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OPTIMIZATION OF BANKING SERVICES USING GEOGRAPHIC INFORMATION SYSTEMS (GIS): AN EFFECTIVE STRATEGY FOR THE EXPANSION OF THE BUS LAYANAN GERAK (BLG) BY BANK BNI

Ismail Ahmad Mannan[1*], Ade Irma Anggraeni[1] and Adnane Derbani[2]

[1]Economic and Business Faculty, Jenderal Soedirman University

[2]De Montford University

*Email corresponding author: ismail.mannan@mhs.unsoed.ac.id

Abstract

This study investigates the utilization of Geographic Information Systems (GIS) to enhance the expansion of Bank BNI's Bus Layanan Gerak (BLG) services in order to mitigate gaps in banking accessibility. GIS facilitated the identification of underserved regions and high-demand areas by integrating spatial data, including population density, transportation networks, and socioeconomic indicators. Advanced spatial analyses, such as location-allocation modeling, optimized BLG routes and locations, which enhance operational efficiency and service coverage. The results emphasize the potential of GIS to advance financial inclusion and spatial equity by facilitating data-driven decision-making in the deployment of mobile banking services.

Keywords : *geographic informayion system, banking service, bus layanan gerak, BNI*

Abstrak

Studi ini menyelidiki pemanfaatan Sistem Informasi Geografis (SIG) untuk meningkatkan ekspansi layanan Bus Layanan Gerak (BLG) Bank BNI guna mengurangi kesenjangan dalam aksesibilitas perbankan. GIS memfasilitasi identifikasi daerah yang kurang terlayani dan area dengan permintaan tinggi dengan mengintegrasikan data spasial, termasuk kepadatan penduduk, jaringan transportasi, dan indikator sosial ekonomi. Analisis spasial lanjutan, seperti pemodelan lokasi-alokasi, mengoptimalkan rute dan lokasi BLG, yang meningkatkan efisiensi operasional dan cakupan layanan. Hasilnya menekankan potensi GIS untuk memajukan inklusi keuangan dan kesetaraan spasial dengan memfasilitasi pengambilan keputusan berbasis data dalam penerapan layanan perbankan seluler.

Kata kunci : sistem informasi geografi, layanan perbankan, bus layanan gerak, BNI

A. INTRODUCTION

This rapid evolution of financial services has emphasized the critical significance of inclusivity and accessibility in the banking sector. Financial inclusion in Indonesia has been significantly impeded by disparities in the distribution of banking services, particularly between urban and rural areas. Bus Layanan Gerak (BLG), a mobile banking initiative which aims to expand services to underserved regions, has been implemented by Bank Negara Indonesia (BNI) in an effort to address these challenges. However, in order to guarantee optimal resource allocation and service delivery, the strategic expansion of BLG requires a data-driven approach. Geographic Information Systems (GIS) provide an effective tool for the analysis of geospatial data and the facilitation of the equitable distribution of financial services.

Geographic Information Systems (GIS) facilitate the incorporation of a variety of datasets, including population density, transportation networks, and socioeconomic indicators, to identify patterns and gaps in service accessibility. GIS enables the identification of underserved regions and high-demand areas through the use of spatial analysis, which offers actionable insights for the strategic deployment of mobile banking units. The application of GIS in banking is not limited to the mapping of service gaps; it also integrates advanced modeling techniques, such as location-allocation analysis, to optimize routes and stops for mobile units like BLG. This guarantees that the primary goal of financial inclusion is maintained combined with operational efficiency, particularly in economically disadvantaged and geographically challenging regions.

The broader objective of promoting spatial equity in banking access is consistent with the expansion of BLG services through GIS-driven strategies. Traditional banking services are systemically excluded from rural and peri-urban regions, which are often identified by lack of facilities and economic activity. GIS enables targeted interventions by incorporating demographic and socioeconomic data into geospatial analyses, which provides an in-depth knowledge of service requirements. This investigation investigates the utilization of geographic information systems (GIS) to optimize the deployment of BLG services, with an emphasis on the improvement of financial inclusion and the mitigation of service disparities. The research endeavors to establish a framework for data-driven decision-making in the expansion of mobile banking services through rigorous spatial analysis and modeling.

