OPERATIONAL ANALYSIS OF A VIDEO GAME MANAGEMENT AND SALES PLATFORM

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ABSTRACT

This study provides an evaluation of a web-based platform for game management and sales, developed using PHP, MySQL, and SASS. The development process utilized the SCRUM methodology, concentrating on essential modules such as user management, game catalog, payment processing, and technical support. The platform's performance was assessed using Google's Lighthouse tool, which evaluates four critical areas: performance, accessibility, best practices, and SEO. The results demonstrated exceptional performance with a score of 99/100 and perfect adherence to best practices with a score of 100/100, reflecting high efficiency and compliance with web development standards. Accessibility received a score of 83/100, indicating potential areas for improvement, while SEO achieved a score of 91/100, suggesting effective search engine optimization. The findings reveal that the platform exhibits high levels of optimization and operational efficiency. However, there remains an opportunity to enhance accessibility features. This study highlights the significance of rigorous web development practices and optimization efforts in achieving superior performance and user experience in web-based systems.

Keywords Lighthouse, optimization, PHP, web platform, performance, SCRUM, video game sales platform

1 Introduction

The video game industry has experienced remarkable growth in recent years, becoming one of the main forms of entertainment worldwide. By 2023, the global video game market was forecast to reach a value of $159.3 billion, surpassing traditional industries such as film and music[1] [2]. This growth is not only due to the quality and variety of games produced, but also to increased interest in developing sales and financing models for new video games [3] [4].

Digital video game retail platforms, such as Steam and Epic Games, have revolutionized how users acquire and experience games. Steam, developed by Valve Corporation, is one of the largest and most widely used platforms, offering an extensive library of games. In contrast, the Epic Games Store is distinguished by its timed exclusives and frequent promotions, which provide access to a diverse array of titles through various discounts and special offers [5] [6].

One innovation in this context is the use of digital activation keys, which users can purchase through online platforms. This sales method has proven to be efficient and convenient for both consumers and game developers [7]. However, the increasing demand for activation keys has led to the rise of secondary marketplaces and platforms specializing in their sale. Although these alternative sources may offer more affordable options for consumers, their acquisition and sale often occur outside official channels, presenting significant risks such as potential fraud and legal issues [8]. While purchasing unofficial activation keys remains an option for some users, it is crucial to consider the associated risks and, whenever possible, opt for legal acquisition methods.

In this context, Unlockopia emerges as a platform currently in development since early 2024, aiming to simplify the search for video games and the stores that offer them. It is distinguished by its intuitive and user-friendly interface. Although it is currently available only for PC, it provides a diverse selection of computer games. Unlockopia is designed to meet the needs of a global audience, offering

a practical solution for accessing a wide range of titles and continuing to evolve to enhance its functionality and expansion.

The objective of this article is to conduct an operational analysis of Unlockopia, examining its internal processes and efficiency in video game sales. To contextualize this analysis, it is crucial to understand the competitive environment and current trends in digital game sales. Digital sales have significantly reduced the costs associated with the physical production and distribution of games, allowing developers to reach a broader audience with a lower initial investment [9].

Additionally, security and fraud prevention are crucial in the sale of video games. A study by Brown and Taylor [10] indicates that online purchase-related fraud has increased by 30% over the past five years, underscoring the need for secure and reliable platforms. Unlockopia has implemented several security measures to protect buyers, including *transaction verification* and *ongoing activity monitoring*.

User experience also plays a crucial role in the success of digital sales platforms. An intuitive interface and a streamlined purchasing process can significantly enhance customer satisfaction and retention [11] [12]. In this regard, Unlockopia has invested in developing an easy-to-use platform that allows users to find and manage video games with ease.

Evaluating software quality is essential to ensure that platforms like Unlockopia operate efficiently and securely. Methods for assessing software quality, such as those proposed in the studies by Bernardo [13] and Souza Pereira [14], provide valuable frameworks for measuring and improving aspects like usability and user satisfaction.

