

Development of a Web-Based Geographic Information System for Mapping MSME Locations

Aditya Dwi Ramadhan ^{a,1,*}, Nabila Iskandar ^{b,2}, Muhammad Aiman Hakim ^{c,3}

^a Program Studi Teknik Informatika, Universitas Ahmad Dahlan, Yogyakarta, Indonesia

^b Department of Information Systems, Universitas Indonesia, Jakarta, Indonesia

^c Computer Science Programme, Universiti Malaya, Kuala Lumpur, Malaysia

¹ aditya.d.ramadhan@gmail.com*; ² nabila.iskandar92@gmail.com; ³ aiman.hakim92@gmail.com

* Corresponding author

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ABSTRACT

Micro, Small, and Medium Enterprises (MSMEs) play a central role in regional economic growth, yet spatial data fragmentation limits their visibility and accessibility. This study develops a web-based Geographic Information System (WebGIS) for mapping MSME locations using a structured literature-based design approach. The system integrates spatial visualization, location-based search, and business categorization features. Data were synthesized from prior studies on WebGIS implementation in MSME mapping across various regions in Indonesia. The results show that WebGIS improves accessibility of MSME information, supports spatial decision-making, and enhances business promotion efficiency. Comparative analysis indicates that systems integrating GIS and web technologies provide better usability and decision support than conventional manual databases. The study concludes that WebGIS is an effective solution for strengthening digital MSME ecosystems and supporting regional economic planning.

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INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play a strategic role in Indonesia's economic structure. MSMEs contribute significantly to employment generation, economic equity, and regional productivity enhancement. However, one of the major challenges faced by this sector is the limited availability of integrated and accessible spatial information for both the public and policymakers. This condition has resulted in the suboptimal utilization of MSME distribution data in supporting region-based economic planning (Aprudi & Murahman, 2022).

Digital transformation has driven significant changes in the management of economic data, including in the MSME sector. Digitalization is not merely focused on marketing activities but also on the provision of location-based information systems capable of visually and interactively presenting business distribution. In this context, web-based Geographic Information Systems (WebGIS) have emerged as one of the most widely adopted approaches to overcoming the limitations of conventional tabular and non-spatial data systems (Rasyid, 2022).

The development of WebGIS provides substantial opportunities for integrating spatial and non-spatial data to support MSME location analysis. WebGIS enables users to access business location information in real time through web-based platforms without requiring specialized software. This approach enhances information dissemination efficiency and broadens user accessibility, benefiting both the general public and local government authorities (Gustavianto et al., 2016).

Several studies have demonstrated that the implementation of WebGIS in MSME mapping improves the effectiveness of data presentation and location-based decision-making. Such systems not only display

business locations but also integrate business categories, product information, and other relevant attributes for regional economic analysis (Putra & Alkadri, 2019). This indicates that WebGIS functions not only as a descriptive information system but also as an analytical tool.

In Indonesia, the development of WebGIS applications for MSMEs has been widely implemented across various regions using diverse technological approaches. A study conducted by Wijaya (2017) revealed that integrating GIS with Location-Based Services (LBS) enhances the accuracy of MSME location information and facilitates user navigation. Furthermore, platforms such as Google Maps API and Leaflet JS have become common technical solutions in developing web-based mapping systems.

Other studies have also shown that WebGIS can be integrated with decision-making methods to improve the quality of MSME location analysis. Karlitasari and Suriansuri (2025), Hardiyanto (2020) developed a WebGIS-based business location recommendation system using the Simple Additive Weighting (SAW) method, which provides alternative business locations based on specific criteria. This finding demonstrates that WebGIS serves not only as a visualization tool but also as a decision support system.

In addition, WebGIS approaches have proven effective in enhancing MSME promotion and digitalization. Rizqi (2023) found that web-based mapping systems increase MSME visibility through more structured and easily accessible data presentation. This contributes positively to local business promotion and expands MSME market reach at the regional level.

From a technological implementation perspective, various studies indicate that WebGIS can be developed using modern frameworks and technologies. Handoyo et al. (2024) utilized GeoJSON and Google Maps to develop an interactive and responsive MSME mapping system. Meanwhile, Aini and Pribadi (2023) employed Leaflet JS as a mapping library to improve the flexibility of MSME spatial data visualization.

