Uluslararası Akademik Birikim Dergisi
Yıl: 2023, Cilt: 6, Sayı:4, ss. 811-829

Gönüllü Coğrafi Bilgi Sistemleri ve Pazarlama Alanında Kullanımı

Mustafa ERGÜN
Dr. Öğr. Ü. Giresun Üniversitesi, Bulancak UBYO
mustafa.ergun@giresun.edu.tr
https://orcid.org/0000-0003-1675-0802

Makale Başvuru Tarihi : 26.08.2023
Makale Kabul Tarihi : 07.10.2023
Makale Yayın Tarihi : 27.10.2023
Makale Türü : Araştırma Makalesi
DOI: 10.5281/zenodo.10048622

Özet

Anahtar Kelimeler:

Coğrafi Bilgi Sistemleri, Gönüllü Coğrafi Bilgi Sistemleri, Konumsal Pazarlama

Günümüzde akıllı telefonların ve bir dizi akıllı cihazın yaygınlaşması, son kullanıcının coğrafi bilgilere erişimini önemli ölçüde kolaylaştırmıştır. Eş zamanlı olarak, gelişmiş uygulamaların ortaya çıkışı, kullanıcılara kişiselleştirilmiş haritalar oluşturma veya Wikimapia ve OpenStreetMap gibi platformlara katkıda bulunma olanağı sağlamıştır. Bu durum, müşterilerin coğrafi dağılımını tespit etmek, tüketicilerin pazar eğilimlerine ilişkin verileri toplamak ve incelemek ve rakiplerin faaliyetlerini izlemek gibi amaçlarla pazarlama alanında kullanılabilecek Gönüllü Coğrafi Bilgi Sistemlerine uygun ortam sağlamaktadır. Bu şekilde elde edilen bilgiler, hedeflenen çalışmalar için belirli pazar segmentlerinin belirlenmesi, ürünlerin dağıtımının optimize edilmesi ve pazarlama kampanyalarının etkinliğinin arttırılması bağlamında önem kazanmaktadır. Bu çalışmanın amacı Coğrafi Bilgi Sistemleri (CBS), Katılımcı CBS, Kitle Kaynaklı CBS ve GCBS'nin gelişimi ve pazarlama alanında kullanımını ele almaktır. Sonuç olarak GCBS'nin bir pazarlama aracı olarak çok geniş bir yalpazede kullanımının uygun olduğu belirlenmiştir.

Volunteered Geographical Information Systems And Its Use In Marketing

Abstract

Keywords:

Geographic Information Systems, Volunteered Geographic Information Systems, Geomarketing.

I Today, the proliferation of smartphones and a number of smart devices has significantly facilitated end-user access to geographic information. Simultaneously, the emergence of advanced applications has given users the ability to create personalized maps or contribute to platforms such as Wikimapia and OpenStreetMap. This situation provides a suitable environment for Volunteered Geographic Information Systems (VGIS) that can be used in the field of marketing for purposes such as determining the geographical distribution of customers, collecting and examining data on market trends of consumers and monitoring the activities of competitors. The information obtained in this way becomes important in the context of identifying specific market segments for targeted studies, optimizing the distribution of products and increasing the effectiveness of marketing campaigns. The purpose of this study is to discuss the development and use of Geographic Information Systems (GIS), Participatory GIS, Crowdsourced GIS and VGIS in the field of marketing. As a result, it has been determined that VGIS is suitable for use in a wide range of areas as a marketing tool.

INTRODUCTION

Volunteered geographic information systems (VGIS) are systems that rely on the voluntary contribution of geographic information by individuals or organizations. In the field of marketing, VGIS can be used to determine the geographical distribution of customers, collect and analyze data on customers' market trends and competitors' activities. This information can be used to target specific market segments, improve product distribution and make marketing campaigns more efficient. For example, VGIS can be used to map the locations of a company's customers, allowing the company to identify geographic areas with a high concentration of customers and target marketing efforts to those areas. VGIS can also be used to track customers' behavior over time, allowing companies to understand how customer behavior varies by location and other factors. Small and medium-sized firms who lack the funds to purchase more expensive market research tools may find VGIS to be particularly helpful. By leveraging voluntary contributions from customers and other stakeholders, businesses can access valuable geographic information at a lower cost. Overall, VGIS is a valuable tool for marketers who want to better understand their customers, markets and competitors and use this information to determine marketing strategies and tactics.

Government entities at all levels can generate geospatial databases with the help of volunteer geographic information (VGI), or geospatial material made by amateurs utilizing online mapping tools. According to some study, some participatory mapping initiatives can result in data that is just as precise as that gathered by institutional means. Additionally, because contributors have specialized local knowledge, VGI's "eyes on" sometimes outperforms more expensive accuracy assessments by government organizations (USGS, 2023). VGI is the process of gathering, analyzing, and sharing geographic data that users have contributed via digital tools and platforms. Unprecedented advancements for VGI have been made possible by recent improvements in digital communication technologies and apps. VGI may combine the experiences and viewpoints of many people because no official certifications are necessary (Ferster, et. al. 2017: 1).

