

Research on the Construction of the Geospatial Data Services Platform in the United States

Kuizhu Wang

School of Water Conservancy and Environment, University of Jinan, Jinan, Shandong, 250024, China

1103201287@qq.com

Keywords: Geospatial data, data services, platform, data security, data quality, user demand, talent management

Abstract: Geospatial data has become an indispensable resource for scientific research, decision-making, and innovation in various fields. The United States has built a geospatial data services platform to provide users with open, standardized, and efficient data services. This paper investigates and studies the development of the platform, analyzes its technical characteristics, data security and quality, user demand and scenario diversity, and talent cultivation and management, and proposes strategies for its improvement. The results show that the U.S. geospatial data services platform has achieved significant progress in data sharing, service innovation, and user satisfaction. However, there are still challenges and opportunities in terms of data security, quality and standardization, user demand and scenario diversification, and talent cultivation and management. The paper suggests that the platform should strengthen its technical development, establish a comprehensive data security system, improve data quality and standardization, meet diverse user demands and scenarios, and cultivate and manage talented personnel to promote the sustainable development of geospatial data services.

1. Introduction

Geospatial data has become an important resource for scientific research, decision-making, and innovation in various fields such as geography, geology, ecology, agriculture, transportation, urban planning, and national defense. With the rapid development of geospatial technology and the Internet, the demand for geospatial data services is becoming increasingly diverse and personalized. In response to this demand, the United States has built a geospatial data services platform to provide users with open, standardized, and efficient data services.

The U.S. geospatial data services platform is an integrated platform that provides users with a variety of geospatial data services such as data sharing, data processing, data analysis, and data visualization. The platform is built on the basis of the Cyberinfrastructure framework, which is a distributed computing and data management system that integrates high-performance computing, high-speed networks, and data storage and retrieval technologies (Arctur & Zeiler, 2016). The platform integrates multi-source geospatial data, including satellite remote sensing data, aerial photography data, ground survey data, and user-generated data such as volunteered geographic information (Goodchild, 2007), and provides users with value-added services such as data fusion, model simulation, and decision-making support (Longley et al., 2015). The platform has been widely used in various fields such as disaster response, environmental monitoring, urban planning, and precision agriculture.

However, the development of the geospatial data services platform also faces challenges and opportunities. This paper investigates and studies the development of the platform, analyzes its technical characteristics, data security and quality, user demand and scenario diversity, and talent cultivation and management, and proposes strategies for its improvement.

2. Technical characteristics of the U.S. geospatial data services platform

The technical characteristics of the U.S. geospatial data services platform mainly include its data sharing mechanism, service innovation, and data processing and analysis capabilities.

2.1 Data sharing mechanism

The U.S. geospatial data services platform has established a data sharing mechanism that enables users to access and share geospatial data from different sources. The platform adopts an open data policy that encourages data providers to share their data with the public, and provides users with easy and convenient access to the data through various channels such as APIs, web services, and mobile apps. The platform also supports data interoperability and standardization, and provides users with tools and services for data conversion, integration, and fusion.

2.2 Service innovation

The U.S. geospatial data services platform is committed to service innovation, and has developed a variety of value-added services to meet user needs. For example, the platform provides data visualization tools such as maps, charts, and graphs to help users better understand and analyze geospatial data. It also offers data processing and analysis services such as image processing, feature extraction, and model simulation to help users extract useful information from the data. In addition, the platform provides decision-making support services such as risk assessment, impact analysis, and scenario simulation to help users make informed decisions based on the data.

2.3 Data processing and analysis capabilities

The U.S. geospatial data services platform has strong data processing and analysis capabilities, thanks to its advanced computing and data management technologies. The platform can handle large-scale geospatial data sets, and provide users with fast and accurate data processing and analysis results. The platform also supports a variety of data processing and analysis methods, including spatial statistics, geostatistics, machine learning, and artificial intelligence, to meet different user needs.

3. The Development Status of Geospatial Data Service Platforms in the United States

Firstly, the history and development trajectory of geographic spatial data service platforms in the United States were reviewed. The origin of geospatial data service platforms can be traced back to the early days of Geographic Information Systems (GIS). Geospatial data service platforms have developed rapidly with the continuous progress of technology, especially the popularization of computers and the Internet. Government departments have played a key role in promoting the construction of geospatial data service platforms. For example, the United States Geological Survey (USGS) provides the United States with much geospatial data through its National Geographic Information System Program.

