Metaverse Basic and Applied Research. 2022; 1:20
doi: 10.56294/mr202220

REVIEW

Importance of design and user experience (UX) in web development

Importancia del diseño y la experiencia de usuario (UX) en el desarrollo web

Brayan Stiven Tovar Claros[1]

[1]Universidad de la Amazonia. Facultad de Ingeniería, Carrera de Ingeniería de Sistemas. Florencia, Colombia.

Cite as: Tovar Claros BS. Importance of design and user experience (UX) in web development. Metaverse Basic and Applied Research. 2022; 1:20. https://doi.org/10.56294/mr202220

Submitted: 06-10-2022 **Revised:** 28-10-2022 **Accepted:** 21-12-2022 **Published:** 23-12-2022

Editor: Adrián Alejandro Vitón-Castillo

ABSTRACT

This article studies the responsive design and user experience (UX) in addition to its status and importance in web design and development, these being concepts not very well known or extended in Latin America, although they are currently fundamental factors to achieve Highlight in the supersaturated world of the internet. For this, the methodology of descriptive research and some aspects of the exploratory methodology are used, based on a broad reference framework updated to no more than 5 years and a fluid explanation of the characteristics and applications of the (UX).
Currently the UX and with him, the responsive design has been adopted worldwide as a practically mandatory standard in the workplace, especially in social networks where you can see ever more impressive and ingenious demonstrations of application of these concepts.

Keywords: CSS3; Responsive Design; Web Design; HTML5; Usability.

RESUMEN

Este artículo estudia el diseño responsivo y la experiencia de usuario (UX) además de su estado e importancia actual dentro del diseño y desarrollo web, siendo estos, conceptos no muy conocidos ni extendidos en Latinoamérica, aunque actualmente son factores fundamentales para conseguir destacar en el sobresaturado mundo de la internet. Para esto se hace uso de la metodología de investigación descriptiva y algunos apartes de la metodología exploratoria, basado en un amplio marco referencial actualizado a no más de 5 años y una explicación fluida de las características y aplicaciones de la (UX). Actualmente la UX y consigo el diseño responsivo han sido adoptadas mundialmente como un estándar prácticamente obligatorio en el ambiente laboral, sobre todo en redes sociales donde se pueden apreciar demostraciones cada vez más impresionantes e ingeniosas de aplicación de estos conceptos.

Palabras Clave: CSS3; Diseño Responsivo; Diseño Web; HTML5; Usabilidad.

INTRODUCTION

This article was developed using a descriptive research methodology, which "involves organizing information in a useful and understandable manner through indicators that facilitate the interpretation of phenomena; multivariate analyses allow for the description of more complex structures",[(1)] given the relative novelty of the topic in the Latin American context, where responsive design parameters are not yet considered mandatory in web design and development.

This situation requires us to borrow some parameters from exploratory research, with "the aim of clarifying problems, collecting data, and formulating hypotheses,"[(1)] as references on this topic are not very abundant in the Spanish language.

These methodologies allow us to gain a good understanding of how the investigated variables, factors, or elements behave, and the exploratory method helps us increase our familiarity with relatively unknown phenomena, obtain information about the possibility of conducting more comprehensive research in a particular real-life context, providing guidelines for properly addressing responsive design in web development.[2,3]

Thus, around 100 referenced sources confirm the importance of responsive design, covering its development since 2010 when Ethan Marcotte first coined the term Responsive Web Design in an article later published on the A List Apart website.[4] This article explored all aspects that contributed to today's user experience, shaping the future of web design, aspects such as usability, accessibility, and human-computer interaction, using search tools in academic databases such as Dialnet, SEDICI, CIDE, GREDOS, CIDUI, and SCIELO, among others, and making use of Google Scholar, where queries were made and information from consulted authors was compiled.

Currently, Responsive Web Design is essential for providing a smooth and consistent user experience throughout navigation on our website. As pointed out,[5,6] responsive web design offers a path forward, allowing us to design for the ebb and flow of things.

METHODS

The technology has engulfed us; in an already irreversible manner, we have accepted electronic devices as a habitual and fundamental part of our daily lives. It is common to carry with us at all times some means of connecting to the internet.[7] Unlike traditional media, the internet has given us the opportunity to become prosumers, both producers and consumers of content, allowing us to transfer a large part of our lives to it.[8] The arrival of the Smart generation (smartphones, smart TVs, etc.) marked a significant turning point in web design, as the need to display information on mobile devices led to the development of two versions of websites.[4]

Previously, websites only had to work on monitors, and although their sizes varied, the difference was not significant. This led to the question: how can websites work on this wide range of screens?

