**BACHELOR OF COMPUTER SCIENCE
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ASSIGNMENT 1: Performance Analysis Using Metrix Google Lighthouse

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Abstract

In this modern digital era, online platforms have become essential in supporting everyday activities such as communication, education, and shopping. One of the most rapidly growing online activities is e-commerce. The effectiveness of an e-commerce website can significantly influence user trust and engagement, which is why performance analysis is crucial. This research focuses on analyzing the performance of several popular e-commerce websites such as Shopee, Lazada, Taobao, Amazon, and eBay using Google Lighthouse, a tool that measures website metrics such as Performance, Accessibility, Best Practices, and SEO. By auditing these websites, the study aims to evaluate and compare how well each platform is optimized for user experience. The results show that international platforms like eBay and Amazon outperform some local or regional websites, especially in performance and accessibility. These insights can help web developers and businesses improve their websites for better engagement and competitiveness in the digital marketplace.

1. Introduction

With the ever-changing digital age, several tasks can be completed through online media such as studying, employment, investment, etc. Furthermore, technology is broadening in our daily lives like shopping, for which it may be completed even without direct intervention and operations from the store. However, that kind of a task may even be available over the internet. Online shopping dealings are assisted through a portal by the name e-commerce. Business, or otherwise called online purchasing and selling, is an electronic platform through which its users can trade in products or services and a digital platform providing amenities for carrying out social activities to all its users. E-commerce is also a means to socialize with other users and carrying out online activities allows human beings to interact with each other without being restricted by time and space.

Based on the audit results using Google Lighthouse, several e-commerce platforms were tested in terms of their website performance: Shopee, Lazada, Taobao, Amazon, and eBay. The analysis includes key metrics that reflect user experience and site optimization. This study provides insights into which platforms have better performance and user accessibility, contributing to their effectiveness in the online marketplace. Website quality together with performance serve as primary factors which determine the ability of e-commerce platforms to gain and maintain active user bases when market competition rises. Holding less than ideal performance standards leads platforms to reduce traffic levels and experience lower conversion rates as well as poor customer satisfaction. The assessment of such websites through Google Lighthouse brings to light their critical aspects to guide future development and quality enhancement initiatives.

2. Literature Review

2.1. E-commerce Website

The design and functionality of e-commerce websites are critical in influencing consumer behavior and conversion rates. According to Laudon and Traver (2021)[1], effective e-commerce platforms must combine ease of use, strong visual design, and robust backend infrastructure to

support transactions. User experience (UX) is a key factor, and research by Kumar and Jha (2020)[2] shows that clear navigation, minimal design, and fast-loading pages significantly enhance user satisfaction and reduce bounce rates. Mobile commerce is rapidly growing, and websites must now be optimized for various screen sizes. Gao and Bai (2014)[3] argue that mobile responsiveness and ease of checkout on smartphones are strongly correlated with conversion success.

2.2. Shopee

Shopee, one of Southeast Asia's leading e-commerce platforms, has been recognised for its performance-oriented and user-friendly mobile web design. According to Sahana Madan (2022) [4], the online shopping platform Shopee also enables online consumers to shop anytime and anywhere with a wide variety of small sellers and trusted marketplace sellers who offer the best deals and savings. Research by Yuliati and Setiawati (2019) [5] states that Shopee often provides the goods with their accurate specifications and is effortless to understand after a short loading presentation, which means it is fast. Therefore, Shopee is used for performance evaluations in this report.

2.3. Lazada

According to Amanah and Harahap (2020) [6] Lazada.co.id is one of the online shops operating in Indonesia which is part of the Lazada Group which became the number one online shopping destination in Southeast Asia. Lazada provides a very wide range of products and is uncomplicated to be accessible via any search engine. The UI of Lazada website is fancy, neatly arranged advertisement space and very responsive. Buyers and sellers can complete transactions quickly, effortlessly, and affordably. Moreover, Lazada always offers the latest and best product to the customer. Therefore, Lazada is used for performance evaluations in this report.

2.4. TaoBao

Li, Li and Lin (2007) [7] reported, the rapidly expanding online consumer-to-consumer (C2C) business in China is worthy of extensive examination. Taobao is one of the leading C2C auction companies in China. According to the quantity of products displayed and website traffic, Taobao.com was ranked as the top C2C website. In the first three quarters of 2005, Taobao's overall transaction volume was approximately US$ 625 million, which represented 57.1% of China's entire C2C market size. There are some factors that cause Taobao to be the leading C2C website. Therefore, Taobao is used for performance evaluations in this report.