In this study, the development and use of Geographic Information Systems (GIS), Participatory GIS, Crowd Sourced GIS and VGIS in the field of marketing are discussed and how VGIS can be used as a marketing tool is examined. In addition, this study emphasized the contributions of VGIS to marketing and thought that it could be a guide for researchers who want to work in this field in the future. In this research, in the first part, geographic information systems (GIS) and its components will be mentioned, in the second part, VGIS will be defined and its features will be explained, and in the last part, the use of VGI in the field of marketing will be explained. aforementioned.

GIS and Its Fundamentals

On the surface of the Earth, known locations are referred to in spatial data. Geospatial data always employs a unique coordinate system, unit of measurement, and map projection to guarantee precise location recording. A GIS can be thought of as a collection of informational layers in which each observation is connected to particular locations and features on the surface of the earth (such as population, road networks, land use, and mall locations) using a particular coordinate system (Leslie et al., 2007: 114). It is important to realize that GIS is more than just a tool for creating maps or

presentation graphics. For instance, several spreadsheet programs now have GIS features that let users generate map screens. These are just a few of the tools that may be used to create presentation graphics and other types of displays. (Mennecke and Crossland, 1996,: 537).

The evolution of GIS

The first GIS was the Canadian Geographic Information System (CGIS), designed in the mid-1960s as a computerized map measurement system. (Longley et al., 2005: 16).

A second breakthrough was made in the U.S. Census Bureau's design of the equipment required for the 1970 Census in the late 1960s. For the purpose of supporting automatic referencing and aggregation of census results, the DIME (Dual Independent Map Encoding) initiative developed digitized records of every street in the US. A significant program was started at Harvard University's Computer Graphics and Spatial Analysis Lab to create a general purpose GIS that could suit the needs of both applications as soon as the resemblance between this technology and CGIS was identified. ODYSSEY GIS was developed as a result of this study in the late 1970s (Longley et al., 2005, : 16-17).

Large-scale geographical search issues were one of the initial uses of GIS that contributed to its early development. For the storing and retrieval of environmental and planning data, many states started developing geodatabases (in raster format) in the 1970s. Examples of these systems are Maryland's MAGI (Maryland Automated Geographic Information) database and New York State's land use and natural resource inventory. On a historical perspective, the MAGI database was primarily created by Dangermond, the founder of ESRI (Environmental Systems Research Institute). There was a great deal of discussion over whether electrical utilities could provide the rising demand for power in the middle of the 1970s. Many also questioned if there were sufficient suitable locations for power projects. The State of Maryland financed the Maryland Power Plant Siting Project and the creation of a straightforward grid-based GIS due to this concern (Church, 1999: 293).

In the 1980s, ESRI made significant contributions to GIS. ARC/INFO for minicomputers was released in 1982 and PC Arc/Info ESRI with Intel microcomputer production in 1986. 1990-2010 was when the history of CBS really began. However, advances in technology had exceeded the average user. GIS users did not know how to take full advantage of GIS technology. Companies did not use GIS software very much and countries did not have access to topographic data (Gisgeography, 2022).

Components of GIS

People

The most vital element is people. Geographic or not, the necessity for employees in businesses to conduct business, provide information, and generally engage with the world and the individuals and organizations inside it leads to the development of information systems. An information system is expected to facilitate work, speed up production with more reliable outcomes, and instill a high degree of confidence in the final product. The people and their needs form the foundation of the design and implementation of a GIS, and the applications that result are placed in the hands of the workers who

will use them. The entire system is there to help them with their mission (Harmon & Anderson, 2003: 3).

Data

All spatial and non-spatial inputs that have not been processed yet, in other words that are considered raw, are called data. Spatial data is divided into two as raster and vector. Non-spatial data is called attribute information.

Method

It is the set of rules followed to achieve the targeted result with GIS analysis.

Equipment

They are the physical components that GIS runs on.

Software

These are the programs required to perform GIS applications. It is important for a GIS software to be capable of analyzing, visualizing and storing data.

Data models used in GIS

Vector data

It is the whole of the data that has a certain coordinate and has a point, linear and polygonal (areal) structure.

Point data

It is data consisting of only X and Y coordinates. The locations of base stations can be given as an example of this data type.

Line data

It is the data that consists of connecting at least two X,Y point data. Roads and rivers are examples of this data type.

Polygon data

It is the data that has more than one X,Y point and the starting and ending coordinates are the same. All places with a given field are examples of this data type.

Raster data

It is data that is created using sources such as satellite images and aerial photographs and consists of cells of equal size.

Uses of GIS

GIS is the underlying technology used to perform spatial analysis. Typical examples of such applications are tools that use GIS to answer the following questions: (Harmon and Anderson, 2003, p: 21-22)

What is in or near a particular place?

Where are these places?

Which geographic regions meet the following criteria?

What has changed in this region or region over time?

What spatial patterns are there?

Where do we do this, what will be the result?