For a while, websites were optimized for smartphone screens, with separate web apps from the main site. However, maintaining sites for every existing screen size became simply unmanageable. Moreover, these are not the only existing screens; “browsing, using one type of device or another, radically changes the user experience, and therefore websites must adapt to all these formats”.[4] Faced with this problem, a solution was needed that encompassed different screen sizes – a way to design websites that adapted to the size of the screens from which they were accessed.

RESULTS

Marcotte[5] suggests that Responsive Web Design (RWD) is a method for creating flexible websites that do not rely solely on fixed screen widths but can detect screen width and adjust the design to provide an appropriate user experience for each device.

RWD is where flexible design and intelligent use of CSS rules, or Cascading Style Sheets, come together to offer a seamless experience as users navigate between their devices, or, in other words, “the website must have the technology to automatically respond to the user's context”.[9]

One compelling reason for using RWD is that it creates a website that not only looks good and functions properly on devices currently on the market but will likely look good and function on new devices that will be available in the future.[10]

As explained in the book Learning Responsive Web Design,[9] an obvious advantage of using RWD is that it requires less effort and enables future maintenance, as it is only necessary to create one website that can be viewed on various devices using the same design, code, and content, which will display correctly regardless of screen size.

Illustration 1. Responsive design adaptable to multiple screens

https://doi.org/10.56294/mr202220

RWD provides customized designs across multiple devices. With just a single HTML document, to which different style sheets are applied according to screen size,[11] it generates a website that is not only independent of resolution and device but also adapts to the device's characteristics, as seen in Illustration 1. When a site designed in RWD is viewed on a desktop browser, it displays a header and three columns, which will reorganize into a single column with enlarged links for easy tapping when displayed on a smartphone.

The advent of HTML5

While designing a responsive website is much more complicated than a standard website, the arrival of HTML5 brought multiple tools and improvements to established standards,[12] driving and popularizing RWD. Perhaps its most significant contribution was giving users the importance they deserve as consumers and critics of online content, attracting them with visual methods supported by CSS3 (Cascading Style Sheets), which feature gradients, shadows, and other visual techniques that make navigation more user-friendly and fluid for the best possible user experience.[13,14]

Due to the wide range of platforms and devices to support, combined with the increasing power of mobile browsers, HTML5 is becoming the "write one, run many" solution that the mobile industry has longed for.[15] Thanks to various frameworks like Ionic, React Native, and others that provide access to hardware and software resources unique to mobile devices, we can now talk about hybrid applications, which reduce software development costs and allow for packaging and running applications on different platforms.[16,17,18]

Examples include the application of innovative and intelligent systems that leverage the potential of mobile devices along with the vast information and resources from the internet, whether in the use of geolocation and route plotting,[19] the utilization of web protocols like Remote Desktop Protocol (RDP),[20] or more complex and comprehensive technologies such as Rich Internet Applications (RIA) that combine the advantages of web applications and traditional applications.[21]

The basis of everything, the design

As the name suggests, Responsive Web Design (RWD) is about design, specifically the “transfer of the mental representation of the creative idea to the desired configuration of the project”, and likewise, design thinking can be applied to it, as well as each of its stages: analyze, design, prototype, and validate.[22]

As design is the fundamental core of RWD, it is interesting to evaluate each of these stages and their applications.

- Analyze: Knowledge in design topics is not enough to properly address a design problem; it is necessary to understand the context, the interacting elements, and those that can intervene in the problem to propose intelligent and suitable solutions.[23] In this new multi-screen user context, designers face various challenges in creating satisfying and consistent experiences.[24] Achieving an intuitive interface requires a high degree of understanding of the target user's behavior.
- Design: Turning thought into something physical is quite complex. Factors such as usability, accessibility, and information architecture must be considered, as outlined by Sánchez.[25] In what is known as “Integral Web Design”, a balance between planning and product development is proposed. In this stage, “the goal is to escape limited and inflexible notions and feel free to explore”,[26] in order to faithfully portray our visions.
- Prototyping: In the design field, ergonomics, also called “human factors engineering” or “psychological engineering”, must be considered. As Vásquez et al.[27] state, this discipline deals with introducing "human factors" into the design of all types of machines, tools, and interfaces to optimize and facilitate their use. In this stage, the designs proposed in previous stages should be constructed, following the project's Requirement Specification (RS). The RS is a document that describes the features a website to be developed or modified must meet, and it is prepared to ensure compliance.[28]
- Validation: In this stage, a review of everything accomplished is conducted, ensuring compliance with the RS and that it represents the vision given in the design stage. This stage also depends heavily on the development methodologies used, which define the final product, such as model-driven development, allowing interoperability between applications and the platforms on which they are installed.[29]

