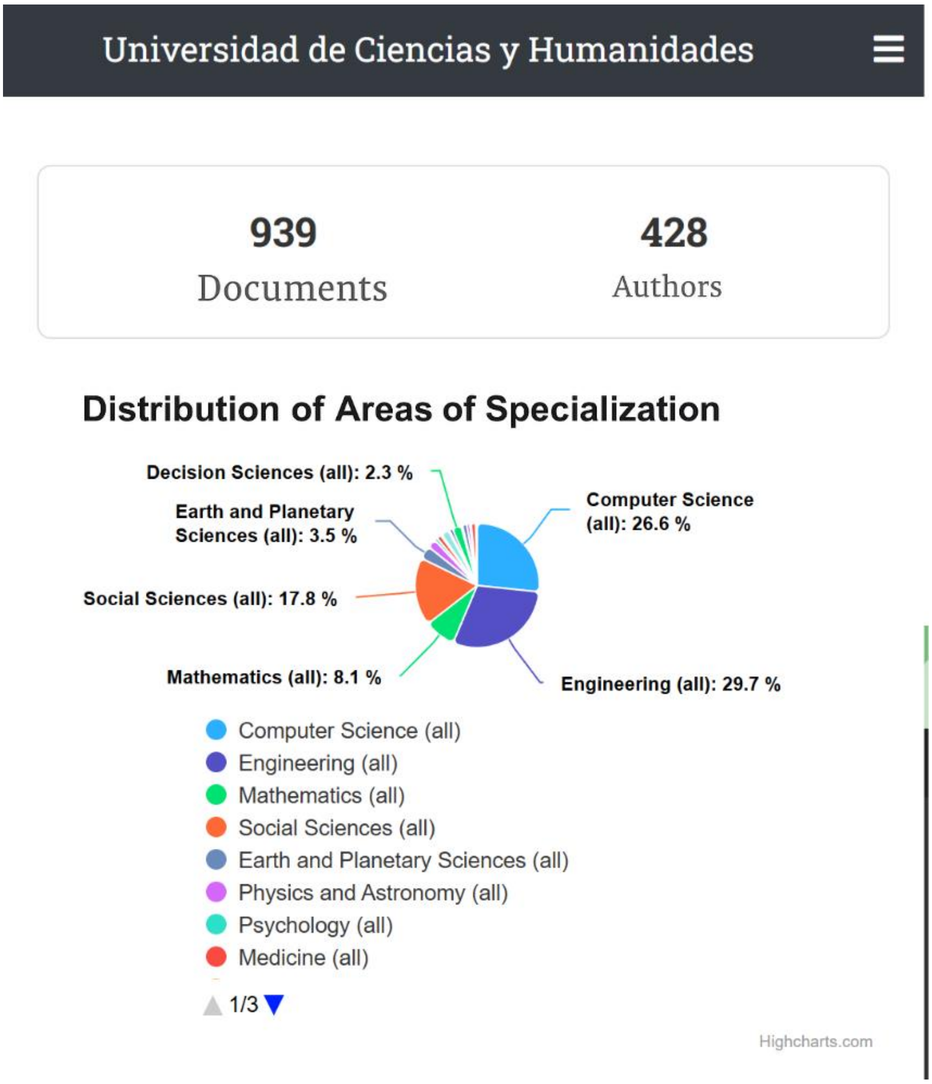

Figure 8.
Scientific Production Dashboard by Areas of Specialization.

The backend was built with Flask, making it easy to handle HTTP requests and interact with external APIs. The Scopus API was integrated to get researchers' details, such as their scientific papers and publications, while a custom API with MongoDB handles additional information, such as academic titles and image paths. These images are stored in AWS S3, and their paths are stored in the database for retrieval and display on the frontend. The backend path file contains the functions responsible for consuming these APIs and processing the necessary information.

Using React made it possible to create a dynamic and efficient interface, while Flask made it easy to create a lightweight yet functional backend. External APIs from Scopus and MongoDB provided the necessary data, and Highcharts.js was used to generate interactive graphical visualizations. In addition, the use of AWS S3 enabled efficient storage of the researchers' images.

3.6. Evaluate

Functionality testing was conducted to ensure that the prototype met the technical requirements of the system and was able to handle interactions correctly. The interactive slider was found to allow users to navigate between researchers' profiles seamlessly, with both automatic and manual transitions.

In addition, it was verified that the Scopus API and the MongoDB database were properly integrated with the prototype to retrieve the researchers' data and their publications. The tests confirmed that the information was uploaded in real time, with no noticeable delays.

Figure 9 shows how the user interacts with the slider totem, observing how the researchers' profiles change dynamically as they navigate between them. The image illustrates both the operation of the automatic transition and the manual scrolling option to switch between the different profiles of the researchers.

Figure 9.
Interaction with the slider on the digital totem.

The dashboard displays interactive graphs of scientific production and other relevant data. Users must be able to quickly understand the information displayed and navigate through the different charts.