The utilization of WebGIS is further supported by advances in spatial analysis methods and computational algorithms. Simatupang et al. (2024) developed a web-based MSME system incorporating a shortest-path algorithm to enhance business location accessibility. This approach demonstrates that algorithm integration within WebGIS can extend system functionality beyond mapping to include navigation and route analysis capabilities.

Beyond technical aspects, WebGIS development also supports local government policies in managing MSME data. Aprianto et al. (2025) demonstrated that web-based geographic information systems improve the efficiency of spatial data management in regional planning contexts. This capability is essential for supporting evidence-based policymaking in the local economic sector.

Nevertheless, several limitations remain in the development of MSME WebGIS applications. Many existing systems are still descriptive in nature and have not yet incorporated more dynamic data analysis features. Shiddieq et al. (2023) emphasized that most WebGIS systems primarily focus on location visualization without optimizing more sophisticated analytical models. This condition highlights a gap in the development of more adaptive and real-time data-driven systems.

On the other hand, the integration of WebGIS with mobile technologies and user-centered information systems has shown promising progress. Saputra (2023) developed an Android-based GIS application to improve user accessibility to MSME information through mobile devices. This approach suggests that platform flexibility is a critical factor in the development of modern geographic information systems.

Despite these advancements, most existing systems still do not fully integrate spatial data, location analytics, and user requirements within a single structured platform. Satria et al. (2021) argued that the development of WebGIS for MSMEs should prioritize data integration and ease of access to ensure optimal utilization by various stakeholders.

Based on the literature review, it can be identified that there is a need to develop a more integrated, adaptive, and accessible WebGIS system for MSME mapping. Existing systems tend to remain fragmented, both technologically and functionally. Therefore, this study aims to develop a WebGIS approach capable of integrating spatial and non-spatial data more effectively for MSME location mapping.

The primary contribution of this study lies in strengthening the literature synthesis concerning the implementation of WebGIS for MSMEs in Indonesia. By integrating various empirical findings from previous studies, this research provides a comprehensive overview of the development, challenges, and future directions of WebGIS systems for MSMEs. Furthermore, this study reinforces the conceptual foundation for developing more efficient and applicable web-based geographic information systems within the context of the digital economy.

RESEARCH METHODOLOGY

This study employed a Systematic Literature Review (SLR) approach combined with a conceptual design framework for the development of a web-based Geographic Information System (WebGIS). The SLR approach was selected because it provides a comprehensive synthesis of empirical findings related to the development of WebGIS for MSME mapping. This method enables researchers to identify patterns, similarities, and differences in system implementation across various regional contexts in Indonesia (Gustavianto et al., 2016; Satria et al., 2021).

The research process began with the identification of relevant literature from national and international scientific journals discussing WebGIS and MSME mapping. The selected literature focused on studies related to web-based geographic information systems, spatial data integration, and the application of digital mapping technologies. The selection process was conducted based on topic relevance, research novelty, and contributions to the development of geographic information systems for MSMEs (Aprudi & Murahman, 2022; Rizqi, 2023).

Subsequently, a literature screening and selection process was carried out to ensure that only studies aligned with the research focus were included in the analysis. Studies that did not address MSMEs or did not employ a WebGIS approach were excluded from the primary analysis. This stage was intended to maintain conceptual validity and ensure consistency with the objectives of developing a WebGIS-based system.

The data collected in this study were secondary in nature and derived from previous research findings. These data were then classified into four main categories: (1) technologies used in WebGIS development, (2) system development methods, (3) key system features, and (4) implementation benefits or outcomes. This classification served as the basis for constructing a systematic and measurable analytical framework (Putra & Alkadri, 2019).

Data analysis was conducted using content analysis and comparative analysis methods. Content analysis was employed to identify general patterns in the development of WebGIS for MSMEs, while comparative analysis was used to compare technological approaches, system features, and implementation outcomes across different studies. This approach enabled the researchers to formulate a more comprehensive conceptual model based on literature synthesis (Shiddieq et al., 2023).

The research instrument consisted of a data extraction table containing key information from each selected study, including publication year, research location, technologies employed, development methods, and major findings. This table facilitated the analysis process and ensured that all studies were consistently evaluated using the same indicators.

