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A Survey on Leveraging GIS and Location Intelligence for Business Expansion

[1]Ketaki Katre; [2]Aditya Deshmukh; [3]Dinesh Rathod;
[4]Mayank Mehta; [5]Tanisha Adhav; [6]Akshay Singhal

[1]Asst. Professor, Dept. of AI & DS, MMCOE, Pune
[2]Dept. of AI & DS MMCOE, Pune
[3]Dept. of AI & DS MMCOE, Pune
[4]Dept. of AI & DS MMCOE, Pune
[5]Dept. AI & DS MMCOE, Pune
[6]Principal Architect Dista Technology Pvt. Ltd.

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Abstract: This survey explores the role of Geographic Information Systems (GIS) and location intelligence in optimizing industrial and food business expansion. While GIS has been widely used for site selection, challenges remain in integrating multi-objective criteria, real-time constraints, and dynamic market factors. This paper reviews existing methodologies, highlighting key GIS applications in demographic analysis, competitor mapping, and infrastructure assessment. By synthesizing recent advancements, this survey provides insights into how GIS-driven decision-making enhances market penetration, profitability, and operational efficiency.

Keywords*: GIS, Location Intelligence, Business Expansion, Site Selection, Market Analysis*

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I. INTRODUCTION

The strategic expansion of industrial and food businesses depends heavily on selecting the right locations, as factors such as customer demographics, competition, infrastructure, and accessibility play a critical role in operational success. Geographic Information Systems (GIS) and location intelligence have become essential tools in modern business planning, providing data-driven insights for site selection. Previous research has demonstrated the effectiveness of GIS when integrated with machine learning, artificial intelligence (AI), and decision support systems for optimizing resource allocation and land-use classification. For instance, GIS has been applied to assess healthcare accessibility through location-allocation models[1], while hierarchical neuro-fuzzy models have been used for industrial site classification[2]. Similarly, GIS-driven methodologies have optimized emergency response planning by identifying locations that minimize transportation time[3] and have been successfully employed for urban land-use classification using machine learning techniques[4].

This survey provides a comprehensive review of GIS applications in business expansion, focusing on methodologies that enhance decision-making for industrial and food enterprises. Deep learning and GIS integration have been proposed for smart city planning, aiding in spatial pattern recognition and infrastructure distribution[5]. Additionally, GIS-based environmental impact assessments have been utilized to ensure sustainable industrial development[6], while flood risk assessments using machine learning have helped businesses evaluate environmental vulnerabilities[7]. Other research highlights the role of GIS in evaluating urban green spaces for land-use planning[8] and developing GIS-integrated decision support systems for sustainable industrial site selection[9]. Furthermore, the integration of big data with GIS has enhanced real-time decision-making in smart city planning, providing valuable insights into population density, transportation networks, and market trends[10]. By synthesizing these advancements, this survey aims to highlight how GIS and location intelligence continue to shape strategic business expansion and site selection.

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II. LITERATURE SURVEY

[1] **K.S.G. Ramos & E.C. Peramo (2024)** – Used **location-allocation analysis** to optimize hospital placements and **land-use semantic segmentation models** to classify urban and rural areas based on GIS and AI techniques.

[2] **Aleksandar Rikalovic et al. (2017)** – Developed an **Intelligent Decision Support System (IDSS)** integrating **GIS with a hierarchical neuro-fuzzy model** to classify industrial sites by evaluating spatial and expert knowledge-based criteria.

[3] **X. Zhang et al. (2019)** – Applied **GIS and machine learning** for **emergency response planning**, optimizing response times by analyzing transportation networks and accessibility metrics.

[4] **H. Chen & L. Zhang (2019)** – Combined **GIS and machine learning** for **urban land use classification**, mapping different land categories using remote sensing and spatial clustering techniques.

[5] **A. Mitra & A. Khamparia (2020)** – Proposed a **deep learning and GIS framework** for **smart city planning**, integrating geospatial data with AI-driven pattern recognition to optimize urban layouts.

[6] **M. Alharbi & H. Kim (2020)** – Conducted **GIS-based environmental impact assessments** using geospatial modeling to evaluate **sustainability factors** in urban development and industrial site selection.