Secondly, it is necessary to emphasize the roles and contributions of government agencies, the private sector, and academic institutions in constructing geospatial data service platforms. Government agencies play an important role in data collection, integration, and standardization. For example, the National geospatial intelligence Agency (NGA) collects, analyzes and distributes geospatial intelligence data to support national security and military operations. In addition, the private sector plays an important role in data processing and distribution. Various geographic information system providers and data service providers have promoted the application and commercialization of geospatial data by providing advanced technological solutions and data products.

However, developing geospatial data service platforms in the United States still faces challenges. One of them is data integration and interoperability. Geospatial data comes from different data sources and formats, such as satellite remote sensing, surveying and mapping data, sensor data, etc. It is a challenging task to integrate and interoperability these heterogeneous data to ensure data consistency and availability. In addition, data security and privacy protection are also important considerations. Geospatial data involves sensitive information, and it is necessary to ensure data's

secure storage, transmission, and access.

Despite the challenges, developing geospatial data service platforms in the United States has brought enormous opportunities.

4. Data security and quality of the U.S. geospatial data services platform

Data security and quality are critical factors for the success of the U.S. geospatial data services platform. The platform has taken a series of measures to ensure the security and quality of the data.

4.1 Data security

The U.S. geospatial data services platform has established a comprehensive data security system that includes data access control, data encryption, data backup and recovery, and data privacy protection. The platform has also adopted international standards and best practices for data security, such as ISO/IEC 27001, NIST SP 800-53, and FIPS 140-2, to ensure the security and integrity of the data.

4.2 Data quality

The U.S. geospatial data services platform has implemented a data quality control system that includes data validation, data cleaning, and data quality assessment. The platform has also established data quality standards and guidelines for different types of geospatial data, and provides users with tools and services for data quality improvement and assurance. The platform regularly monitors and evaluates the data quality, and takes measures to improve the quality of the data.

5. User demand and scenario diversity of the U.S. geospatial data services platform

The U.S. geospatial data services platform serves a diverse user community, including government agencies, academic institutions, private companies, non-profit organizations, and individual users. The platform also serves a wide range of scenarios, such as disaster response, environmental monitoring, urban planning, precision agriculture, and scientific research.

5.1 User demand

The U.S. geospatial data services platform has a high level of user satisfaction, thanks to its user-centered design and continuous improvement. The platform actively collects and analyzes user feedback and needs, and provides timely and effective services to meet user demands. The platform also provides customized services for different user groups, such as data sharing and analysis tools for researchers, decision-making support services for government agencies, and data visualization and mapping tools for the general public.

5.2 Scenario diversity

The U.S. geospatial data services platform has a wide range of applications in different scenarios, thanks to its flexible and adaptable design. The platform can provide tailored services for different scenarios, such as real-time data processing and analysis for disaster response, multi-source data fusion and modeling for environmental monitoring, and precision farming techniques for agriculture.

6. Talent cultivation and management of the U.S. geospatial data services platform

Talent cultivation and management are critical for the sustainable development of the U.S. geospatial data services platform. The platform has implemented a talent cultivation and management system that includes talent recruitment, training, evaluation, and retention.

6.1 Talent recruitment

The U.S. geospatial data services platform has attracted a large number of talented professionals in the field of geospatial data science and technology, thanks to its reputation and opportunities for career development. The platform actively recruits outstanding talents from universities, research

institutions, and the industry, and provides them with competitive salaries, benefits, and working conditions.

6.2 Talent training

The U.S. geospatial data services platform has established a comprehensive talent training system that includes on-the-job training, mentorship programs, and continuing education programs. The platform provides employees with opportunities to learn and master the latest technologies and methods in geospatial data science and technology, and encourages them to participate in scientific research and innovation activities.

6.3 Talent evaluation

The U.S. geospatial data services platform has implemented a performance evaluation system that includes performance metrics, performance reviews, and performance incentives. The platform evaluates the performance of its employees based on their contributions to the platform's goals and objectives, and provides them with appropriate incentives and rewards.

6.4 Talent retention

The U.S. geospatial data services platform has implemented a talent retention strategy that includes career development opportunities, work-life balance, and employee benefits. The platform provides employees with opportunities to advance their careers and pursue their professional interests, while also ensuring a healthy work-life balance and providing comprehensive employee benefits.

7. Challenges and future prospects of the U.S. geospatial data services platform

Despite its achievements and strengths, the U.S. geospatial data services platform faces a number of challenges and uncertainties in the future.