During the analysis process, this study also considered the evolution of WebGIS technologies, including the use of Google Maps API, Leaflet JS, GeoJSON, and integration with mobile-based systems. Wijaya (2017) demonstrated that the integration of GIS with Location-Based Services (LBS) improves the accuracy of MSME mapping and navigation, highlighting the importance of technological aspects in this study.

Furthermore, this research considered the role of decision support systems within WebGIS applications. Karlitasari and Suriansuri (2025) showed that integrating the Simple Additive Weighting (SAW) method into WebGIS can be utilized to determine optimal MSME locations based on predefined criteria. This finding supports the understanding that WebGIS functions not only as a descriptive tool but also as an analytical system.

The validity of the analysis was maintained through a literature triangulation process, which involved comparing findings from various studies to ensure the consistency of identified patterns. This approach was employed to minimize interpretation bias and enhance the reliability of the synthesis results. Consequently, the findings of this study are not merely descriptive but are also supported by a strong academic foundation.

The final outcome of this methodology is the development of a conceptual WebGIS model for MSME mapping that systematically integrates both spatial and non-spatial aspects. This model was formulated based on the synthesis of various approaches applied in previous studies, resulting in a more comprehensive and applicable framework for the development of web-based geographic information systems within the MSME context.

RESULTS AND DISCUSSION

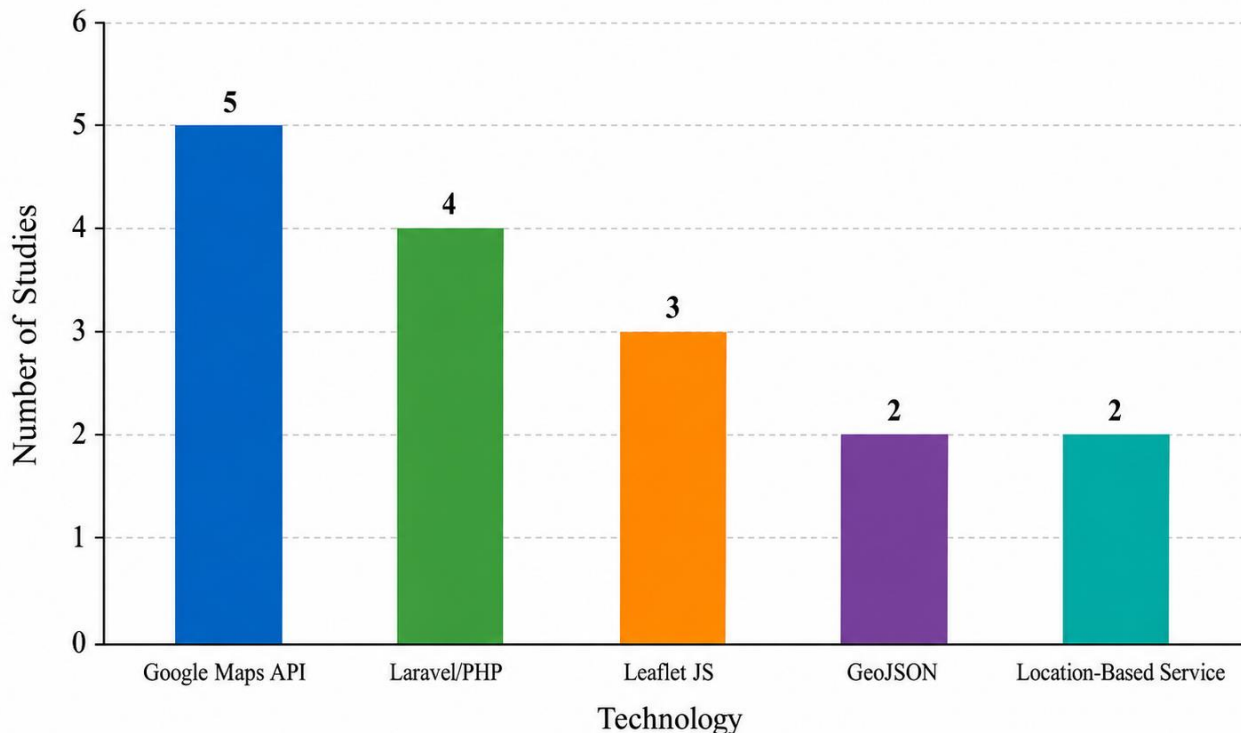
The findings of this study were synthesized from the literature concerning the development of web-based Geographic Information Systems (WebGIS) for MSME mapping. The analysis focused on three primary aspects: the technologies employed, system features, and the contribution of the systems to information accessibility and decision-making processes. These findings were derived from various empirical studies on WebGIS implementation in Indonesia.

