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ASSIGNMENT 1
Top 5 E-Commerce Websites Performance Analysis Using Google Lighthouse Matrix

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1.   **INTRODUCTION**

In the age of digitization, many retail businesses have made the switch from conventional brick-and-mortar storefronts to online platforms. The main factor behind this change is the worldwide pattern of increased internet access in recent years. This trend is also noticeable in Malaysia, where increased internet connectivity has resulted in a rise in the country's use of e-commerce websites. E-commerce platforms, or online shopping websites, are specialized websites that provide a large selection of goods for online purchasing. Online shopping has grown significantly as a result of the widespread use of smartphones and tablets, which allow customers to explore and buy things at any time and from any location. With this context in mind, this research aims to examine the e-commerce sector in Malaysia, focusing primarily on the top five online shopping websites that have garnered a significant number of users. The research will evaluate the total performance of these websites, taking into account aspects like user experience, the speed of the website, how well it responds on mobile devices, and the security features in place. By recognizing what these e-commerce platforms are good at and where they fall short, businesses can pinpoint what needs to be improved to make the online shopping experience better for their customers.

Figure 1. Top 5 e-commerce websites in Malaysia

Based on the latest data from similarweb.com in April 2024, Shopee.com.my has come out on top as the most visited e-commerce platform in Malaysia. Lazada.com.my is not far behind, taking the second spot in the ranking. Mudah.my has secured the third position, marking its significance in the Malaysian e-commerce market. Amazon.com and Taobao.com complete the top five, reinforcing their status as favored online shopping sites in Malaysia. Keep an eye out for next month's update on website rankings and traffic analysis for the top e-commerce platforms in Malaysia.

In this research, our objective is to conduct a comparative evaluation among 5 popular and most familiar e-commerce websites in Malaysia which are **Shopee, Lazada, Mudah, Amazon, and Carousell.** We will utilize Google Lighthouse, an open-source automated audit platform, to assess various aspects of website performance, including speed, accessibility, best practices, SEO, and progressive web app (PWA) capabilities.

2.   **LITERATURE REVIEW**

2.1. E-COMMERCE
Electronic commerce, or e-commerce for short, refers to the buying and selling of goods and services conducted over electronic systems such as the internet and other computer networks (Turban et al., 2019). In simpler words, e-commerce is the act of buying and selling things online via e-commerce channels such as Shopee, Lazada, and Mudah.

2.2. SHOPEE

Shopee is a commercial electronic company headquartered in Singapore and owned by Sea Limited (formerly known as Garena), founded in 2009 by Forrest Li. Shopee was first launched in Singapore in 2015 and has since expanded its reach to Malaysia, Thailand, Taiwan, Indonesia, Vietnam, and the Philippines. Starting in 2019, Shopee has also been active in Brazil, making it the first country in South America and outside of Asia that Shopee visited.

2.3. LAZADA

Lazada is an international e-commerce company, founded by Maximilian Bittner in 2012 and backed by Rocket Internet, as a marketplace platform that sells inventory to consumers from its own warehouses. It is currently owned by Alibaba Group, and its headquarter, Lazada One, is located in Singapore. Lazada modified its business model the following year to allow third-party retailers to sell their products on its platform. Lazada operates in Southeast Asia, except Myanmar, Laos, Cambodia, Brunei and East Timor.

2.4. MUDAH

Mudah (styled as *mudah.my*), is an online site that caters primarily to the Malaysian market, headquartered in Malaysia. Founded in 2007, it is the result of a partnership between Singapore's 701Search (a joint venture of SPH and Schibsted) and Norway's Telenor ASA. It is an online marketplace where users buy and sell a wide variety of goods, products, and services under different categories among Malaysian individuals and business groups worldwide. Mudah allows anyone to buy and sell in their respective areas easily, without the need for a physical store or registered company. As of June 2015, Mudah.my is the second most visited website in Malaysia, with 1,887,000 unique visitors.

2.5. AMAZON

Amazon is one of the world's largest and most influential e-commerce websites. Founded by Jeff Bezos in 1994 as an online bookstore, which then later expanded to a diverse range of products and services. Amazon operates on a massive scale, reaching millions of customers worldwide through its various regional websites. It markets items from both third-party sellers and its own inventory. As of 2023, it is the world's largest online retailer and marketplace.

2.6. CAROUSELL

Carousel is an online marketplace platform that originated in Singapore. Founded in 2012 by Quek Siu Rui, Marcus Tan, and Lucas Ngoo. It facilitates transactions between consumers and businesses, allowing them to buy and sell both new and used items. Originally, Carousell focused on the mobile market, where users can easily snap photos of items and list them for sale. Eventually, it expanded its reach to have a web-based version as well. It operates in several countries such as Singapore, Malaysia, Indonesia, the Philippines, Cambodia, Taiwan, Australia, New Zealand, and Canada.