Next, the dashboard is presented, which interactively visualizes the data of the scientific production of the university's researchers, as well as the total scientific production at the institutional level. Users have the ability to interact with the navbar to explore the different graphs available, which offer a clear and detailed representation of the information. This allows for easy navigation between the various charts, making it easy to access relevant data. In Figure 10, you can see the dashboard in operation, highlighting how users can interact with the graphs and explore scientific information dynamically.

Figure 10.
Interactive dashboard of scientific production.

In this phase, a questionnaire with key questions is used to assess the effectiveness and usability of the digital totem prototype from the users' perspective. The questions address aspects such as ease of navigation, relevance of information, general satisfaction with the design, and the impact of the totem pole on knowledge and interest in the scientific production of the UCH. The information gathered will help determine if the system meets the proposed objectives and identify possible areas for improvement. As shown in Table 3, the questions in the questionnaire include aspects related to ease of use, relevance of information, and overall perception of the impact of the digital totem.

Table 3.
Prototype Evaluation.

ID	**Question**
Q1	How easy was it for you to navigate the digital totem?
Q2	What is your overall impression of the design and usability of the totem?
Q3	Do you think that the digital totem has increased your knowledge about the scientific production of the UCH?
Q4	How relevant do you consider the information presented on the totem pole to your relationship with the UCH?
Q5	Are you satisfied with your overall experience using the totem?
Q6	Do you think the digital totem could increase interest in UCH research?

4. Results

In this phase, an evaluation of the digital totem was carried out with the participation of users. The results of this evaluation are presented below, highlighting the most relevant aspects and the general acceptance of the system.

4.1. Prototype Validation

The results of the survey, presented in Table 4, reflect a positive reception towards the prototype of the digital totem. In terms of ease of navigation, 57.1% of users indicated that navigation was easy, while 42.9% considered it very easy. This suggests that the interface is intuitive and easy to use for most. Regarding the design and usability, 85.7% rated the design as very good, which highlights the positive acceptance of the aesthetics and functionality of the interface. Only 14.3% considered the design to be good, which is also a favorable outcome.

In terms of knowledge about scientific production, 85.7% of users stated that their knowledge increased significantly. This indicates that the tool meets its objective of improving the understanding of the university's research. 57.1% considered the information presented to be very relevant, while 42.9% found it relevant, suggesting that the content is pertinent and useful to users.

Finally, 100% of respondents expressed that the system would increase their interest in research, which validates the positive impact of the prototype

Table 4.
Prototype Evaluation.

Evaluated Aspect	Answers	Percentage (%)
Ease of Navigation	Easy	57.10%
	Very easy	42.90%
Design and Usability	Very easy good	85.70%
	Well	14.30%
Knowledge about Scientific Production	Definitely increased	85.70%
	Something improved	14.30%
Relevance of Information	Very relevant	57.10%
	Relevant	42.90%
Overall Satisfaction	Satisfied	40%
	Very satisfied	60%
Impact on Research Interest	Interest in research would increase	100%

5. Discussion

The results obtained in the validation of the prototype of the digital totem are quite positive, corroborating the hypothesis that an interactive tool can increase knowledge about scientific production and interest in research. In particular, the ease of navigation and design were highly rated by users. These results are in line with previous studies, such as that of Gutiérrez et al. [27], which emphasizes the importance of user-centered design to improve usability and accessibility in academic platforms. In fact, the majority of users rated the design as "very good," supporting the effectiveness of the user-centric approach used in this prototype.

In terms of the relevance of the information and the impact on interest in research, the results show a high degree of satisfaction. The survey revealed that 100% of users felt that the system would increase their interest in research, which is consistent with González-Pérez et al. [28] work, which highlights how analytics dashboards can improve decision-making and user motivation. In addition, the increase in knowledge about scientific production reflects the effectiveness of the tool to meet its objective of informing and educating about research at the university, as also pointed out in the literature related to the use of emerging technologies in education [23].

However, although the results are positive, there are areas for improvement, such as the need for greater personalization in the presentation of information, which could be aligned with the recommender models mentioned in Mekterović et al. [24], which improves the accuracy and personalization of recommendations for users. Overall, the findings of the prototype validation suggest that the digital totem has great potential to foster the visibility and promotion of research, although additional adjustments are required to maximize its effectiveness in all aspects evaluated.

6. Discussion

The main objective of this project, which was to develop a digital totem to promote research at the Universidad de Ciencias y Humanidades, has been successfully fulfilled. Through the user-centered design methodology, it was possible to create a functional prototype that has been highly valued by users, who highlighted its ease of navigation, its attractive design, and the relevance of the information provided. The results of the validation show that the totem has a positive impact on both knowledge about scientific production and interest in research, thus meeting the expectations raised.

Despite the achievements made, the project has great potential to continue evolving. Additional functionalities could be incorporated, such as greater personalization in the presentation of content. In the future, it is suggested to continue refining the system, integrating new technologies that optimize user interaction and expand the reach of the tool within the academic community.

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