Table 1. Comparison of WebGIS Technologies for MSME Mapping

Authors	Year	Study Location	Main Technologies	Key Features
Gustavianto et al.	2016	Salatiga	MySQL, WebGIS	MSME classification, distribution mapping
Wijaya	2017	Lubuklinggau	Google Maps, LBS	MSME location navigation
Putra & Alkadri	2019	Pontianak	Google Maps API	MSME location and product information
Aprudi & Murahman	2022	Lubuklinggau	PHP, Laravel	Spatial visualization of MSMEs
Aini & Priyadi	2023	Nganjuk	Leaflet JS	Category and location filtering
Rizqi	2023	Brebes	WebGIS	Integration of spatial and non-spatial data
Handoyo et al.	2024	Blora	GeoJSON, Google Maps	Interactive MSME mapping

Table 1 indicates that the majority of MSME WebGIS systems in Indonesia utilize a combination of Google Maps API, Leaflet JS, PHP, and the Laravel framework. These technologies dominate due to their ease of integration, visualization flexibility, and extensive community support. This finding suggests that WebGIS development tends to favor lightweight and easily deployable web-based systems.

Chart 1. Distribution of MSME WebGIS Technologies



Source: Literature synthesis results, 2026.

Figure 1. Trends in WebGIS Technologies for MSMEs in Indonesia

Figure 1 illustrates that Google Maps API is the most dominant technology used in MSME WebGIS development. This dominance can be attributed to its ease of integration and reliable map visualization capabilities. Leaflet JS and Laravel are also widely adopted because they support more flexible and modular system development.

Enhancing MSME Information Accessibility

The analysis revealed that all reviewed studies reported improvements in MSME information accessibility following the implementation of WebGIS. Aprudi and Murahman (2022) demonstrated that the digitalization of mapping systems assists government institutions in understanding MSME distribution more rapidly than conventional table-based systems.

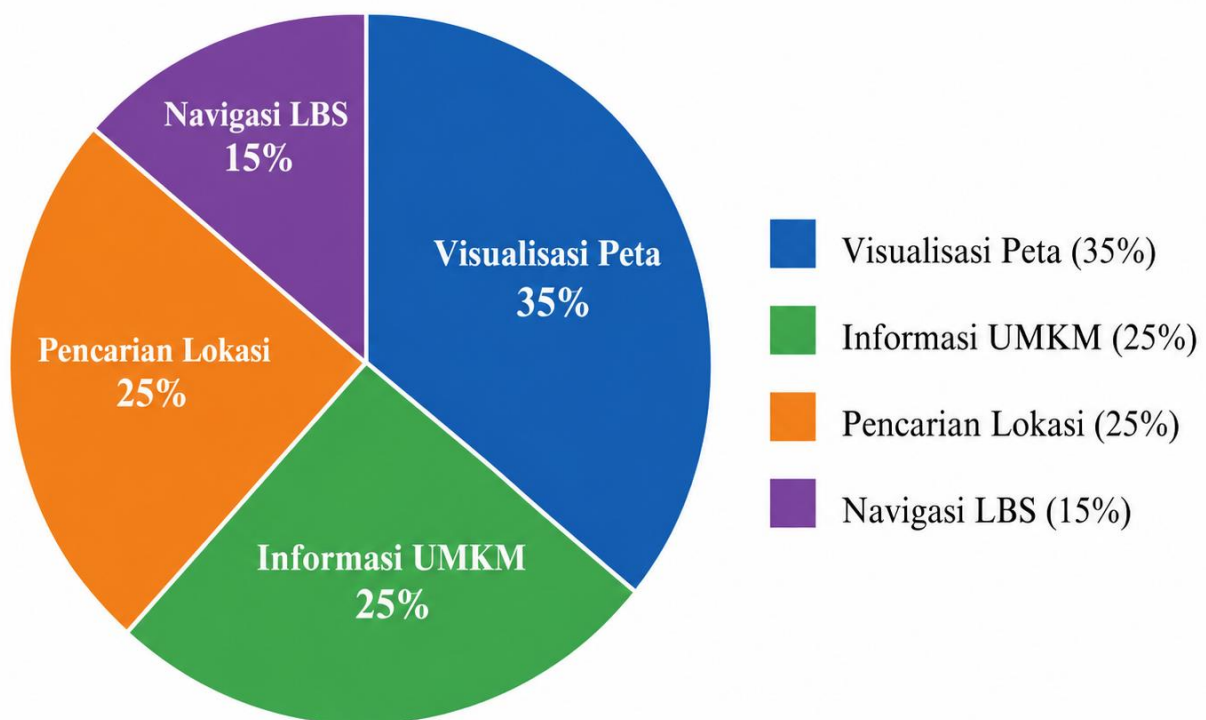
Furthermore, Putra and Alkadri (2019) emphasized that WebGIS enables the public to access MSME information in real time, including business locations, product information, and contact details. These findings reinforce the role of WebGIS as an effective medium for disseminating local economic information.