This study aims to provide a detailed analysis of Unlockopia, exploring its operational processes, market strategies, and methods for ensuring customer satisfaction [15]. The findings of this research will not only offer a comprehensive view of the video game management platform but also provide valuable *insights* for the industry at large, contributing to the discussion on the future of digital game sales and best practices for operating in this ever-evolving market.

2 Methodology

2.1 Design

This research on video game sales management is quantitative in nature, employing statistical analyses to assess the efficiency and security of the sales management system. The study is prospective, as it relies on primary data collected during the implementation and operation of the video game sales management system.

Additionally, it is analytical, examining multiple variables such as delivery times for video games, sales success rates, and resistance to fraud attempts. The methodology involves a direct intervention by the researcher, who designs and implements a new video game sales management system and subsequently evaluates its impact on the aforementioned variables.

The longitudinal nature of the study is reflected in the multiple measurements taken over time, including assessments of processing speed, sales integrity, and end-user satisfaction. Statistical tools are employed to analyze metrics such as the number of video games sold, successful activations, and the average response time of the system.

In terms of scope, the study is applicative, aiming to enhance the video game sales management process by developing a practical solution that improves efficiency and security in digital game sales.

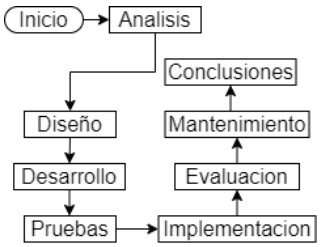

Figure 1: Research Stages

All activities related to video game management were analyzed in detail:

- Game management.
- Sale of keys to end users.
- Inventory control of available and used keys.
- Customer management.
- Monitoring of key sales.

2.2 Web System Development Methodology

For the development of the platform, the agile SCRUM methodology was chosen for project creation and management, establishing specific goals and deadlines for each stage of the process [16]. This methodology is summarized in four fundamental stages.

Figure 2: SCRUM

This methodology ensures a systematic and efficient development of the system, specifically tailored for the optimal management of video games [17].

2.3 Flowchart of Research in Web System Development

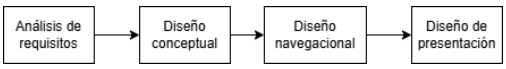

Figure 3: Research Stages

2.4 Requirements analysis

The platform has main functions such as:

- Game sales
- Support by mail

Use Case: Product Sale

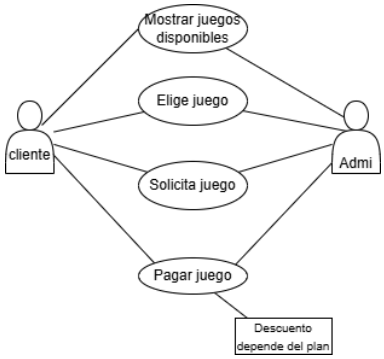

Figure 4: Sales Use Case

2.5 Navigational Design

Definition of Navigation Space

Users/Actors
Compradores
Vendedor y distribuidor
Administradores de plataforma

Table 1: Users and Actors in the video game sales system

Products Offered:

- Popular video games
- Technical support services for key management and related issues

2.6 MoSCoW

To ensure effective development focused on the critical needs of the system, functionality implementation was prioritized using the MoSCoW technique [18] [19]. This methodology allowed for categorizing the platform's features into four priority levels, optimizing resource allocation and development efforts.

In the "Must Have" category, essential functionalities for the system's viability were identified. These include user registration and authentication to ensure the protection of sensitive data, a robust game management system for the efficient generation, storage, and distribution of keys, the ability for users to easily purchase and activate keys, and an accessible technical support system for timely problem resolution.

The "Should Have" category includes important but not critical features for the initial release. This category encompasses an administrative panel for effective management of key inventories, users, and transactions. Additionally, implementing an inventory tracking system to monitor key stock and usage, as well as establishing robust information security measures to protect user data and stored keys, was deemed crucial.