3.   RESULT AND ANALYSIS

No	E-Commerce Platform	Google Lighthouse Analysis Result				
		Performance	Accessibility	Best Practices	SEO	PWA
1	**Shopee**	**24**	**78**	**96**	**86**	✓
2	**Lazada**	**30**	**49**	**33**	**79**	-

3	Mudah	19	86	74	78	-
4	Amazon	44	95	70	92	-
5	Carousell	35	82	70	97	✓

When it comes to performance measurements, Amazon leads the pack with a strong score of 44, demonstrating its dedication to smooth customer experiences. But Carousell, at 35, is not far behind this skill, suggesting a competitive environment where optimisation is crucial. On the other hand, Mudah lags behind with a score of 19, indicating possible areas where the responsiveness and speed of the site might be enhanced.

The foundation of inclusive web design, accessibility, is another important factor considered. With an outstanding score of 95, Amazon takes the lead in this category, highlighting its commitment to making sure that all users, regardless of ability, can easily browse the platform. With an 86, Mudah likewise does quite well; Lazada comes in lower at 49, indicating a need for more accessibility features.

A variety of standards are included in best practices with the goal of maximizing user experience and website functionality. With an impressive score of 96, Shopee leads the field in this regard, closely followed by Amazon and Carousell. On the other hand, Lazada receives a score of 33, which indicates that there is room for improvement and that it should follow industry norms.

To increase exposure and bring in organic traffic, Search Engine Optimisation (SEO) is essential for e-commerce platforms. Carousell establishes itself as a leader in the efficient use of SEO tactics by displaying its superiority once more with a remarkable score of 97. Amazon also has an exceptional score of 92. Shopee exhibits a commendable score of 86, while Mudah and Lazada lag significantly, suggesting areas for development in their SEO strategies.

Support for Progressive Web Apps (PWAs) stands out as a significant differential across the platforms under evaluation. The usage of PWA technology by Shopee and Carousell distinguishes them and allows for improved user experiences, such as offline functioning and app-like interactions. However, Lazada, Mudah, and Amazon have not yet adopted this novel strategy, which may restrict their capacity to successfully engage users across platforms.

4. RECOMMENDATION

Based on the test results and analysis, we have a few recommendations to improve the websites of each of the chosen e-commerce websites.

For Shopee, they should consider improving their performance by reducing unnecessary resources. This can be achieved by compressing images and simplifying CSS and JavaScript files to optimize page load times. Accessibility should also be considered improving by improving keyboard navigation and ensuring color contrast meets accessibility standards.

For Lazada, it is recommended to make improvements for all elements, as their overall scores are considerably low. For performance, they should optimize resource loading and eliminate render-blocking resources. To further enhance accessibility, keyboard navigation, screen reader compatibility, and many other accessibility features need investment for improvements. Best practices should also be reviewed for

web development and optimization. For SEO, consider optimizing meta tags and improve the site structure. Finally, they should consider implementing PWA features for better user experiences across all platforms.

For Mudah, improving performance should be prioritized, as it has an exceptionally low score of 19. For starters, analyze website loading times, resource delivery, and server response times to identify bottlenecks. Best practices should also be updated by addressing code inefficiencies and vulnerabilities to ensure compliance with industry standards and security protocols. For SEO, implement keyword research, and optimize meta tags and descriptions. PWA features should also be implemented.

For Amazon, best practices should be reviewed and updated via optimizing code and improving security measures to ensure compliance with website standards, PWA should be implemented. Other aspects of the analysis should be maintained.

For Carousell, slight optimization for website performance should be made such as caching, code minifications and server-side improvements to reduce loading times. Best practices should also be updated by regularly reviewing and updating website code.

All and all, while some aspects of the websites need immediate optimization, almost all elements have room for further improvements, as it is essential for enhancing overall user experience and achieving their business objectives.

5.   CONCLUSION

In this research we have conducted, we have acquired the performance test results using Google Lighthouse on the 5 chosen e-commerce websites and analyzed them. We tested based on 5 Matrix elements, which is Performance, Accessibility, Best Practices, SEO, and PWA. Based on the results and analysis, higher scores in these indicators correlate with better user experience and website accessibility. Therefore, when designing an e-commerce platform, prioritizing optimization in these areas is crucial. By continuously improving these metrics, e-commerce websites can enhance their competitiveness and provide users with a seamless shopping experience.

6.   REFERENCES

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