[7] **Y. Hu et al. (2020)** – Used **machine learning models (SVM, decision trees)** combined with **GIS-based flood risk assessments**, identifying high-risk zones by integrating spatial hydrology and meteorological datasets.

[8] **R. Smith & T. Brown (2020)** – Developed a **GIS-based evaluation framework** for **urban green spaces**, using **remote sensing and spatial analysis** to assess land use, vegetation cover, and ecosystem services.

[9] **W. Liu et al. (2020)** – Designed a **GIS-integrated decision support system (DSS)** with **machine learning algorithms** to evaluate industrial sites based on environmental regulations, emissions, and sustainability goals.

[10] **Y. Wang & X. Zhang (2019)** – Utilized **big data and GIS** for **smart city planning**, integrating real-time population density, traffic flows, and infrastructure distribution to optimize site selection.

III. PROPOSED METHODOLOGY

This survey examines the role of Geographic Information Systems (GIS) and location intelligence in optimizing business expansion, particularly in the industrial and food sectors. The methodology involves a structured review of existing research, focusing on key technological advancements, data integration techniques, and decision-making frameworks. The following steps outline the approach taken in this study:

A. Data Collection and Sources:

The survey aggregates information from various research papers, case studies, and industry applications that have explored GIS-driven business expansion. Key data sources include government demographic records, satellite imagery, OpenStreetMap (OSM) data, Google Earth Engine, and market analysis reports. These sources provide insights into spatial factors such as population density, infrastructure availability, transportation networks, and competitor distribution.

B. GIS and Analytical Techniques:

The surveyed studies employ multiple GIS-based analytical techniques, including spatial clustering, multi-criteria decision analysis (MCDA), and location-allocation modelling. Some approaches integrate machine learning algorithms such as neural networks and decision trees for predictive modelling. The methodology reviews these techniques to assess their effectiveness in optimizing site selection.

C. Comparative Analysis of GIS Applications:

The paper categorizes GIS applications based on their purpose, such as competitor analysis, environmental sustainability assessment, and customer demographic evaluation. By comparing different methodologies, the study identifies best practices and common limitations in current GIS-based decision-making frameworks.

D. Integration with Emerging Technologies:

The survey explores how GIS is increasingly being integrated with artificial intelligence (AI), big data analytics, and cloud computing for enhanced business intelligence. Studies implementing deep learning for land-use classification and real-time data integration for dynamic decision-making are examined.

E. Evaluation of Business Impact:

The final phase of the methodology assesses the practical implications of GIS-driven decision-making on business performance. This includes reviewing case studies where GIS has successfully guided food business expansions, leading to increased profitability and market penetration. Challenges such as data accuracy, computational complexity, and real-time adaptability are also discussed.

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By synthesizing these aspects, this survey aims to provide a comprehensive overview of the technological advancements, challenges, and future directions of GIS applications in industrial and food business expansion.