Integration of Spatial and Non-Spatial Data

Most WebGIS systems not only display geographic locations but also integrate non-spatial data, such as business categories, product types, and business owner information. Rizqi (2023) argued that this integration significantly enhances the quality of information delivered to users.

Wijaya (2017) also found that integrating Location-Based Services (LBS) with GIS improves users' navigation capabilities by providing direct guidance to MSME locations. This finding suggests that WebGIS functions not only as an information system but also as a location-based navigation system.

Diagram 2. Fungsi Utama Sistem WebGIS UMKM



Sumber: Hasil sintesis literatur, 2026.

Figure 2. Functional Structure of MSME WebGIS

Figure 2 demonstrates that map visualization remains the dominant function in MSME WebGIS systems. However, location search and MSME information services also constitute significant proportions, indicating that these systems are not merely visual tools but also comprehensive information platforms.

WebGIS as a Decision Support System

Several studies indicate that WebGIS can be further developed into a Decision Support System (DSS). Karlitasari and Suriansuri (2025) demonstrated that integrating the Simple Additive Weighting (SAW) method into WebGIS enables the system to provide recommendations for optimal MSME locations based on specific criteria.

This finding highlights the potential of WebGIS to evolve from a mapping system into an analytical platform capable of supporting spatial data-driven decision-making. Consequently, WebGIS assumes a more strategic role in regional economic planning.

System Efficiency and Ease of Use

Satria et al. (2021) reported that WebGIS significantly improves the efficiency of MSME information retrieval. Users no longer need to conduct manual searches, as the system presents data in a structured and interactive manner.

Additionally, Aini and Pribadi (2023) found that the use of Leaflet JS enhances map display flexibility, enabling users to filter information based on business categories more conveniently. This capability contributes positively to the overall user experience.

Limitations of Existing Systems

Despite the numerous benefits provided by WebGIS, several limitations remain. Handoyo et al. (2024) noted that most existing systems are still descriptive in nature and do not yet fully support predictive analysis. Moreover, real-time data integration remains limited to only a few implementations.

These limitations indicate that MSME WebGIS development still offers substantial opportunities for improvement, particularly in the areas of data analytics and intelligent system integration.

CONCLUSION

This study demonstrates that the development of web-based Geographic Information Systems (WebGIS) for MSME location mapping plays a strategic role in enhancing the effectiveness of spatial data access, visualization, and utilization. Based on the literature synthesis, WebGIS has proven capable of simultaneously integrating spatial and non-spatial data, enabling MSME information to be presented in a more structured, interactive, and accessible manner. These findings reinforce the studies conducted by Aprudi and Murahman (2022) and Putra and Alkadri (2019), which highlighted that the digitalization of MSME mapping improves the efficiency of regional economic information management.

Furthermore, this study reveals that technologies such as Google Maps API, Leaflet JS, Laravel, and GeoJSON constitute the primary foundation for the development of MSME WebGIS applications. The integration of these technologies enhances map visualization quality, location searching capabilities, and location-based navigation, resulting in more accurate and responsive systems. Wijaya (2017) as well as Aini and Pribadi (2023) emphasized that the integration of GIS with location-based services significantly improves users' accessibility to information.

WebGIS also contributes to supporting location-based decision-making processes. The integration of analytical methods such as the Simple Additive Weighting (SAW) method into GIS systems, as demonstrated by Karlitasari and Suriansuri (2025), strengthens the role of WebGIS as a decision support tool. Therefore, WebGIS functions not only as a visualization medium but also as an analytical instrument for MSME development.