In the "Could Have" category, additional functionalities that would add significant value to the platform were considered. These include integration with various payment platforms to offer flexibility in key acquisition, analytical capabilities to generate detailed reports on sales, key usage, and market trends, and an automated system for updating and maintaining active keys to improve operational efficiency.

Finally, in the "Won't Have" category, the decision was made to exclude unnecessary or low-priority features that could divert resources and development time from the critical functionalities mentioned earlier. This decision helps maintain focus on the most critical and valuable aspects of the platform.

2.7 Software and Web Tools Used

2.7.1 Applications

Several applications were utilized for the platform's development. Visual Studio Code served as the primary IDE for development. TablePlus was used for database management with MySQL. Additionally, Draw.io was selected for creating diagrams and visualizations, while Figma was employed to preview the application's design [20]. These tools collectively facilitate efficient development, database management, and visualization of the video game key management platform.

2.7.2 Framework

The platform employs PHP to manage user authentication, process video game purchases and key activations, and interact with the MySQL database used to store game inventories, user information, and transaction records [21].

For design control, SCSS was utilized to manage the user interface design. SCSS allows for the use of variables,

mixins, and nested styles, which helps maintain modular and maintainable CSS code, ensuring a consistent and attractive appearance across all devices.

It is also important to highlight that Gulp was integrated into our development workflow. Gulp automates tasks such as compiling SCSS files to CSS, minifying JavaScript and CSS files, and optimizing images. This integration enhances development efficiency and ensures that the code is optimized for production [22].

2.7.3 Web

To ensure an optimized user experience on the platform, Google Lighthouse is used to audit and enhance the overall quality of the web pages. This tool evaluates performance, accessibility, web development best practices, and SEO (search engine optimization).

It assesses metrics such as load time, time to interactive, and efficient resource usage. It also verifies that the page meets web accessibility standards, including the proper use of HTML tags for content, sufficient color contrast, and accessible navigation.

Additionally, JIRA was employed to manage and execute the platform's sprints. Utilizing agile methodologies such as Scrum, we detailed the entire web development process.

2.8 Population and Sample

In this study, since the development of the activation key management platform was conducted by a single individual, both the population and sample are limited to this one person: the primary developer of the project. This scenario allows for a detailed and direct analysis of the entire development process, from conception to initial implementation.

The technical resources used in this research include a primary workstation consisting of an Acer Aspire 5 laptop, equipped with an Intel Core i5 10th generation processor, 8 GB of RAM, 500 GB SSD, and Windows 11 Pro operating system.

This set of technical resources has enabled the developer to implement, test, and evaluate the game management platform efficiently. The configuration reflects a modern development environment suitable for a project of this nature, allowing for agile development and the application of good software engineering practices, despite being a one-person project. The use of these tools and technologies not only facilitated the development process but also provided a scalable environment that could easily adapt to future project expansions or the incorporation of additional developers in later stages.

2.8.1 Data Collection Techniques and Instruments

This study on video game management employs system monitoring tools and log analysis as the primary data collection instruments. These tools enable detailed tracking of the performance of the video game sales system.

ETAPA	TECNICA
Recolección	Monitoreo del sistema y registro de eventos
Análisis	Procesamiento de logs y métricas de rendimiento
Presentación	Sistemacion y Visualidador de datos

Figure 5: Example of monitoring tools used

During the data collection phase, continuous system monitoring is implemented to record key information such as transaction processing times and success rates in the sale and activation of video games.

For data analysis, system logs are processed using statistical techniques that evaluate performance and detect usage patterns and potential anomalies. Specialized software is utilized to conduct these complex analyses.

In the presentation phase, advanced data visualization techniques are employed to clearly display the results obtained. Detailed technical reports are prepared, including findings and recommendations for optimizing the video game management system.