GIS is used in many fields with its features such as spatial data collection, storage and analysis methods. The usage areas of GIS can be listed under the following headings on the basis of application: (Çabuk, 2018:127)

Engineering Applications:

• Electricity, Water, Natural Gas Networks

• Telecommunications Network

• Vehicle Tracking Systems

Agricultural Applications:

• Flora

• Arable Land

• Irrigation Systems

• Grain Yield Forecast

• Soil Maps

Environmental Applications:

• Erosion Risk Analysis

• Water Resources and Pollution Analysis

• Climate Science Studies

• Flood Zones Risk Analysis

• Wildlife Conservation

Earth Sciences Applications:

• Identification and Inventory of Mines and Oil Fields

• Geological Maps

• Earthquake Risk Analysis

Forestry Applications:

• Forest and Tree Inventory

• Conservation of Forest Regions and Sustainability Analysis

• Emergency Forest Fire Detection and Response Systems

Archaeology:

• Mapping and Excavation Inventory of Archaeological Excavations

• Inventory of Historical Sites

• Archaeological Locating Studies by Processing Satellite and Aerial Photographs

• Archaeological Measurements

Public Applications:

• Urban Information Systems in Local Governments

• City and Regional Planning Studies

• Land Use Maps

• Base Map and Zoning Plans

• Urban Real Estate Inventory

• Property Inventory in Land Registry and Cadastre Offices

• GIS Based e-government Projects

• Urban Transportation Plans

• Address Management System

• Community Health Analysis and Maps

• Crime Analysis and Maps

Analyzes used in GIS

Each dataset in a GIS is handled as a layer and can be graphically integrated by running overlay analyses. GIS enables working with these layers to identify and respond to important questions by merging layers using screens. Geometric and topological elements are included in spatial data by default, in addition to location and attribute information. While topological features indicate spatial relationships such as connectedness, inclusion, and contiguity, geometric features represent measurements such as location, length, direction, area, and volume. Numerous analyses are performed on the existing data using these spatial attributes to uncover further information (ESRI, 2022).

Spatial Inquiry

In Geographic Information Systems, spatial query can be done in various ways. These;

• From spatial data to verbal (attribute) data

• From verbal (attribute) data to spatial data

• Verbal (attribute) data can be sorted as querying Verbal (attribute) data. Each of these operations is called a geospatial query (Yıldırım, 2018:18).

Surface Analysis

Calculating the vertical distance between two points in the area, determining the places with the highest or lowest slopes, calculating the planimetric area and surface area, volume, calculating the amount of excavation fill, displaying the features of the area on the model, performing optical visibility analyzes, visualizing the area from different angles, virtual It covers operations such as flying over the area (Küpçü, 2019:16).

Digital Terrain Models (DTM)

DTM has found an important application opportunity in cartography (Koyuncu, 1981:51). Digital terrain model data can be obtained in many different ways. The most used methods for this are land measurements, photogrammetric paths, remote sensing and digitization of cartographic data. Undoubtedly, the healthiest and easiest among these methods is to reach numerical data with photogrammetric methods. The advantages of this method can be listed as follows:

• It is much faster to reach the result according to the data to be obtained by measuring the land.

• Since there may be errors or changes in the field in the existing maps, healthier results are obtained compared to the cartographic maps.

• It is the least costly way of collecting data for very large areas (Küpçü, 2019:16).

Network Analytics

Graph theory and topology are two mathematical fields on which network analysis in GIS is based. Every mesh is made up of a network of linked vertices and edges. The study of graphs or meshes is done through the use of graph theory (Wikigis, 2022).

The creation of node-line (arc-node) topology is necessary for network analysis. There are three approaches to undertake network analyses These:

• Optimum route optimization

• Address determination (address matching)

• Resource allocation (Erden, Coşkun and İpbüker, 2003: 16).

CROWDSOURCING AND CITIZEN SCIENCE

Voluntary geospatial information can give very valuable and detailed content that can be used in practical applications and services due to the process of gathering, organizing, and disseminating geo-referenced information. This procedure adheres to techniques and guidelines that are typical for crowdsourced data but unique to a particular geographic area (Jabeur et al. 2019: 684).

Through the use of a centralized computer system, a network of volunteers controls online participation for the generation of geographic data. From the perspective of information systems, one might address the independent aspects of VGI creation. The analysis, comprehension, and design of VGI production, where multiple players, processes, and resources need to be coordinated, are made easier by a systematic viewpoint (Gómez-Barrón et al. 2019, 978).

Because crowdsourcing information has the advantages of real-time, rich semantic information and openness, more and more applications are using this type of data as a source of updates for industry data collection and emergency relief (Zhang et al 2019: 1624).

Crowdsourcing information systems unlock redundant capacity by providing organizations with a distributed network of participants on the web as a new, cost-effective and scalable digital workforce and information resource. Crowdsourcing provides the interactions between an online system and its users for tasks such as creating, bartering and delivering value to users and organizations to achieve a common goal (Gómez-Barrón et al, 2019: 977).

The data quality issue requires more research in several areas. The formalization of rules that allow contributing geographic information to be evaluated based on its geographic context and the standardization of software tools to enforce these rules are crucial components for further study, as was previously mentioned. In order to establish suitable institutions and processes to foster trust in volunteer resources, research is also required to understand what is already known about trust and volunteering in the context of geographical information crowdsourced by the general public (Goodchild and Glennon, 2010: 240)

Crowd-sourced data in general and voluntary geographic information in particular are becoming big data sources. VGI is free, can generate large amounts of data in a short time and in some cases collect local data that is impossible to obtain with traditional mapping methods. Despite its advantages, voluntary geographic information cannot be used in many applications due to the lack of clarity surrounding its quality. Therefore, many studies have been conducted to determine the quality of VGI (Esmaili, Naseri and Esmaili, 2013: 25).