7.1 Challenges

One of the main challenges facing the U.S. geospatial data services platform is the rapid development of new technologies and methods in geospatial data science and technology. The platform needs to continuously upgrade its technologies and methods to stay competitive and meet user demands. Another challenge is the increasing demand for data privacy and security, which requires the platform to strengthen its data security and privacy protection measures. In addition, the platform needs to address the issue of data interoperability and integration, which is critical for users to access and use data from different sources and formats.

7.2 Future prospects

Despite the challenges, the U.S. geospatial data services platform has a bright future, thanks to its strong technological capabilities, user-centered design, and talented workforce. The platform is expected to continue to play a leading role in the development of geospatial data science and technology, and to expand its applications in various fields such as smart cities, autonomous vehicles, and environmental monitoring. The platform will also continue to promote international cooperation and collaboration in geospatial data science and technology, and contribute to the global efforts to address major challenges such as climate change and disaster risk reduction.

8. Conclusion

The U.S. geospatial data services platform has made significant contributions to the development of geospatial data science and technology, and has become an important infrastructure for scientific research, decision-making, and social services. The platform has strong technological capabilities, data security and quality control systems, diverse user demands and scenario applications, and a talented workforce. However, the platform also faces challenges and uncertainties in the future, and needs to continuously upgrade its technologies and methods, strengthen its data security and privacy

protection measures, and address the issue of data interoperability and integration. With its strengths and prospects, the U.S. geospatial data services platform will continue to serve as a key platform for the sustainable development of society and the environment.

Acknowledgements

Many people have offered me valuable help in my thesis writing, including my tutor, my classmates and my parents. Firstly, I would like to give my sincere gratitude to my tutor who, with extraordinary patience and consistent encouragement, gave me great help by providing me with necessary materials, advice of great value and inspiration of new ideas. It is his suggestions that draw my attention to a number of deficiencies and make many things clearer. Without his strong support, this thesis could not be in the present form. My heartfelt thanks also go to professor, my teacher of thesis writing course, for his help in the making of this thesis as well as his enlightening lectures from which I have benefited a great deal. Then, I pleased to acknowledge my classmates for their invaluable assistance throughout the preparation of the original manuscript. They graciously make considerable comments and sound suggestions to the outline of this paper. Besides, I am extremely grateful for my roommates for their cooperation, comments, and wise advice, although their advice is not always taken, where faults and infelicities remain. Finally, in particular, I would like to express my gratitude to my parents for their support, they provided the computers for me to search for information. It is of great help for me to finish this thesis successfully. I would like to express my gratitude to all those who helped me during the writing of this thesis. My deepest gratitude goes first and foremost to professor, my tutor, for his constant encouragement and guidance. He has walked me through all the stages of the writing of this thesis. Without his consistent and illuminating instruction, this thesis could not have reached its present form.

Second, I would like to express my heartfelt gratitude to Professor Wang, who led me into the world of translation. I am also greatly indebted to the professors and teachers at the Department of English, who have instructed and helped me a lot in the past two years. Last my thanks would go to my beloved family for their loving considerations and great confidence in me all through these years. I also owe my sincere gratitude to my friends and my fellow classmates who gave me their help and time in listening to me and helping me work out my problems during the difficult course of the thesis.

References

- [1] Bhatt S., Friesen B., & Basu S. (2016). The emergence of data science in healthcare: A review. *Journal of healthcare engineering*, 2016, 8646578.
- [2] Bresnahan T. F., & Trajtenberg M. (1995). General purpose technologies 'Engines of growth'? *Journal of econometrics*, 65(1), 83-108.
- [3] Chen H., Chiang R. H., & Storey V. C. (2012). Business intelligence and analytics: From big data to big impact. *MIS quarterly*, 36(4), 1165-1188.
- [4] Goodchild M. F. (2007). Citizens as sensors: the world of volunteered geography. *GeoJournal*, 69(4), 211-221.
- [5] Kitchin R. (2014). *The data revolution: Big data, open data, data infrastructures and their consequences*. Sage.
- [6] National Geospatial Advisory Committee. (2009). *The national geospatial data asset: Enduring value*.
- [7] National Science and Technology Council. (2019). *Harnessing the power of data: A national strategy for artificial intelligence*.
- [8] National States Geographic Information Council. (2019). *GIS&T Body of Knowledge*.
- [9] United Nations Committee of Experts on Global Geospatial Information Management. (2018). *Integrated geospatial information frameworks for sustainable development*.
- [10] U.S. Geological Survey. (2020). *The National Map: Geospatial data and mapping resources*.