3 Results

For the implementation of the web platform "Unlockopia," the SCRUM methodology was employed, which includes a planning and estimation schedule using an agile software development approach. Each of the sub-features related to the web application was assigned a level of importance.

Nivel de Importancia	Simbología	Porcentaje Referencial del Nivel de Importancia
Alto	A	70%-100%
Medio	M	25%-69%
Bajo	B	1%-24%
No Aplica	N.A	0%

Figure 6: Definition of level of importance

The platform was developed using PHP for server-side logic, MySQL for database management, and SASS for creating CSS styles. The modules implemented in the platform include user management, video game catalog, payment processing, and technical support. The project was referenced from [23] for necessary implementations.

To evaluate the performance of our platform, Lighthouse, an advanced auditing tool from Google, was employed. Lighthouse analyzes critical aspects of the website's performance, providing a comprehensive view of its effectiveness. This evaluation focuses on measuring the current performance of "Unlockopia" and identifying potential areas for improvement.

The results presented below offer a clear perspective on the performance of our platform, establishing a foundation for future optimizations and enhancements in user experience.

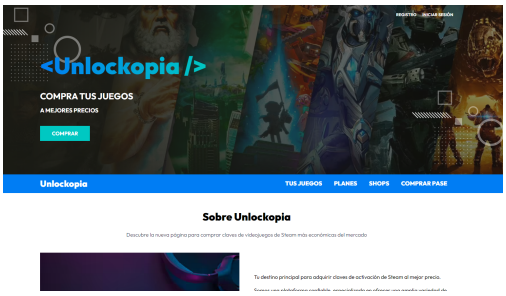

Figure 7: Video game management platform

Link:The used source code of the platform can be found on GitHub.

3.1 Desktop results

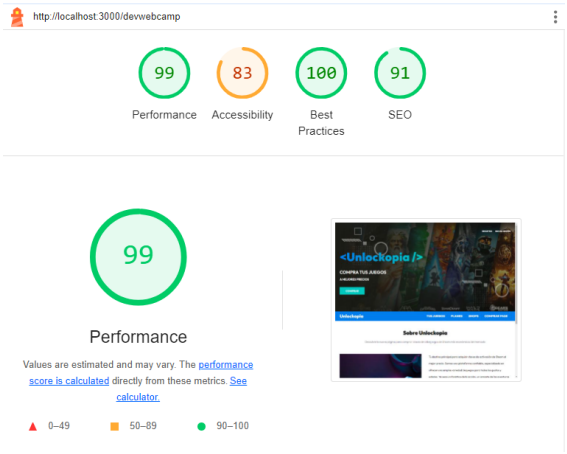

Figure 8: Resultados generales

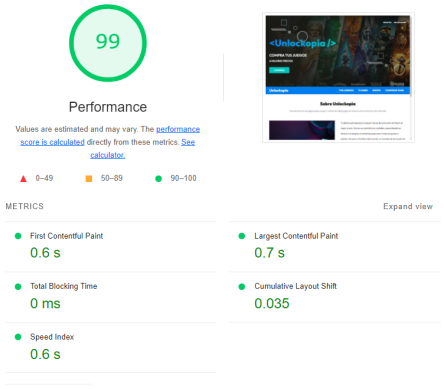

Figure 9: Performance (Rendimiento)

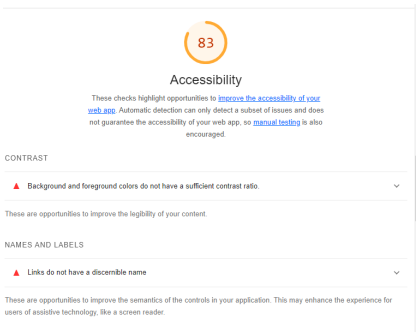

Figure 10: Accessibility (Accesibilidad)