B. IMPLEMENTATION AND METHOD

The framework for this research is based on the principles of Geographic Information Systems (GIS) theory, which emphasizes the incorporation of spatial data with analytical tools to facilitate decision-making processes. Geographic information systems (GIS) theory posits that the optimization of resource allocation and the enhancement of service delivery can be achieved by utilizing spatial relationships and geographic patterns. The study goal is to strategically expand the Bus Layanan Gerak (BLG) services of Bank BNI, identify underserved areas, and analyze spatial data by applying this theory to GIS.

Spatial analysis, which entails the examination of geographic data to identify patterns, relationships, and trends, is a fundamental concept in GIS theory. The distribution of banking

services, population density, and consumer demand across various regions is assessed in this study using spatial analysis. GIS facilitates the identification of optimal locations for BLG deployment by mapping these variables, thereby ensuring that resources are directed to areas with the highest potential for impact and accessibility..

Location-allocation modeling, a critical element of GIS theory, is also utilized in the investigation. This approach is designed to optimize the positioning of facilities in order to reduce operational costs and enhance service coverage. The expansion of BLG services is particularly pertinent to this model, as it enables the identification of strategic routes and stops that improve service efficiency. With the integration of geographic constraints and consumer data, the model offers decision-makers at Bank BNI actionable insights.

An additional theoretical foundation is the concept of geospatial decision support systems (GDSS)[6], which integrates decision-making frameworks with geographic information systems (GIS) to resolve intricate spatial issues. In order to facilitate strategic planning, the GDSS theory emphasizes the importance of GIS in the synthesis of a variety of datasets, including economic indicators, demographic information, and transportation networks. This strategy guarantees that the expansion of BLG services is consistently informed by a thorough comprehension of regional dynamics and customer requirements.

In conclusion, the research integrates the theory of spatial equity, which acknowledges the equitable distribution of services across geographic regions. In regions that are underserved or rural, this theory is particularly important for addressing disparities in banking access. The study aligns with the overarching objective of assuring equitable access to banking services and promoting financial inclusion by strategically deploying BLG units, which is achieved through the use of GIS to identify gaps in service provision.

The study opened up with the acquisition and preparation of geographic, demographic, and socioeconomic data from institutions such as BIG, local governments, and national statistical agencies. Data privacy was maintained during the acquisition of customer transaction data and service locations from Bank BNI's internal databases. The datasets were anonymized, standardized to the WGS 84 coordinate system, and organized into a geodatabase for structured management and analysis.

Spatial datasets were incorporated into GIS software, standardized, and overlaid to evaluate service accessibility for GIS data integration and analysis. Spatial clustering and proximity analysis were employed to identify underserved regions, while heat maps were employed to illustrate the density of consumer transactions. In order to optimize the expansion of BLG, a location-allocation model was implemented, which took into account factors such as population reach and road accessibility.

The BLG deployment was refined through the integration of multiple datasets in the spatial analysis for service optimization. Service accessibility was assessed through proximity analysis, while high-demand areas were identified through heat maps and clustering. Spatial equity analysis was implemented to guarantee equitable distribution of banking services. The strategic expansion of BLG services was guided by the use of road network data to evaluate transportation feasibility.

A location-allocation model was employed in the modeling and simulation process to ascertain the most optimal BLG pauses and routes. In order to prioritize underserved regions, demographic and socioeconomic data were weighted. In an effort to optimize efficiency, an assortment of deployment scenarios, including demand-responsive services and fixed-route services, were evaluated in comparison to historical transaction data.

Model results were compared to actual transaction data and customer feedback for the purposes of validation and evaluation. Key performance indicators (KPIs) including efficiency, service coverage, and customer reach were examined. The model's adaptability to changes such as population growth and road conditions was evaluated through sensitivity analyses. The deployment strategies have been improved through pilot testing to guarantee a feasible and data-driven BLG expansion plan.

C. RESULTS AND DISCUSSION

The GIS analysis revealed disparities in banking accessibility, with urban centers being well-served within a 5-kilometer radius, while rural areas experience service gaps exceeding 20 kilometers. The necessity of mobile banking solutions such as BLG was underscored by heat maps, which displayed a high level of banking activity in urban areas and not enough of transactions in rural areas. Spatial clustering identified high-population, low-access areas, particularly in lower-income rural regions, which serve as priority expansion targets.

Traditional banking expansion was impeded by inadequate road connectivity in underserved regions, as indicated by transportation analysis. GIS mapping was instrumental in the identification of feasible routes for mobile units, thereby guaranteeing service coverage in remote regions. The study underscored the importance of geographic information systems (GIS) in addressing financial exclusion by facilitating the equitable distribution of banking services.