The internet has changed the rules for designers, who have had to adapt their content to new technologies. Cases such as editorial design, which has been forced to transfer its content to the web to avoid being forgotten,[30] the implementation of new standards applicable to web content, its organization, and the optimal way to find it in the vastness of digital content,[31] or the Dutch avant-garde group De Stijl, which has found an opportunity to present and showcase their artistic style to the world,[32] and at a more global level, the internationalization of web content. Thanks to globalization and the "omnipresence" our applications acquire once published, there is extensive analysis on how to organize content so that it is correctly displayed anywhere in the world.[33]

We must not forget that the purpose of RWD, and by extension, of design itself, is to present content in a pleasing way to the user. This, as Moral states in his extensive work, “has in turn led to a professionalization

of the sector, along with the creation of standards that facilitate the quick and effective understanding of websites by users," which is reflected in different sectors where the optimal way for users to interact with content is sought, such as in the healthcare sector for chronic patient care and, to a large extent, in educational environments, whether in student tutoring management[34] or the mobile interface design for a university.[35]

User Experience (UX)

User Experience (UX) refers to 2the experience that an individual obtains when interacting with a product in specific environments or situations subject to certain conditions governing the system, which may affect it",[36] emphasizing relevant aspects such as beauty, enjoyment, pleasure, and personal growth that satisfy human needs through interaction with the product.

This aspect is so important that multiple organizations have committed to improving the user experience on the Web, which involves considering users and their diverse characteristics and capabilities within the broad range of Web user profiles proposed by human diversity.[37]

This same diversity is mainly reflected in projects targeting audiences from different cultural backgrounds, where multiple extra variables must be considered, such as those cited by Chu,[38] who suggests various ways to avoid culturally insensitive design. These include analyzing cultural values by consulting local experts and creating localization packages that incorporate the target audience's preferences for colors, symbols, social norms, and bidirectional languages.

UX provides an organized and efficient way to ensure that responsive design achieves its full potential. Through its organization and analysis of methods and interfaces, reverse engineering can be applied to an already completed product, making it relatively easy to obtain the ER followed during its development.[39]

Likewise, the use of transitional objects can enhance how motivation influences e-learning environments, as Wiberg[40] clarifies, "It is reasonable to take for granted that motivation is a key factor for learning and without motivation, it is hard to learn". UX can even be extended to seemingly contradictory concepts such as interactions between large companies (B2B), as "User experience (UX) is made up of all the interactions a person has with a brand, company, or organization".[41]

UX can also be leveraged in projects like those mentioned by Torres[42] such as cloud computing, helping this technology be more easily implemented in various sectors, like education. Its application could also be used to attract new audiences or retain and engage current ones, helping to maintain the attention of young people, a challenging task, as in the case of encouraging the use of literature.[43]

Accessibility

The internet has grown popular, and with its relatively easy access, its core philosophy invites anyone to consume content regardless of race, gender, or disability. This is why web accessibility has become a standard that aims to bridge the gap between different users,[44] allowing everyone to navigate the internet just like other users do. Web accessibility also acts as a refinement method to enhance user experience,[45] by conducting studies that identify shortcomings in current accessibility standards for individuals with physical disabilities, children, and the elderly.[46]

"Web accessibility as a quality criterion in computer systems and its daily increasing international interest becomes more relevant".[47] As the internet is the primary means of interaction, it is common for exclusionary behaviors from normal life to be reflected on a larger scale within the web. As stated by the W3C, cited in Sosa et al.[48] "universal access to the Web, regardless of hardware type, software, network type, language, culture, geographical location, and users' abilities".

Usability

Similar to accessibility, but distinct, usability functions as a measure of the quality of experience a user has when interacting with a website. Due to its significance, a new concept called "usability engineering" has arisen. This term was first coined at Digital Equipment Corporation, as described by Cancio et al.[49] to "refer to the set of concepts and techniques that allow planning, executing, and verifying a system's usability objectives."