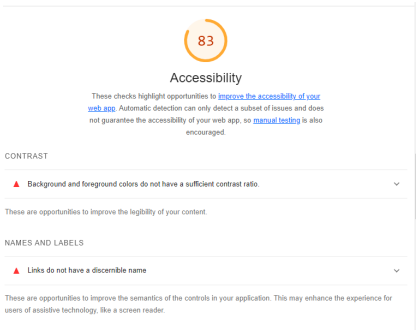

Figure 11: Best Practices (Mejores Prácticas)

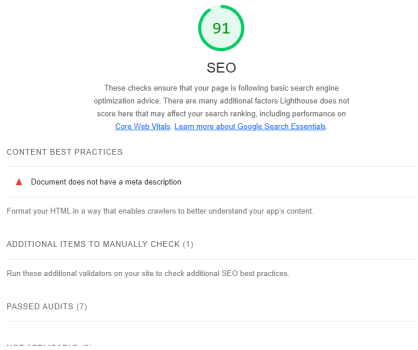

Figure 12: SEO (Search Engine Optimization)

The results of the evaluation of our platform "Unlockopia" are presented, using Lighthouse to measure performance, accessibility, best practices, and search engine optimization. The results reflect the current state of the platform in each of these key categories, highlighting both its effectiveness and areas for future improvements and optimizations.

Performance: 99/100: Lighthouse awarded a high score in this category, indicating that our website loads quickly, providing a smooth and responsive experience without delays.

Accessibility: 83/100: The platform ensures that all individuals, regardless of their abilities, can navigate and enjoy our website. Accessibility remains a top priority for us.

Best Practices: 100/100: This perfect score indicates that the website adheres to all recommended best practices in web development, such as security, modern code standards, and cross-browser compatibility.

SEO: 91/100: This high score suggests that the site is well-optimized for search engines, which can help improve its visibility in search results.

3.2 Mobile results

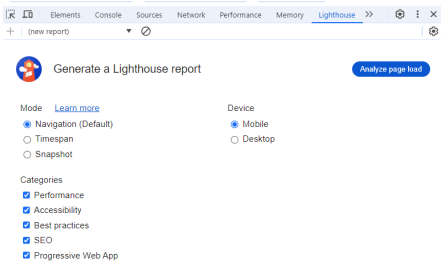

Figure 13: Lighthouse mobile

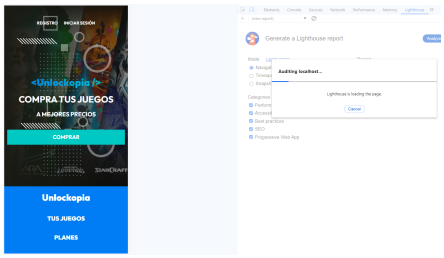

Figure 14: Lighthouse

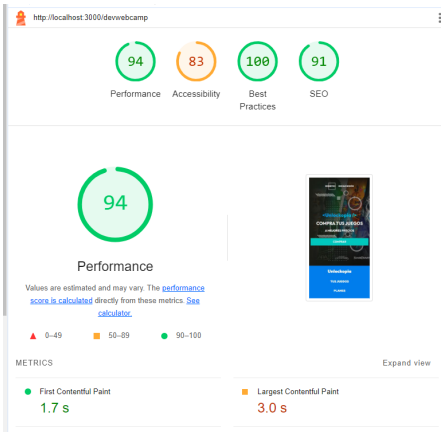

Figure 15: Results

We obtained the same results for Desktop. The results for "Unlockopia" are positive, with high scores in all categories. This indicates that the site is well-optimized in terms of load speed, web development practices, accessibility for users with disabilities, and visibility in search engines.