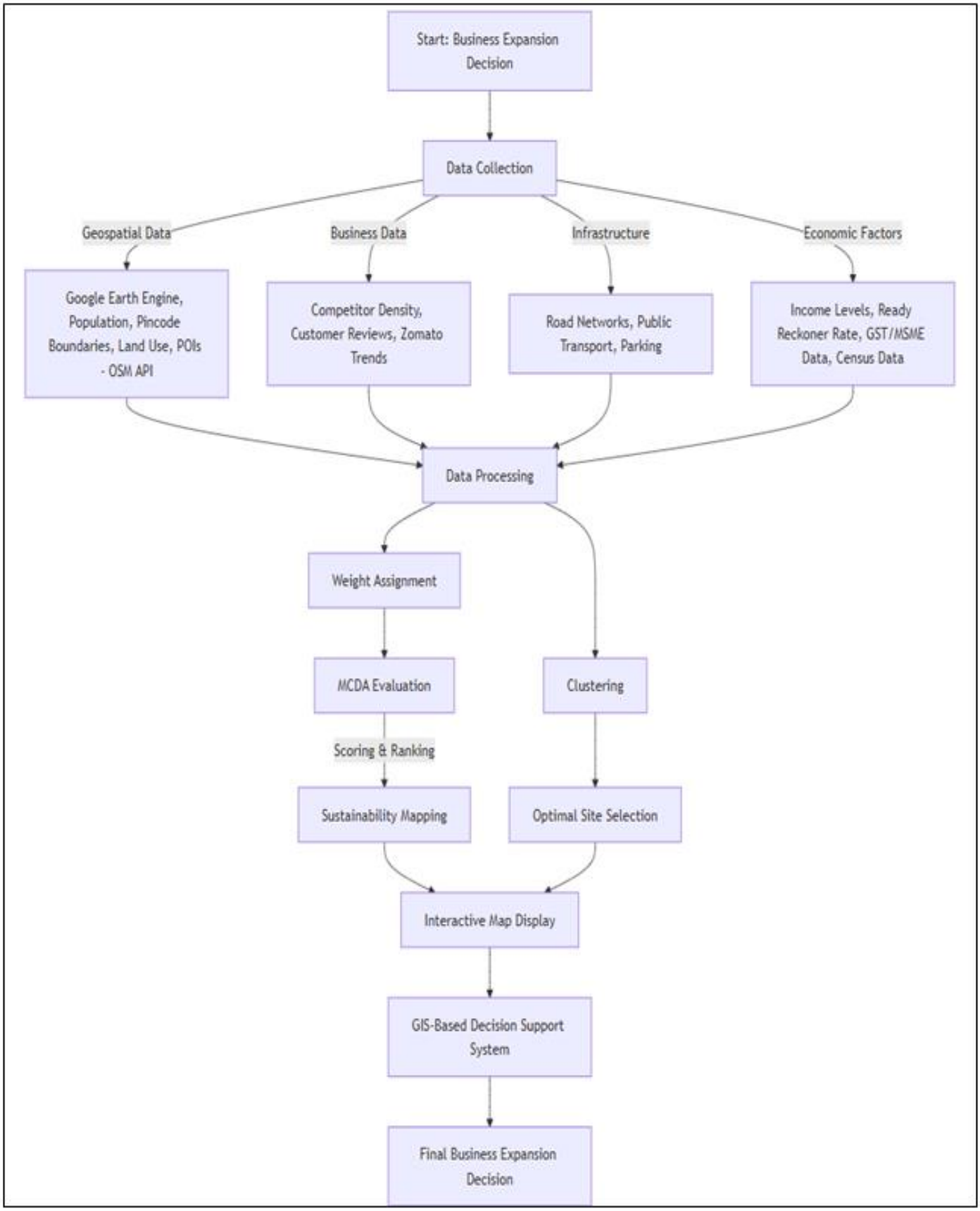

Fig 1: Proposed Methodology Approach

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IV. CONCLUSION

The role of Geographic Information Systems (GIS) and location intelligence in business expansion has been widely recognized across various industries, particularly in the industrial and food sectors. Through an extensive survey of existing research, it is evident that GIS enhances site selection by integrating spatial, demographic, and economic factors, leading to more informed decision-making. The ability to analyze real-time data, optimize resource allocation, and predict market demand gives businesses a competitive edge in identifying ideal locations for growth. Moreover, GIS has proven effective in tackling complex challenges such as competitor mapping, environmental sustainability, and urban planning. Studies have demonstrated its success in applications ranging from land-use classification to smart city development, further reinforcing its value in strategic business planning. The increasing use of AI and machine learning alongside GIS has also expanded its predictive capabilities, making it a vital tool for businesses aiming to adapt to evolving market conditions.

As data becomes more prominent in business operations, GIS and location intelligence will continue to be critical in shaping expansion strategies. The growing availability of high-resolution geospatial data, combined with advancements in cloud computing and real-time analytics, will allow businesses to make faster and more precise decisions. Industries will benefit from GIS-driven insights that not only optimize location selection but also contribute to sustainability efforts by minimizing environmental impact and ensuring long-term viability. With increasing market competition and rapidly changing consumer behavior, businesses that leverage GIS for location intelligence will be better positioned to navigate uncertainties and maximize growth opportunities. In the coming years, GIS will no longer be just a supplementary tool but a fundamental component of business expansion, driving efficiency, profitability, and strategic foresight in an increasingly data-driven world.

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