The advancement of information technology and communication, which has emerged as a result of a number of technological developments in various fields, the geographical processing of internal and external databases of institutions allows customers and potential customers to know their location and characteristics. Through crowdsourced data, R&D, cost differentiation through innovation, audience engagement, demand prediction, and eventually cost optimization, it provides significant cost savings. In order to uncover patterns of proximity between consumers, suppliers, and competitors in your business ecosystem, geomarketing uses geo-referenced mapping technology. This optimizes marketing operations for attracting new customers as well as keeping existing ones. Geomarketing is about segmentation and is the soul of current marketing. Segmentation considers that consumers in different locations have different needs and the foundation of a good marketing strategy these days is how to identify and reach them in a timely manner. In this sense, Geomarketing, OLAP tools allow confirmation of customers' expectations and \ or the discovery of some customer behavior through Data Mining techniques; and all this with a high degree of confidence and speed necessary to assist the marketer's decision making (Guarda, Augusto ve Lopes, 2019: 4).

One of the controversial aspects of crowdsourcing is its potential for use by for-profit firm (Haklay, 2010: 683).

It's not too difficult to leverage large-scale crowdsourcing initiatives to produce trustworthy information sources or excellent software. A great number of volunteers, many of whom operate individually and without much coordination, each focused on their own interests, manage these activities, particularly joint-based initiatives. There has been ongoing discussion among practitioners in co-based collective production networks regarding the direction the project should take or how to implement a specific difficulty (Haklay, 2010: 683).

There hasn't been much focus on enhancing or fixing the target site when it comes to crowdsourcing information for relief activities. Due to the volunteer's distance from the crisis area, the precise location of the incident might not be known. For instance, in the case of a burning building, the volunteer can choose to receive and disseminate information from a distance rather than risk his or her safety by traveling to the disaster scene. The volunteer's mobile phone's geolocation technology is unable to directly pinpoint their exact location. To address the techniques of altering location and achieving absolute position in these situations, the key challenge is to design a VGI system based on mobile, GPS, Web 2.0, and GIS server Technologies (Vahidnia, 2019: 4).

Crowdsourcing is a new paradigm that has evolved in the context of Web 2.0 that uses community (or crowd) participation to carry out a task that has previously only been carried out by a select few successfully and efficiently. OpenstreetMap (OSM), which has a global volunteer crew, is regarded as

one of the most successful and well-liked Volunteer Geographic Information (VGI) projects (Fan, 2014: 700).

PARTICIPANT GIS

In contrast to the fragmented, objective, and technical "solutions" that frequently characterize many traditional GIS applications, a participatory GIS celebrates the diversity of spatial reality. Although there are many and many views of what a GIS is, it is more difficult to give a clear description as the lines between spatial technologies become more hazy (Dunn, 2007: 616). All communities can take part in deciding how to use a space by applying the participatory GIS idea to the regional spatial geographic information system. As a result, the final site placement plan can represent the interests of all neighborhood associations and inhabitants (Radliya et. al., 2019: 417).

CRITICAL GIS

The definition of critical geography in human geography mirrors the rise of radical geography in the 1980s. The Frankfurt School of Social Theoreticians (Horkheimer, Adorno, Marcuse, and more recently Habermas and Offe) coined the phrase "critical theory" in the 1930s to refer to various forms of Marxism. They discovered that they were a long way from Marx while still caring about social and political systems and human emancipation. They looked for a middle ground, rejecting both capitalism and the "scientific" socialism that was attempted under communism (Sheppard, 2005: 10). Critical GIS practitioners frequently share implicit presumptions about the location of the knowledge they are contributing to. Despite having the best of intentions, these presumptions may serve to amplify certain important asymmetries in the geography of knowledge production (Sheppard, 2005: 15).

VOLUNTEER GEOGRAPHICAL INFORMATION SYSTEMS and MARKETING

Due to the increasing competition conditions today, businesses have to take advantage of up-to-date technological applications to market their products. The main feature of these applications, which are generally internet-based, is that they provide businesses with various information about their customers. This information is extracted by various methods, especially data mining techniques and presented to the decision makers. In this environment where data is very valuable, the data obtained is usually obtained from data provider companies and these data are sometimes used by modifying them in line with the needs of the relevant business. In recent years, businesses have understood the importance of spatial data and have started to use this data in many areas, especially in the field of marketing. These applications, which are made using Geographical information systems (GIS), especially geographical marketing and demographic segmentation based on location, have provided very important benefits to businesses. Voluntary geographic information systems (VGIS) is one of the applications with this potential.

Some of the major studies on VGI are as follows:

Goodchild, M. F. (2007), In his article, he explained the concept of VGI in detail, evaluated the reasons that lead people to do it, the reliability of results, individual confidentiality and the pros and cons over traditional data sources.

Flanagin and Metzger (2008) investigated the social environment that encourages crowdsourced information contribution by examining the reliability of voluntary geographic information (VGI) and considering specific geographic applications. They also examined the information and resource reliability of the VGI using various research findings.