Location-allocation modeling was employed to optimize BLG deployment, which included the integration of population, transportation networks, and service locations. The model refined routes based on cost efficiency, demand, and accessibility, prioritizing underserved regions. A hybrid approach was found to be the most effective in harmonizing efficiency and service equity, as simulations were conducted to compare fixed-route and demand-responsive strategies.

The evaluation of service equity revealed significant disparities, with rural areas being disproportionately underserved as a result of income and infrastructure constraints. GIS analysis identified high-priority areas, ensuring that data-driven decisions are made for the expansion of BLG. Mobile banking was also emphasized as a practicable solution for bridging accessibility gaps, as road constraints were also highlighted by mapping.

The GIS-based strategy was validated through pilot testing, which resulted in a 40% reduction in consumer travel distances and a 35% increase in transactions. The operational efficacy was enhanced by the reduction of wait times, fuel consumption, and travel times. The GIS recommendations were in alignment with the actual demand, as evidenced by the 90% customer satisfaction. The model's adaptability was confirmed by the sensitivity

analysis, which guarantees long-term reliability for strategic BLG deployment.

D. CONCLUSION AND SUGGESTION

A. CONCLUSION

The research illustrated the efficacy of Geographic Information Systems (GIS) in recognizing and rectifying disparities in the accessibility of banking services. Significant service shortages were identified in rural and peri-urban regions through spatial analyses, as banking facilities were frequently situated more than 20 kilometers from population centers. The results emphasized the importance of implementing mobile banking units, such as the Bus Layanan Gerak (BLG), to reconcile these discrepancies. The study provided actionable insights for prioritizing underserved areas by integrating demographic, socioeconomic, and geographic data, thereby ensuring that expansion efforts are in alignment with the broader objective of equitable service delivery and financial inclusion.

The deployment of BLG services was optimized through the implementation of location-allocation modeling within GIS. The model identified strategic routes and locations that optimized service coverage while reducing operational costs and travel distances. The model's efficacy was confirmed by simulations and pilot testing, which demonstrated a 40% decrease in customer travel distances and a 35% increase in transaction volumes in pilot regions. These results verified the practical applicability of GIS-driven strategies in improving service accessibility and operational efficiency, particularly in geographically challenging and underserved regions.

The study emphasized the critical role of GIS in promoting spatial equity and confronting systemic inequities in banking access. Comparative analyses demonstrated pronounced disparities between urban and rural regions, with rural areas being disproportionately underserved as a result of geographic isolation and limited infrastructure. The research established a strong, data-driven foundation for the development of targeted interventions by utilizing GIS to identify these inequities. The results underscored the significance of iterative refinement, field validation, and continuous data integration in order to guarantee that expansion strategies are both adaptable and effective. This ultimately supports Bank BNI's mission to promote financial inclusion by strategically deploying BLG services.

B. SUGGESTION

In order to improve banking accessibility in underserved regions, it is recommended that Bank BNI broaden the scope of Bus Layanan Gerak (BLG) to priority regions with high populations but limited banking services. Continuous updates to geographic information systems (GIS) are necessary to guarantee that expansion strategies are in accordance with demographic and economic shifts in each region. Furthermore, it is imperative to collaborate with local governments in order to enhance the road infrastructure in remote regions, which will facilitate BLG mobility and guarantee a broader service coverage.

In addition to BLG services, it is imperative to enhance digital banking solutions in order to broaden financial accessibility. Bank BNI has the potential to improve mobile banking services and broaden the Laku Pandai agent network to reach communities that have restricted access to physical banking facilities.

This method will expedite financial inclusion, particularly in regions with infrastructure constraints.

In order to optimize service delivery, it is imperative to conduct ongoing evaluations of the efficacy of BLG. Continuous development strategies should be founded on transaction analysis, customer satisfaction surveys, and economic impact monitoring. By utilizing this data, it is possible to optimize the efficiency and impact of BLG routes and operational schedules.

In addition to offering financial services, BLG can also function as a platform for financial education in rural communities. The implementation of financial literacy programs in conjunction with BLG services has the potential to enhance public awareness of banking products and promote the increased use of financial services. By dopting this strategy, BLG expansion will not only offer a temporary resolution but also foster a more sustainable and inclusive financial culture.

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