One application of this new term is its use in recreating the user experience through system logfiles, which, when manipulated using JavaScript, enable us to replicate the user's steps within our website, providing more precise data and statistics than traditional methods.[50]

Usability engineering can also be applied to gather data on other web development practices, such as CAPTCHAs, and examine their cost-benefit relationship in terms of UX.[51] It can be utilized in various other cases, like analyzing user interactions on websites, integrating it into established curricula to enhance quality and update the knowledge gained by students in specific courses,[52] as in Ramirez[53] and assessing the results of web changes, from total page restructuring to simpler features like implementing social networks.[54]

Usability tests are typically conducted to assess a site's usability, which involve examining how users utilize the site or application and making necessary improvements based on the results.[55]

CONCLUSIONS

The popularization and democratization of the web have attracted an increasingly diverse audience, stimulating competition due to the growing number of users and developers with internet access. This trend is evident in all sectors; users, despite their varying needs, seek security and comfort in the applications they use.

Consequently, the challenge is to maintain user engagement with our content amidst a constant barrage of information from websites and applications competing for attention. This rivalry has prompted designers to prioritize user experience (UX), along with factors such as usability, effectiveness, efficiency, and satisfaction. More than mere user opinions, these elements are critical; neglecting them could spell disaster for our site, resulting in wasted time and effort.

For years, it has been demonstrated that responsive design and user experience are the optimal ways to distinguish oneself and provide quality content. Additional benefits include cost reduction, update efficiency, enhanced usability, interface adaptability, image, video, and media reuse, relative sizing, and a single web address (URL), which enable us to stand out in the vast internet ecosystem. Particularly after the introduction of HTML5, its integration into our projects is vital, and it is essential for universities and institutes to update their curricula and begin teaching current standards.

BIBLIOGRAPHIC REFERENCES

1. Atehortúa FHR, Zwerg-Villegas AM. Metodología de la investigación: más que una receta. AD-minister 2012:91–111.

2. Gómez Cano CA, Sánchez Castillo V, Ramón Polanía L. Incorporar las TIC a los procesos de enseñanza-aprendizaje: Una lectura desde el actuar docente. Horizontes Pedagógicos 2017;19:47–54.

3. Anacona JD, Millán EE, Gómez CA, Anacona JD, Millán EE, Gómez CA. Aplicación de los metaversos y la realidad virtual en la enseñanza. Entre Ciencia e Ingeniería 2019;13:59–67. https://doi.org/10.31908/19098367.4015.

4. Arce AEV. De la interfaz del usuario al responsive web design. Revista AUC 2016:59–66.

5. Marcotte E. Responsive web design. A list apart. Retrieved May 2010;15:2013.

6. Guayara Cuéllar CT, Millán Rojas EE, Gómez Cano CA. Diseño de un curso virtual de alfabetización digital para docentes de la Universidad de la Amazonia. Revista Científica 2019;34:34–48. https://doi.org/10.14483/23448350.13314.

7. Mañas Valle S, Peña Timón V. Relatos derivados: un viaje aumentado por la urbe. Opción: Revista de Ciencias Humanas y Sociales 2016:1047–67.

8. Múnera Monsalve M, Marín Ochoa BE. La divulgación científica en la Web, un panorama latinoamericano. Comunicación 2014:35–41.

9. Manso Guerra Y, Cañizares González R, Pedro Febles J. Diseño web adaptativo para la plataforma educativa ZERA. Revista Cubana de Ciencias Informáticas 2016;10:100–15.

10. Rodríguez Álvarez MS, Millán Rojas EE. Diseño de una interfaz neuronal para personas con discapacidad motora. Revista Electrónica Redes de Ingeniería 2017;8:101–8. https://doi.org/10.14483/2248762X.12481.

11. Cazañas A, Parra E, Cazañas A, Parra E. Strategies for Mobile Web Design. Enfoque UTE 2017;8:344–57. https://doi.org/10.29019/enfoqueute.v8n1.142.

12. Gutiérrez RT. El surgimiento de HTML5: un nuevo paradigma en los estándares Web. Revista Teknokultura 2016;13:169–92. https://doi.org/10.5209/rev_TK.2016.v13.n1.52152.

13. Panda PK, Biswal T, Dash PK, Panda RB. Assessment Of Pollution Load In Terms Of Water Quality Index Of Salandi River In The Command Area Of Hadagada Dam And Its Downstream, Bhadrak, Odisha. Studies 2016;1:8–16.

14. Giraldo ML, Chacón JD, Blanco AC. Beneficios Generados por las TIC en el Comercio Internacional de Servicios Outsourcing en Colombia. Negonotas Docentes 2020:37–47.