Haklay, M., Singleton, A., & Parker, C. (2008). They examined a vigorous innovation process that is radically altering online mapping technologies in their study. On the basis of concepts, technologies, and structures, they examine the historical development of Web mapping. They then go on to describe the features and trends of Web mapping 2.0 with the help of case studies, and they talk about the opportunities and implications of these developments for geographic information science, geography, geographic information providers, and society.

Goodchild and Glennon (2010) investigated the specific effects of this issue on data quality by conducting research on data quality and examining its relevance to disaster management at VGI. They discussed the wildfire disasters in Santa Barbara between 2007 and 2009 and the lessons to be learned from this situation and the future of VGI in disaster management.

Castelein, W., Grus, L., Crompvoets, J., & Bregt, A. (2010, May). With their work, they aimed to create a comprehensive characterization of the VGI phenomenon and its relationship with spatial data infrastructure. The study contributes to an understanding of the new challenges that VGI poses to the organization and capabilities of geographic information technology and spatial data infrastructure.

Coleman, D. (2010, October). In his work, he conducted research on collaborative systems, mapping, workflow analysis and geodata infrastructure. The widespread use of GPS and image-based mapping technologies by professionals has explored the emerging role of Web 2.0, wikis and standards-based authentication in contributing information to the Web and the growth of social networking tools, practices and culture. Specifically, he studied how data from both individual and professional mappings could be validated, processedand used for open-source and commercial databases.

Budhathoki and Nedović-Budić (2010) drew the conceptual framework of VGI and focused on people's motivations to contribute to VGI. They investigated people's personal, social and technological motivations, which can be classified as intrinsic and extrinsic factors.

Goodchild and Li (2012), in their study, examined the quality reliability of VGI data with 3 alternative approaches. These; crowdsourced approach, social approach and geographical approach. According to the authors, although the crowdsourcing approach may seem more attractive, it may be less effective for geographical facts than other types of information. The social approach is similar, but such projects should be well structured and supported by large social networks. The geographic approach seems more useful to geographers because geographic information lies in the middle of it.

Elwood, S., Goodchild, M. F., & Sui, D. Z. (2012). In their article, they wrote that, in addition to data quality, the VGI covers legal and ethical issues and the types of research that only academic geographers can undertake to tackle the technical demands of bridging the digital divide, as well as the research methods needed to address them, covering many paradigms from the technical to the critical dimensions of GIS. and thus have the power to address a wide cross-section of the discipline.

Arsanjani et al., (2013), in their research, tried to determine whether VGI could be used to map land use. In the study, they did not receive input from remote sensing or any other source, they only used OSM data.

Esmaili, R., Naseri, F., & Esmaili, A. (2013). In their article, they reviewed existing methods for quality assessment of VGI data. Most current methods are based on comparing VGI data with official data, but since in most cases there is no access to accurate data, they have alternatively proposed a method of assessing location accuracy by comparing existing data of the same location with each other based on metadata provided by the creators.

Mozas-Calvache, A. T. (2016). In his study, he determined a methodology that analyzes the movements of vehicles to obtain information from the global navigation satellite system (KNUS) tracks obtained from VGI data. The process includes acquiring, editing and matching KNUS tracks with existing track sequences, determining the speed, acceleration or deceleration and the final analysis of the results and derived values such as the speed above the limit at each track point. The proposed methodology has been applied to a set of approximately 2430 km of roads selected from the Spanish National Network and more specifically located in the region of Andalusia (Southern Spain).

Davis, C. A. (2018). His work focused on the challenges of integrating geospatial data with crowdsourced data provided by volunteer users or online tools, social networks, public or corporate sources

Gómez-Barrón, Alcarria and Manso-Callejo (2019), in their article, aimed to contribute to the integrated operation of VGI systems in order to develop a more systematic and efficient VGI management and design processes. In this study, the processes, functions and elements of technological infrastructures that facilitate value creation interactions are evaluated separately from the VGI perspective.

Table 1. Focus area of some studies on VGI

Author and Year	**Article Summary**	**Study Focus**
Goodchild, M. F. (2007)	Explores VGI concept, reasons for participation, reliability and pros/cons.	VGI Concept, Reliability, Pros/Cons
Flanagin and Metzger (2008)	Investigates the social environment, reliability and geographic applications.	Social Environment, Reliability, Geographic Applications
Haklay, M., Singleton, A., & Parker, C. (2008)	Examines web mapping tools evolution and implications for GIS.	Web Mapping Tools, Implications for GIS

Goodchild and Glennon (2010)	Studies data quality in VGI with a focus on disaster management.	Data Quality, Disaster Management
Castelein, W., Grus, L., Crompvoets, J., & Bregt, A. (2010)	Characterizes VGI and its relationship with spatial data infrastructure.	VGI Characterization, Spatial Data Infrastructure
Coleman, D. (2010)	Explores collaborative systems, mapping and geodata infrastructure.	Collaborative Systems, Geodata Infrastructure
Budhathoki and Nedović-Budić (2010)	Develops a conceptual framework for VGI and investigates motivations.	Conceptual Framework, Motivations
Goodchild and Li (2012)	Examines reliability of VGI data using three approaches.	VGI Data Reliability, Crowdsourced, Social, Geographical Approaches
Elwood, S., Goodchild, M. F., & Sui, D. Z. (2012)	Covers data quality, legal/ethical issues and research methods.	Data Quality, Legal/Ethical Issues, Research Methods
Arsanjani et al., (2013)	Investigates the use of VGI for mapping land use.	VGI for Land Use Mapping
Esmaili, R., Naseri, F., & Esmaili, A. (2013)	Reviews methods for quality assessment of VGI data.	Quality Assessment Methods
Mozas-Calvache, A. T. (2016)	Develops a methodology for analyzing vehicle movements using VGI data.	Vehicle Movement Analysis, GNSS Data
Davis, C. A. (2018)	Addresses challenges of integrating geospatial data with crowdsourced data.	Data Integration Challenges
Gómez-Barrón, Alcarria and Manso-Callejo (2019)	Aims to improve the integrated operation of VGI systems.	VGI System Integration

