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PIONEERING WOMEN IN COMPUTING: A CULTURAL WEBSITE BASED ON INFORMATION ARCHITECTURE

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ABSTRACT

In an effort to acknowledge the eminent role of a number of relevant women, pioneers in the field of Computer Science, an exposition was developed as part of a cultural project hosted by the University of Jaen (Spain). In order to establish a permanent, virtual, version of this exhibition, a website has been created, as a way to allow visitors to know more about these pioneers, about their life and history, and their many contributions to the field. In addition, the site serves as a record of all events related to the exhibition, as well as multimedia galleries in order to improve the experience. In this work, we provide an analysis about the development of this site, which features information architecture guidelines, as well as accessibility and usability issues.

KEYWORDS

Accessibility, Usability, Information Architecture, Gender Gap, Female Computer Pioneers

1. INTRODUCTION

In recent decades, a noticeable gender gap has persisted in computer-related fields, often dominated by men. Only in recent years have studies (Misa, 2011) acknowledged the significance of women in computer science, aiming to promote girls' involvement in computer engineering careers. "Pioneering Women in Computing Science" ("Pioneras Informáticas" in Spanish) (García-Cabrera et al., 2021, 2023), led by the University of Jaén (Spain), is a cultural initiative dedicated to bridging this gender gap in Computer Science. The project takes the form of a traveling exhibition titled "Pioneering Women Computer Scientists: Recognizing the Contributions of Women in Computer Engineering." This exhibition invites visitors to explore the lives of several influential 20th-century women who made crucial contributions to Computer Science. For each of these Computer Pioneers, the project has created expressive comic-style posters. These posters succinctly and engagingly highlight their most notable contributions to Computer Science, share anecdotes, motivational quotes, and significant moments from their lives, including the social challenges they faced. Schools, institutes, and educational institutions can request this exhibition. Additionally, a promotional video (UJA, 2022) has been developed to support the exhibition's objectives and the broader cultural project.

In order to promote this physical exhibition, support it and progressively expand it with more educational and informative content, a website was also developed. In addition, this website serves as a permanent, virtual exhibition, and it keeps the project alive. The website can be viewed also as a historical log of all the events that have taken place related to the cultural project: the original exhibition at the University of Jaén, roundtables and conferences, external exhibitions in other educational institutions, etc. Our objective is also to gradually incorporate more protagonists and additional, richer contents to offer and maintain a digital museum about pioneering women computer scientists.

Information architecture (IA) is a critical aspect in the designing of a website that significantly impacts its usability, user experience, and overall success (Gullikson et al., 1999, Hasegawa, 2021). In particular:

- It organizes content, ensuring it to be easily found and hence reducing user frustration.
- It establishes consistent navigation patterns, making it easier for users to browse the site.
- It designs user flow and journeys, helping users to efficiently accomplish their goals.

- It prevents content overload, avoiding overwhelming users with too much information.
- It ensures scalability, making it easier to manage and maintain the website as it grows.
- It considers accessibility, ensuring the site is usable by people with disabilities.
- It improves conversion rates, as an intuitive IA leads to better user engagement and interaction.
- It effectively provides an intuitive user experience, meeting user needs and expectations.

In cultural and promotional websites, IA plays a significant role to present information in a clear, engaging, and accessible manner, the design of these websites must pay attention to:

- Categorization and Organization: IA assists in organizing content into logical categories, simplifying navigation and enabling visitors to explore cultural information and events efficiently. Grouping related content enhances user experience.
- Storytelling and Narrative: Cultural websites often feature captivating stories about history, society, biographies, or artistic endeavors. Effective IA structures and presents these narratives coherently, creating a seamless flow that captivates and engages visitors.
- Navigation: A clear and logical navigation structure is essential. IA helps users understand the website's hierarchy, improving usability. A well-structured IA reduces frustration and encourages users to explore more content through links and internal references.
- Emphasizing Key Events: IA can highlight featured events or cultural exhibits to ensure they receive appropriate attention. This may involve prominent placement on the homepage or a dedicated section for upcoming events.
- Multilingual and Multicultural Considerations: For global audiences, IA should consider multilingual and multicultural aspects. Providing clear navigation in multiple languages and localized content options is essential for success.
- Easy Access to Practical Information: Cultural websites often include practical details like event schedules, venue locations, and contact information. A well-structured IA ensures easy access to such information, helping visitors plan their participation effectively.
- Visual Hierarchy and Design: IA and design work together. Establishing a clear visual hierarchy through typography, colors, and layout choices helps users quickly identify important information or promotional offers on the website.
- Integration of Multimedia Content: Cultural websites frequently incorporate multimedia content, such as images, videos, and audio recordings, to convey cultural experiences. IA ensures these media elements are appropriately placed, enhancing storytelling and engagement.
- Performance and Accessibility: A well-structured IA contributes to overall website performance and accessibility. It optimizes load times and adheres to accessibility standards, ensuring that the website is usable by all users, including those with disabilities.