3.3 Administrator Results

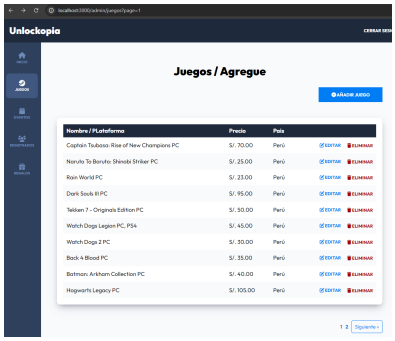

Figure 16: AdmiGame

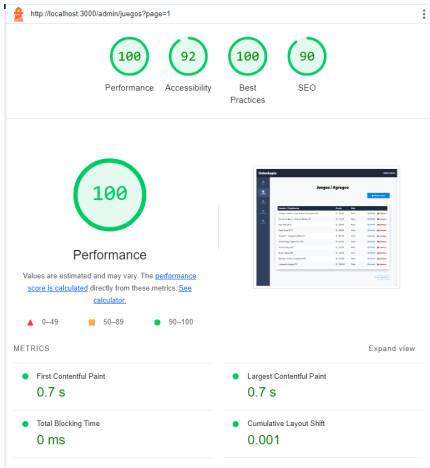

Figure 17: Admin Results

Similar to the previous tests, the results for the "Administrator" interface are also favorable:

Performance: This score indicates that the website demonstrates excellent performance, referring to its loading speed and overall efficiency. A score of 100 suggests that the page loads very quickly and utilizes resources efficiently.

Accessibility: This score measures how well the site accommodates users with disabilities. An 83 is a good score but indicates that there are areas that could be improved to enhance accessibility further.

Best Practices: This perfect score indicates that the website adheres to all recommended best practices in web development, including security, code modernity, and browser compatibility.

SEO (Search Engine Optimization): This high score suggests that the site is well-optimized for search engines, which can contribute to improving its visibility in search results.

4 Discussion

The primary goal of this research was to evaluate the quality and efficiency of the "Unlockopia" web system using Google's Lighthouse tool. This tool provides a comprehensive evaluation based on standardized web performance criteria, which "allows developers and auditors to have a clear and objective view of a website's performance" [24] [25]..

The results obtained for "Unlockopia" reveal outstanding performance compared to the results described in Aggarwal's study [25]. In their evaluation of e-commerce applications, Aggarwal et al. indicate that typical platforms generally score in the range of 80 to 90 [26]. In contrast, the site achieved a score of 99/100, suggesting superior optimization and efficient resource use, placing it above many e-commerce platforms evaluated in the study.

The platform's accessibility score was 83/100. While this score is quite good, best practices in accessibility often exceed 90 [27]. Compared to higher expectations in this aspect, "Unlockopia" shows an opportunity to enhance accessibility and improve the experience for all users [28].

Regarding Best Practices, the platform stands out with its flawless adherence, achieving a perfect score of 100/100. Although Mozilla Developer Network (MDN) [29] and Website Response Times [30] do not provide specific data on this metric, it aligns with best practices observed in other high-quality platforms. As noted by MDN, following these guidelines not only optimizes performance but also facilitates long-term code maintenance, ensuring a smooth and lasting user experience.

For SEO, the platform achieved a score of 91/100, which exceeds the typical range of 80-85 reported for optimization in Aggarwal et al.'s study [25]. This high score indicates effective search engine optimization, comparable to leading platforms in the market.

In summary, "Unlockopia" demonstrates a very high performance compared to the applications evaluated by Aggarwal [25], excelling in performance, best practices, and SEO, with opportunities to enhance accessibility.

5 Conclusions

The evaluation using Lighthouse has proven to be a valuable tool for measuring the efficiency and quality of the platform, providing precise insights into its performance.

The results for the website indicate a high level of optimization in terms of performance, best practices, and SEO, which is crucial for a game e-commerce platform. Accessibility, while scoring well, presents opportunities for improvement to make the site more inclusive.

The quantitative analysis provided by Lighthouse allows for the identification of specific areas for future optimization, ensuring continuous improvement of the system. The implementation of "Unlockopia" has demonstrated a high level of technical efficiency, which is likely to translate into a better user experience and potentially greater commercial success.

The results suggest that investing in quality web development and optimization has a direct and measurable impact on site performance.

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