15. Ogunlolu I. HTML5, the future of mobile applications: A comparison between HTML5 application development platforms and native platforms. Tesis de Grado. Kemi-Tornio University of Applied Sciences, Technology, 2012.

16. Sampedro Guamán CR, Machuca Vivar SA, Patrón Sabando EI. Desarrollo de aplicaciones de escritorio híbridas con javascript, css y html. MIKARIMIN Revista Multidisciplinaria 2016; 2:85–94.

17. Cano CAG, Castillo VS, Ortiz DMT, Burgos HR, Peña FR. Las TIC como aliadas estratégicas en la competitividad de los sistemas educativos: El caso de la Universidad de la Amazonia. Revista faccea 2017; 7:89–95.

18. Narváez EDC. Vigilancia Tecnológica: un análisis bibliométrico. Negonotas Docentes 2021:57–69.

19. Dalmau FV, Cladera JR. Herramienta de visualización de rutas accesibles en espacios urbanos utilizando tecnología HTML5. ACE: Arquitectura, Ciudad y Entorno 2017. https://doi.org/10.5821/ace.11.33.5138.

20. Ganji RR, Mitrea M, Panovski D, Joveski B, Mitrea M, Panovski D, et al. Improving the RDP based applications by using HTML5 content representation. Electronic Imaging 2016;28:1–7. https://doi.org/10.2352/ISSN.2470-1173.2016.7.MOBMU-293.

21. Wahid SAA, Khoon ZK. Rich internet application (RIA) new dimension with HTML5, CSS3 and javascript technology. International Journal of Advances in Computer Science & Its Applications 2015;5:172–7.

22. Cely CC, Romero JA, Mora HB. Fundamentos del pensamiento de diseño. Investigium IRE: Ciencias Sociales Y Humanas 2015;VII:38–50. https://doi.org/10.15658/CESMAG15.05060204.

23. Tena Parera D. Diseño como proceso iterativo. Grafica: documents de disseny gràfic = documentos de diseño gráfico = journal of graphic design 2015;3:5–11.

24. Dabós MP. Diseñando en entornos digitales. Bold 2015;no. 2.

25. Sánchez JAP. Bases para un Diseño Web Integral a través de la convergencia de la Accesibilidad, Usabilidad y Arquitectura de la Información. Scire: representación y organización del conocimiento 2010:65–80. https://doi.org/10.54886/scire.v16i1.1536.

26. Flores P. Una bitácora sobre el color. Tsantsa Revista de Investigaciones artísticas 2016.

27. Vásquez AC, Fernández CL. Aprendizaje de perfiles de usuario web para modelizar interfaces adaptativas. Theorēma (Lima, Segunda época, En línea) 2015:155–64.

28. Pedraza-Jiménez R, Blanco S, Codina L, Cavaller V. Diseño conceptual y especificación de requerimientos para el desarrollo y rediseño de sitios web. Profesional de la información 2013;22:74–9. https://doi.org/10.3145/epi.2013.ene.10.

29. Vega W, Umaña H. Semantic Web Services design using model-driven software development. Ventana Informática 2014. https://doi.org/10.30554/ventanainform.30.286.2014.

30. Nieto JY. Tabletas y "smartphones". El diseño editorial obligado a adaptarse a los nuevos soportes informativos digitales. adComunica 2015:133–55. https://doi.org/10.6035/2174-0992.2015.9.9.

31. Bernardis S. Estudio del impacto del SEO. semántico en los motores de búsqueda: aplicando microdatos y RDFa Lite 1.1 en el ámbito de Schema.org. Cuadernos de Gestión de Información 2013;3:85–104.

32. Moreno A. Diseño y tipografía en De Stijl. I+ Diseño: Revista Internacional de Investigación, Innovación y Desarrollo En Diseño 2014;9:153–75.

33. Segovia C. Internacionalización web: un conjunto de herramientas para la democratización de la información y el conocimiento, 2014.

34. Sánchez AV, Colorado EM, Fernández M del RM, Aguilar DA, Mejia MAP. Desarrollar e implementar una aplicación web para el control de tutorías de los alumnos del ITSTB. Revista Iberoamericana de Producción Académica y Gestión Educativa 2014;1.

35. Moyano A, Gaetán G, Martin A. Interface Móvil para el Sitio Web de la UACO. Un Prototipo centrado en el Usuario. Informes Científicos Técnicos - UNPA 2016;8:172–201. https://doi.org/10.22305/ict-unpa.v8i1.156.