In this contribution, we present how the design of the Computer Pioneers website has been approached with all these considerations in mind. The aim is to share this experience so that it can serve as a pattern or guide when designing the IA of cultural and educational information spaces. Section 2 describes the process followed for the design of the information architecture. In section 3 interaction, style and accessible issues are discussed. Finally, conclusions and future tasks can be found in section 4.

2. DESIGNING AN USABLE CULTURAL & PROMOTIONAL WEBSITE

The website aims to close the gender gap in Computer Science by highlighting the inspiring journeys of pioneering women who overcame obstacles to make substantial contributions to the field. Its target audience encompasses a wide range of individuals, notably schools and colleges. To fulfill its goals, the website must provide captivating, narrative-style content to engage visitors effectively. It should also incorporate multimedia elements related to the featured historical figures and include clear call-to-action design elements.

2.1 Technologies Involved in the Development of the Website

A headless architecture was considered for the development and implementation of the website. The frontend has been decoupled from the backend, allowing the use of different technologies and programming languages for each part, content management flexibility, improved performance, scalability and enhanced security.

In the internal layer, an SQLite database stores and maintains all the necessary information about the website. For the backend section, the headless Strapi CMS was considered. It can be used along with SQLite to obtain efficient results in the management of the website. ReactJS Javascript library has been used for the frontend development. Finally, Nginx has offered an efficient and secure solution as a web server.

2.2 Structured Contents: Female Computer Pioneers and Events

The core contents of our website are obvious: the story of these female computer pioneers and the events log around the traveling exhibition. Both types of contents are structured and ready to be increased over time, with new content-page for each new pioneer and event. According to this, gallery pages and formal ways to organize and filter these information spaces are needed (section 2.3). All the documentation and research project is described in depth in (García-Cabrera et al., 2021). Maintaining attention about a historical figure on a webpage requires a well-crafted approach that must combine engaging content, an appealing design, and interactive elements. Previously, fixed layouts need to be determined regarding the essentials and relevant contents about each computer pioneers:

- Short formal description. Her name, place of birth, birth-death dates.
- In two sentences. A couple of key phrases or sentences that define or characterize their most significant contributions.
- Summary: A brief summary of who they are and what they have done.
- Life. A description of their LIFE in a brief list of chronologically ordered milestones: date of birth, training, relevant social events…
- Achievements. An enumeration of contributions both in the field of Computer Science and social, especially if they have contributed to break the gender gap, chronologically ordered.
- Acknowledgements. A list of awards and recognitions related to their contributions.
- Quotes. A series of inspirational quotes or anecdotes that reflect personal or challenging circumstances they had to deal with according to their gender.
- Documentary Sources. Consulted documents, websites, books, papers, etc.
- Multimedia Material. Embedded videos or interactive content related to the female CS pioneer.

The events section serves a dual purpose: to inform visitors about the locations and details of the traveling exhibition and to engage schools and institutes, fostering their involvement in the project. This section provides simplified information, including event type, hosting institution and location, event description, and event photos (https://pionerasinformaticas.ujaen.es/en/events/exposicion-colegio-generalcastanos-bailen-en).

Furthermore, a glossary has been integrated as a third structured content component. It's designed to assist exhibition visitors, especially those less familiar with computer science terminology, in comprehending and appreciating the achievements of these pioneering women in computing. The glossary includes CS and technical terms sorted alphabetically, making them searchable by keyword or filterable by classification tags. Additionally, whenever these terms appear in website texts, they are linked to the glossary for easy reference.

2.3 Multimedia Galleries Pages

To facilitate access, search and filtering of computer pioneers and events, two gallery pages have been included. Women pioneers gallery (https://pionerasinformaticas.ujaen.es/en/computer-women-pioneers) displays each pioneer as a multimedia element with her portrait, name, place of birth, birth-death date. The gallery includes accurate sorting and filtering schemes such as A-Z index, chronological timeline and other ambiguous ones like research or career fields (software engineering, game design, artificial intelligence, and so on), nationalities, awards and companies (https://pionerasinformaticas.ujaen.es/en/events#all-events). Events gallery includes the same accurate sorting and filtering schemes and only one ambiguous: type of event.