2.5. Amazon

Amazon is a well-known e-commerce website around the world. Amazon was dedicated to making e-commerce attractive, secure, and simple for inexperienced online consumers. Consumers needed only an email address, a charge card, and a password to shop. Amazon carried more than 1 million titles in stock, and prices were often considerably lower than they were in brick and mortar establishments. Amazon's website contributed significantly to its increase in

revenue, and the overall revenue was $177.9 billion in 2017 as reported by Wells, Danskin & Ellsworth (2018). It proves that Amazon is very suitable for performance measurement.

2.6.   eBay

Eghoff & Mabey (2007)[9] state that since eBay founding in 1995, eBay has developed into one of the dot-com era's greatest success stories and is currently the most popular online marketplace globally. Since its inception, eBay has had outstanding rates of expansion. Over 100 million people use eBay worldwide at the moment, and the business claims that users spend more time there than on any other website. On eBay, almost anything can be traded, and millions of things are placed as either fixed-price offers or auctions every day on average. Additionally, eBay provides PayPal as a payment method to guarantee secure and speedy money transactions. Ebay sells high quality and safety products to the customer worldwide. Thus, Ebay is used for performance evaluations in this report.

2.7.   Google Lighthouse

An open-source, fully automated technology called Google Lighthouse was created to enhance the functionality and quality of online sites according to Muna, Nurdin, & Taufiq (2022)[10] . Lighthouse was first created to audit Progressive Web Apps (PWA), but it has since matured into a full-featured website analysis tool that assesses SEO, best practices, accessibility, performance, and more. Lighthouse, which Google launched in the middle of 2018 as a component of its SEO toolkit, provides developers with insightful analysis and practical suggestions to improve their websites.

According to McGill, Bamgboye, Liu, & Kalutharage, (2023)[11], performance, accessibility, best practices, SEO, and PWA capabilities are among the areas in which Lighthouse conducts audits. It also produces comprehensive reports that include scores and graphs. Given that customer experience and happiness are directly impacted by website speed, these findings are very crucial. Lighthouse helps developers learn how consumers on slower networks could view their site by simulating real-world scenarios, such as loading a mobile version of a website over a weak 3G connection.

Google Lighthouse is used as web performance audit tools for this report.

3.   Method

This research originates with a literature review of web performance metrics, acquiring some data from other academic journals, Google's Web Vitals documentation, and case studies on e-commerce optimization. We collect and evaluate data from 7 popular e-commerce websites which are Shopee, Lazada, Taobao, Amazon, and eBay through utilizing Google Lighthouse via Chrome DevTools. Each product page is tested under standardized conditions for the desktop to ensure our data is consistent. Google Lighthouse evaluates four key categories scored 0–100 such as Performance Accessibility,Best Practices, and Search Engine Optimization (SEO). Each will have their scores interpreted as Poor (0–49), Adequate (50–89), or Excellent (90–100). Lighthouse can be executed as a web app or a Chrome extension which can be executed on any

website. It is used by many developers to evaluate the performance of applications. Using this information, we can identify patterns in other websites.

4.   Result & Discussion

Based on the testing results obtained by using google lighthouse on 16 april 2025,
I summarise it into table 4.1 to make it understandable.

	Performance	Accessibility	Best practices	SEO
Shopee	32	74	78	85
Lazada	83	54	56	92
TaoBao	78	75	59	83
Amazon	90	88	74	100
Ebay	95	88	78	92

Table 4.1: Audit results of websites

Table 4.1 reveals strengths and weaknesses across evaluated websites.First, **eBay** and **Amazon** have strong overall performance,especially in speed and accessibility. On the other hand, **Shopee** has a big weakness in performance, it only scores 32, which leads to poor loading speed. **Lazada** does well in SEO but falls short in accessibility and best practices, which leads to security and technical issues. **Amazon** and **eBay** shows strength in accessibility but needs to improve its performance.**Taobao** overall is good but quite weak in best practices.

By comparing the evaluation results, we noticed that international platforms like Amazon and eBay are performing better.Shopee and lazada, while popular in southern Asia , have lower scores in areas like performance and best practices. TaoBao has average scores in all areas with no major strengths or weaknesses.Overall, Amazon and eBay are more technically optimized among all evaluated websites.

5.   Conclusion

Based on the results of the analysis and test conducted in this research using Google Lighthouse on the 7 websites (Shopee, Lazada, Taobao, Amazon, and eBay) which test on the Performance, Accessibility, Best Practices, and SEO, it can be summarized that Amazon and eBay are both better optimized than the rest of the websites. Amazon and eBay have done a lot of optimizations and improved their website which results in their high scores in the Lighthouse. Meanwhile, Shopee on the other hand has the lowest scores in the evaluation making it need to have a lot more improvement in the future for better service.

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