36. Balasubramoniam V, Tungatkar N. Study of user experience (UX) and UX evaluation methods. International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) 2013;2:1214–9.

37. Martín AE, Gaetán G, Saldaño VE, Miranda G, Vilte D, Sosa H, et al. Identificación, desarrollo y uso de soluciones web centradas en el usuario, 2014.

38. Chu S. Design Factors Affect User Experience for Different Cultural Populations. Journal of Educational Issues 2016;2:307–19.

39. Jaimes C, Rojas F. Graphical User Interfaces Reverse Engineering for Requirements Elicitation-Literature Review. Revista Antioqueña de Las Ciencias Computacionales 2016;6.

40. Wiberg C. Transitional objects: Moving from extrinsic to intrinsic motivation in e-learning environments by using User Experience (UX) Design. Learning 2016;3:3663–6.

41. Edwards J. The great oxymoron: B2B UX. J Direct Data Digit Mark Pract 2015;16:266–9. https://doi.org/10.1057/dddmp.2015.22.

42. Sánchez SMT. Educación en la nube. Un nuevo reto para los docentes de Educación Media Superior n.d.

43. Nava RMM, Pinto CAM. Sistema de Biblioteca Interactivo como medio para fomentar el uso de la literatura en el ITCG. Revista Iberoamericana de Producción Académica y Gestión Educativa 2014;1.

44. Miranda MG, Martin AE, Gaetan G. Mejora de la accesibilidad web mediante el uso de agentes inteligentes. Informes Científicos Técnicos - UNPA 2013;5:133–60. https://doi.org/10.22305/ict-unpa.v5i2.75.

45. Millán-Rojas EE, Gallego-Torres AP, Chico-Vargas DC. Simulación de una red Grid con máquinas virtuales para crear un entorno de aprendizaje de la computación de alto desempeño. Revista Facultad de Ingeniería 2016;25:85–92. https://doi.org/10.19053/01211129.4140.

46. Martín AE, Gaetán G, Saldaño VE, Miranda G, Sosa H, Pires A, et al. Evaluaciones de accesibilidad y usabilidad en la WWW: propuestas para mejorar la experiencia del usuario, 2016.

47. Mariño SI, Alfonzo PL, Escalante JE, Alderete RY, Godoy Guglielmone MV, Primorac CR. Accesibilidad web en un sistema de administración académica desde dispositivos móviles, 2014.

48. Sosa H, Gaetan G, Martín AE. Rediseño de un portal web universitario aplicando patrones de accesibilidad. Informe Científico Técnico UNPA 2015;7:139–65.

49. Cancio LP, Bergues MM. Usabilidad de los sitios Web, los métodos y las técnicas para la evaluación. Revista Cubana de Información en Ciencias de la Salud (ACIMED) 2013;24:176–94.

50. Menezes C, Nonnecke B. UX-Log: Understanding Website Usability through Recreating Users' Experiences in Logfiles. Journal ISSN 2014;2368:6103.

51. Vega OA, Vinasco-Salazar RE. CAPTCHA: ¿solución para la seguridad informática o problema para la accesibilidad/usabilidad web? e-Ciencias de la Información 2014:1–14. https://doi.org/10.15517/eci.v4i2.15125.

52. Calderón LJ, Campoverde JY, Hoehne AV. El usuario como factor de éxito en el diseño de un geoportal. GeoFocus International Review of Geographical Information Science and Technology 2014:181–210.

53. Rodríguez-Ramírez I. Incorporación del tema de usabilidad en el diseño de sitios web en el curso de Multimedios. Revista Educación 2015:27–41. https://doi.org/10.15517/revedu.v39i2.19896.

54. González-Bañales DL, Monárrez-Armendáriz C. Incorporación de redes sociales y aplicación de principios de diseño adaptativo para la plataforma moodle. Iteckne 2014; 11:50–61.

55. Just BV. Aplicación de un test de usabilidad a la página web de una biblioteca universitaria. Tesis Doctoral. Universidad acional de Mar del Plata, 2015.

FINANCING

No financing.

CONFLICTS OF INTEREST

They do not exist.

AUTHORSHIP CONTRIBUTION

Conceptualization: Brayan Stiven Tovar Claros.
Methodology: Brayan Stiven Tovar Claros.
Research: Brayan Stiven Tovar Claros.
Original writing: Brayan Stiven Tovar Claros.
Writing-revision and editing: Brayan Stiven Tovar Claros.