Ahmad et al. (2022)	Applies statistical modeling to examine VGI adoption in Pakistan, including data quality, collaboration, trustworthiness and factors hindering adoption.	VGI Adoption in Pakistan, Data Quality, Collaboration, Trustworthiness, Adoption Factors
Wang et al. (2023)	Analyzes urban environments using Airbnb reviews, focusing on transportation, amenities, greenery, safety and noise pollution.	Urban Environment Analysis, Emotions, Spatial Autocorrelation

VGIS was first used by Michael Goodchild (Goodchild, 2007: 212). VGIS are applications that allow users to contribute geographic information, be rewarded and recognized for their work and produce VGI applications (Pinheiro et. al. 2018: 9). Because of the process of collecting, organizing and publishing geo-referenced information, voluntary geospatial information can provide very detailed and important content that can be used in real applications and services. This process follows methods and principles that are commonplace for crowdsourced information, but specialized for geographic area (Jabeur et. al. 2019: 678). a thorough approach for evaluating the reputation of geographic data that has been voluntarily shared in crowdsourcing apps. VGI raises questions regarding the quality, dependability, and worth of the information source. For instance, determining the veracity of information is exceedingly difficult due to the multiplicity of sources that enable its widespread dissemination. Furthermore, geographic information's source and, consequently, its quality and authenticity are less evident than before. This is crucial because a poor assessment of credibility can have negative effects on science, society, the individual, education, and even politics. As a result, determining the reliability of information becomes critical as people process VGI collected from digital media (Flanagin and Metzger, 2008). VGI has proven very successful as a way to obtain timely and detailed geographic information at very low cost, but it also has some obvious shortcomings. Unlike traditional geospatial information that it potentially augments and some even replaces, VGI carries no quality assurance (Goodchild and Li, 2012: 117).

Since 2004, users have been able to create high-quality, online maps and their own digital geospatial information for free. Coordinates can be easily obtained using GPS or by finding features on high resolution maps offered by applications such as Google Earth. Expertise in map production is no longer required because open source software is widely available for the production of high quality maps. OpenStreetMap has become the best-known and most successful example of a series of efforts launched to create an alternative to corporate products. (Goodchild and Li, 2012: 111). VGI systems are “applications where users can contribute geographic information, be rewarded and recognized for their work and allow them to produce VGI applications” (Pinheiro and Davis, 2018: 2). The most well-known examples of VGI are websites such as Open Street Map and Wikimapia that provide tools for users to add geographic data to the map by uploading their GPS tracks, digitizing the background satellite image, or simply naming streets or places around the world (Esmaili et. al., 2013: 20). VGI is

also under the influence of private mapping companies. However, integrating VGI into an established data supply chain poses significant data quality issues (Severinsen et. al., 2019: 1697).

VGIS PLATFORMS

Some examples of VGI platforms are: (Wikipedia, 2023)

WikiMapia: A collaborative online map that allows users to add information about any location on Earth, such as landmarks, buildings, roads, or natural features. Users can also organize and enhance existing information, as well as create categories and tags for different types of places. WikiMapia aims to create and maintain a free, complete, multilingual and up-to-date world map.

OpenStreetMap: A free and open source project that creates and provides geographic data for anyone to use. Users can contribute to the map using a variety of methods, such as editing online, uploading GPS tracks, or using mobile applications. OpenStreetMap covers various aspects of the physical world, such as roads, buildings, parks, waterways or borders. OpenStreetMap is also used by many other applications and services that rely on geospatial information.

Yandex.Map editor: A tool that allows users to edit and update maps of Yandex, a Russian internet company that provides various online services such as search, navigation or e-commerce. Users can add or change information about places, such as names, addresses, phone numbers, or business hours. Users can also report errors or issues with the map, such as missing roads, incorrect labels, or outdated images.

TripAdvisor: A travel platform that allows users to share their opinions and experiences on various aspects of travel, such as hotels, restaurants, attractions or flights. Users can also rate and review the places they visit and upload photos and videos. TripAdvisor uses geolocation to show users nearby options and recommendations based on their preferences and interests.

Flickr: A photo sharing platform that allows users to upload and edit their photos online. Users can also manually or automatically geotag their photos with the location where they were taken. Flickr uses geotagged photos to create maps and albums of different places around the world. Users can also browse and discover other users' photos by location

CONCLUSION

In recent years, with the proliferation of participatory applications and websites, as well as the spread of web 2.0, VGI has gained increasing importance. VGI is a system that anyone can contribute without requiring expertise in any field. Especially with the increase of social media channels and social media platforms, the speed of information flow has also increased. With technological advances, GIS has become suitable for data collection and processing for marketing. Especially in the field of marketing, GIS has transformed into "Geomarketing". Geomarketing is a different marketing approach that aims to plan, coordinate and control customer-oriented market activities of companies with GIS methods. Geomarketing is combining the geographically defined information you have with digital maps. It helps to query, categorize and visualize all kinds of data in your GIS database with digital maps. In this way, it becomes easier to analyze data that seems to be complex and to make sense of it.