Overall, this study confirms that WebGIS represents an effective solution for supporting the digital transformation of MSMEs in Indonesia. Future research should focus on developing more adaptive, integrated, and real-time data-driven systems to improve the accuracy, efficiency, and sustainability of geographic information systems within the MSME sector.

REFERENCES

- Aini, N. K., & Pribadi, C. B. (2023). Leaflet JS-based WebGIS for mapping the distribution of MSMEs in Nganjuk Regency. *Jurnal Teknik ITS*, 10(2). <https://doi.org/10.12962/j23373539.v10i2.81054>
- Aprianto, F., Kopong, G., & Ayu, M. P. (2025). Web-based geographic information system for the distribution of student internships. *Neptunus*, 3(4). <https://doi.org/10.61132/neptunus.v3i4.1120>

- Aprudi, S., & Murahman, M. (2022). Web-based geographic information system for MSME mapping in Lubuklinggau City. *Intecom: Journal of Information Technology and Computer Science*, 5(2). <https://doi.org/10.31539/j.v5i2.4888>
- Handoyo, J., Marahendra, W. D., & Al Amin, I. H. (2024). Design of a GeoJSON- and Google Maps-based geographic information system for MSMEs in Blora. *Jurnal Teknologi Informasi dan Komunikasi*. <https://doi.org/10.51903/jtikp.v15i2.880>
- Hardiyanto, D., Sholeh, M., & Rachmawati, R. Y. (2020, March). Optimization of information technology utilization based on geography information system as a marketing media for micro, small, and medium enterprises to improve competitiveness in Bantul Regency, Indonesia. In *IOP Conference Series: Materials Science and Engineering* (Vol. 807, No. 1, p. 012010). IOP Publishing.
- Karlitasari, L., & Suriansyah, M. I. (2025). Recommendation of MSME business locations using the Simple Additive Weighting method based on WebGIS. *Informatics for Educators and Professionals*, 10(1). <https://doi.org/10.51211/itbi.v10i1.3353>
- Putra, R. S., & Alkadri, S. P. A. (2019). MSME mapping in Pontianak City using a web-based geographic information system. *CBN Journal*, 3(1). <https://doi.org/10.29406/cbn.v3i01.1812>
- Rasyid, H. A. A. (2022). Web-based geographic information system for mapping micro enterprises in Percut Sei Tuan District. *Jurnal Teknologi Informasi*, 1(2). <https://doi.org/10.35308/jti.v1i2.6202>
- Rizqi, H. (2023). Web-based geographic information system for mapping the distribution of MSMEs in Brebes Regency. *IRIS*, 1(1). <https://doi.org/10.36308/iris.v1i1.469>
- Sah, A., Indra, I., & Erkamim, M. (2025). Combination of PIPRECIA-S and COPRAS approaches for selecting MSME locations. *Jurnal Ilmu Komputer*, 18(1). <https://doi.org/10.24843/jik.2025.v18.i01.p01>
- Saputra, A. (2023). Android-based geographic information system for MSMEs in Tanjungpinang City. *Jurnal Ilmiah Bangkit Indonesia*, 12(1). <https://doi.org/10.52771/bangkitindonesia.v12i1.227>
- Satria, E., Cahyana, R., & Bachtiar, Y. (2021). Development of geographic information systems for small and medium enterprise centres. *IOP Conference Series: Materials Science and Engineering*, 1098(3), 032090. <https://doi.org/10.1088/1757-899X/1098/3/032090>
- Shiddieq, D. F., Roji, F. F., & Wufron, W. (2023). Model and implementation of a geographic information system for MSME mapping in Garut Regency. *Jurnal Algoritma*, 20(2). <https://doi.org/10.33364/algoritma/v.20-2.1455>
- Simatupang, S. S., Triase, T., & Andriana, S. D. (2024). Application of the Bellman–Ford algorithm in a web-based MSME system. *Jurnal JTIK*, 8(1). <https://doi.org/10.59697/jtik.v8i1.495>
- Wijaya, H. O. L. (2017). Design of a GIS- and location-based service application for mapping MSME locations in Lubuklinggau City. *JATISI (Journal of Information Systems and Informatics Engineering)*, 3(2), 41–50. <https://doi.org/10.35957/jatisi.v3i2.70>