2.4 Unstructured Contents

To ensure the success of the website it is vital to incorporate other unstructured contents but with a clear layout and visual hierarchy:

- Website and sections purpose. Texts that explain “what is the website about” in the home page (https://pionerasinformaticas.ujaen.es/en/) and the aim of each section of the website (giant drop-down menu).
- All about and How to. Texts with detailed description of the material that is part of the traveling exhibition, how to order it (events section).
- About us: Information about what is the Female Computer Pioneers cultural project, what has been its trajectory (https://pionerasinformaticas.ujaen.es/en/about-us), the work team in charge of the project and the institutions that support us (https://pionerasinformaticas.ujaen.es/en/team-sponsors), the press coverage, contact information in order to offer transparency and generate trust.
- Branding and Identity: The webpage incorporates branding elements like logos, taglines, or brand colors to reinforce the identity of the website or organization.

3. INTERACTION, STYLE, AND ACCESSIBILITY ISSUES

The preliminary study of the IA has made it possible to design a user-friendly navigation with well-organized content, a coherent hierarchy of sections/subsections, intuitive tags and usable filters. In order to attract the attention of the user, it is designed with several call-to-action elements such as:

- Buttons (https://pionerasinformaticas.ujaen.es/en/events) to directly access the computer pioneers, request the exhibition, request the visitor's opinion, etc.
- Cards to show the most relevant data of the computer pioneer and the event (https://pionerasinformaticas.ujaen.es/en/computer-women-pioneers/mary-kenneth-keller-en).
- Carousel-type elements to show videos, timeline, the Life-Achievements-Acknowledgement-Quotes of the computer pioneer.
- Icons that allow to show and/or hide elements like texts and filters (https://pionerasinformaticas.ujaen.es/en/computer-women-pioneers).

Some key style elements have been adopted that positively influence the usability of a web site:

- Typography: clear and legible typography, easy to read fonts have been chosen, with appropriate font sizes for the different sections of the website and with sufficient contrast between text and background colors to improve readability.
- White space (negative space): Proper use of white space helps create a clean, uncluttered design, making it easier for users to focus on the content.
- Color Scheme: A simple, attractive color scheme has been used that complements the brand identity.
- Consistent design elements: Buttons, call-to-action, links, headers, footers and navigation have a consistent design that promotes familiarity and helps users to navigate the site in an easier way.
- Navigation and Menus: Intuitive and easy-to-use navigation menus have been designed. Clear, descriptive labels for menu items and a navigation bar that remains visible as users scroll down the page (sticky navigation) have been considered.

In addition, different aspects have been taken into account with respect to the accessibility of the website, with the idea of favoring a suitable navigation from any type of device, and, at the same time, enriching the experience of all types of visitors:

- The website implements a responsive design, so that the content is visually attractive regardless of the screen size and resolution of the device from which it is accessed.
- In order to establish the different elements of the web interface, certain guidelines have been followed regarding the appropriate use and combination of color. For example, the interface supports both day and night modes for viewing.
- Break down the content into short paragraphs and use bullet points to present key facts or highlights. This makes the content more scannable and accessible.
- The website is hosted within the domain of the University of Jaén. This fact has made it possible to make use of some plugins as is the case of webReader (https://www.readspeaker.com/), which has been embedded in the site, making it accessible for visually impaired visitors.
- The content of the site is currently available in different languages (Spanish, English, French, German, Portuguese, Italian...), with the possibility of adding new languages in the future.

Currently, we keep working to make all multimedia material, like images and videos, accessible. In particular, we intend to develop an online version of the pioneers' posters accessible by offering audio-text descriptions. Actually, the goal is more ambitious. The aim is to offer the posters of the pioneers in video format in order to narrate their stories to make the content more engaging and relatable to the audience. The idea is to develop subtitled videos, audio-narrated and with transcriptions describing the poster and the pioneer's panels. For now, only a very preliminary prototype is offered for Computer Pioneer Chieko Asakawa (https://pionerasinformaticas.ujaen.es/en/computer-women-pioneers/chieko-asakawa-en).

4. CONCLUSION AND FUTURE TASKS

In this work, we have presented our proposal for the Female Computer Pioneers website. It is an usable website because it is based on the principles of IA: core-structured content has been identified, it offers a limited upper hierarchy that offers the really relevant options for the users, it has organized the content in a progressive way, trying to catch the audience's attention, it offers multiple criteria for sorting and filtering information, it has designed a rich and contextualized navigation and it is prepared to grow in content while keeping it well-structured and organized.

Our future plans include the maintaining of the website, while we develop and upload new contents for a new batch of Female Computer Pioneers. As the main objective of the website is to keep alive the exhibition, within these new contents we plan to develop interactive and playable versions of the exhibition posters.

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