In a good market flow system; (Fidan, 2009: 2155)

Which product, where, when and in what quantity the producer produces; decide how to sell them; preparation of production plans and marketing programs,

—Collection of products, transportation, storage, processing, etc. Developing practical marketing functions and ensuring that they are carried out in accordance with the technique,

—What manufacturers and intermediaries should do to find new markets and expand their existing markets,

—Producers, market bodies and consumers get better information and adapt to technical developments in marketing in a short time,

—The commodity and price movements and auxiliary information should be given at short intervals (daily, weekly, monthly depending on the nature of the information).

VGIS are systems based on the voluntary contribution of geographic information by individuals or organizations. In the marketing field, VGIS can be used to collect and analyze data on the geographic distribution of customers, market trends of customers and activities of competitors. This information can be used to target specific market segments, improve product distribution and make marketing campaigns more efficient. For example, VGIS can be used to map the locations of a company's customers, allowing the company to identify geographic areas with high customer density and target marketing efforts to those areas. VGIS can also be used to monitor customers' behavior over time, allowing companies to understand how customer behavior changes based on location and other factors. VGIS can be especially useful for small and medium businesses that don't have the resources to invest in more expensive market research tools. By leveraging the voluntary contributions of customers and other stakeholders, businesses can access invaluable geographic information at a lower cost. Overall, VGIS is a valuable tool for marketers who want to better understand their customers, markets and competitors and use this information to determine their marketing strategies and tactics.

In this study, the use of VGI in the field of marketing was examined in general, but no study was carried out in a specific marketing field. Future studies can focus on this area and work on the use of VGI for different marketing applications. with VGIS, all this can be easily accomplished. In addition, the maps created with VGI can contribute in many different areas such as helping with feeding pets, routing traffic and determining the locations of forest fires.

REFERENCES

Budhathoki, N. R., & Nedović-Budić, Z. (2010). An interdisciplinary frame for understanding volunteered geographic information. *Geomatica*, *64*(1), 11-26.

Çabuk, A. (ed.) (2018). Coğrafi Bilgi Sistemlerine Giriş. *Anadolu Üniversitesi, Açık Öğretim Fakültesi. Yayın*, (2567).

Castelein, W., Grus, L., Crompvoets, J., & Bregt, A. (2010, May). A characterization of volunteered geographic information. In *13th AGILE international conference on geographic information science* (p: 1-10).

Church, R. L. (1999). Location modelling and GIS. *Geographical information systems*, *1*, 293-303.

Coleman, D. (2010, October). Volunteered geographic information in spatial data infrastructure: an early look at opportunities and constraints. In *GSDI 12 world conference* (p: 1-18).

Davis, C. A. (2018). Challenges in Crowdsourcing Geospatial Data to Replace or Enhance Official Sources. *DISEGNARECON*, *11*(20), 1-1.

Dunn, C. E. (2007). Participatory GIS—a people's GIS?. *Progress in human geography*, *31*(5), 616-637.

Elwood, S., Goodchild, M. F., & Sui, D. Z. (2012). Researching volunteered geographic information: Spatial data, geographic research and new social practice. *Annals of the association of American geographers*, *102*(3), 571-590.

Environmental Systems Research Institute (ESRI) (2022), https://www.esri.com/en-us/home (Date of Access: 08.11.2022)

Erden, T., Coşkun, M. Z., & İpbüker, C. (2003). CBS'de Ağ Analizi ve Ulaşım Problemleri.

Esmaili, R., Naseri, F., & Esmaili, A. (2013). Quality assessment of volunteered geographic information. *American Journal of Geographic Information System*, *2*(2), 19-26.

Fan, H., Zipf, A., Fu, Q., & Neis: (2014). Quality assessment for building footprints data on OpenStreetMa: *International Journal of Geographical Information Science*, *28*(4), 700-719.

Ferster, C. J., Nelson, T., Robertson, C., & Feick, R. (2017). Current Themes in Volunteered Geographic Information. In *Gis Applications for Socio-Economics and Humanity* (p: 26-41). Elsevier Inc.

Fidan, H. (2009). Pazarlama Bilgi Sistemi (Pbs) ve Coğrafi Bilgi Sistemi (Cbs)'nin Pazarlamada Kullanimi. *Yaşar Üniversitesi E-Dergisi*, *4*(14), 2151-2171.

Flanagin, A. J., & Metzger, M. J. (2008). The credibility of volunteered geographic information. *GeoJournal*, *72*(3-4), 137-148.

Gisgeography, (2022), https://gisgeography.com (Date of Access: 28.09.2022)

Gómez-Barrón, J. :, Alcarria, R., & Manso-Callejo, M. Á. (2019). Designing a Volunteered Geographic Information System for Road Data Validation. In *Multidisciplinary Digital Publishing Institute Proceedings* (Vol. 19, No. 1: 7).

Gómez-Barrón, J. :, Manso-Callejo, M. Á., & Alcarria, R. (2019). Volunteered geographic information systems: Technological design patterns. *Transactions in GIS*, *23*(5), 976-1007.

Goodchild, M. F. (2007). Citizens as sensors: the world of volunteered geography. *GeoJournal*, *69*(4), 211-221.

Goodchild, M. F., & Glennon, J. A. (2010). Crowdsourcing geographic information for disaster response: a research frontier. *International Journal of Digital Earth*, *3*(3), 231-241.

Goodchild, M. F., & Li, L. (2012). Assuring the quality of volunteered geographic information. *Spatial statistics*, *1*, 110-120.

Guarda, T., Augusto, M. F., & Lopes, I. (2019, June). Geographic market intelligence as a competitive advantage. In *2019 14th Iberian Conference on Information Systems and Technologies (CISTI)* (p: 1-5). IEEE.

Haklay, M. (2010). How good is volunteered geographical information? A comparative study of OpenStreetMap and Ordnance Survey datasets. *Environment and planning B: Planning and design*, *37*(4), 682-703.

Haklay, M. (2013). Citizen science and volunteered geographic information: Overview and typology of participation. In *Crowdsourcing geographic knowledge* (p: 105-122). Springer, Dordrecht.

Haklay, M., Singleton, A., & Parker, C. (2008). Web mapping 2.0: The neogeography of the GeoWeb. *Geography Compass*, *2*(6), 2011-2039.

Harmon, J. E., & Anderson, S. J. (2003). *The design and implementation of geographic information systems*. John Wiley & Sons.

Jabeur, N., Karam, R., Melchiori, M., & Renso, C. (2019). A comprehensive reputation assessment framework for volunteered geographic information in crowdsensing applications. *Personal and Ubiquitous Computing*, *23*(5-6), 669-685.

Jabeur, N., Karam, R., Melchiori, M., & Renso, C. (2019). A comprehensive reputation assessment framework for volunteered geographic information in crowdsensing applications. *Personal and Ubiquitous Computing*, *23*(5-6), 669-685.

Jokar Arsanjani, J., Helbich, M., Bakillah, M., Hagenauer, J., & Zipf, A. (2013). Toward mapping land-use patterns from volunteered geographic information. *International Journal of Geographical Information Science*, *27*(12), 2264-2278.

Koyuncu , D. 1981. Sayısal Arazi Modelleri. K .D .M .M A . Yayını, Konya.

Küpçü, S. (2019). Temel Kavramlar, Çabuk ve Uyguçgil (Ed.), Coğrafi Bilgi Sistemleri. Anadolu Üniversitesi Açık Öğretim Fakültesi Yayınları*, Eskişehir*

Leslie, E., Coffee, N., Frank, L., Owen, N., Bauman, A., & Hugo, G. (2007). Walkability of local communities: using geographic information systems to objectively assess relevant environmental attributes. *Health & place*, *13*(1), 111-122.

Longley: A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2005). *Geographic information systems and science*. John Wiley & Sons.

Mennecke, B. E., & Crossland, M. D. (1996, January). Geographic information systems: Applications and research opportunities for information systems researchers. In *Proceedings of HICSS-29: 29th Hawaii International Conference on System Sciences* (Vol. 3, p: 537-546). IEEE.

Mozas-Calvache, A. T. (2016). Analysis of behaviour of vehicles using VGI data. *International journal of geographical information science*, *30*(12), 2486-2505.

Pinheiro, M. B., & Davis, C. A. (2018). ThemeRise: a theme-oriented framework for volunteered geographic information applications. *Open Geospatial Data, Software and Standards*, *3*(1), 9.

Radliya, N. R., Fauzan, R., & Irmayanti, H. (2019). The Development of Geographic Information System using Participatory GIS Concept of Spatial Management. *International Journal of Advanced Computer Science and Applications*, *10*(1).

Severinsen, J., de Roiste, M., Reitsma, F., & Hartato, E. (2019). VGTrust: measuring trust for volunteered geographic information. *International Journal of Geographical Information Science*, *33*(8), 1683-1701.

Sheppard, E. (2005). Knowledge production through critical GIS: Genealogy and prospects. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *40*(4), 5-21.

United States Geological Survey (USGS) (2023), https://usgs.gov (Date of Access: 16.03.2023)

Vahidnia, M. H., Hosseinali, F., & Shafiei, M. (2019). Crowdsource mapping of target buildings in hazard: the utilization of smartphone technologies and geographic services. *Applied Geomatics*, 1-12.

Wikigis (2022), https://wiki.gis.com (Date of Access: 13.12.2022)

Wikipedia (2023), https://en.wikipedia.org/wiki/Volunteered_geographic_information. (Date of Access: 03.03.2023)

Yıldırım V. (2018). Coğrafi Bilgi Sistemleri Mekânsal Analiz Uygulamaları. İstanbul Üniversitesi Açık ve Uzaktan Eğitim Fakültesi Yayınları*, Istanbul*

Zhang, H., Jiang, J., Huang, W., & Yang, L. (2019). Design and Implementation of Crowdsourcing Based China's National Public Geospatial Information Collection System. *International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences*.