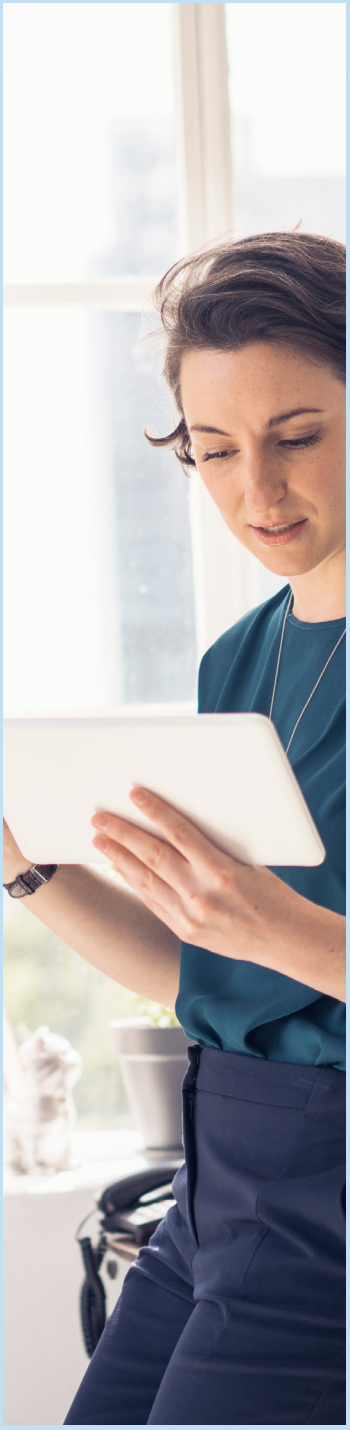
VIEW POINT



NAVIGATING TO ACCURATE POINTS OF INTEREST (POI): BENEFITTING MAP USERS AND BUSINESSES THROUGH THE 3D APPROACH

Abstract

Do you use a map to navigate from point A to point B? What do you use as the source and destination? How many times did you end up landing in a wrong place or to a destination that was closed or temporarily shifted? How many times have you been around a certain place trying to identify the exact store or restaurant in spite of using the maps? Why do you face these troubles and how can you solve them? In this paper, we will address these questions through understanding the concept of "point of interest" (POI).

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The relevance of point of interest and navigations services

While using a navigational device to travel from point A (source) to point B (destination), most often the points a user selects are well-known places such as business entities, shopping malls, or historical monuments. These places are called points of interest (POI), places that are popular and frequently visited, places that the users can relate to quickly. A POI has multiple attributes that provide valuable information about a place. This information helps users make decisions and plan activities as per their needs.

A POI is a navigation component that is of interest for both users (map users) as well as data aggregators (3rd party data providers). However, the intent and usage of the same data by both the parties differs. While map users utilize POI to navigate from point A to point B, the data aggregators use POI data points to curate, correct and enhance their database.

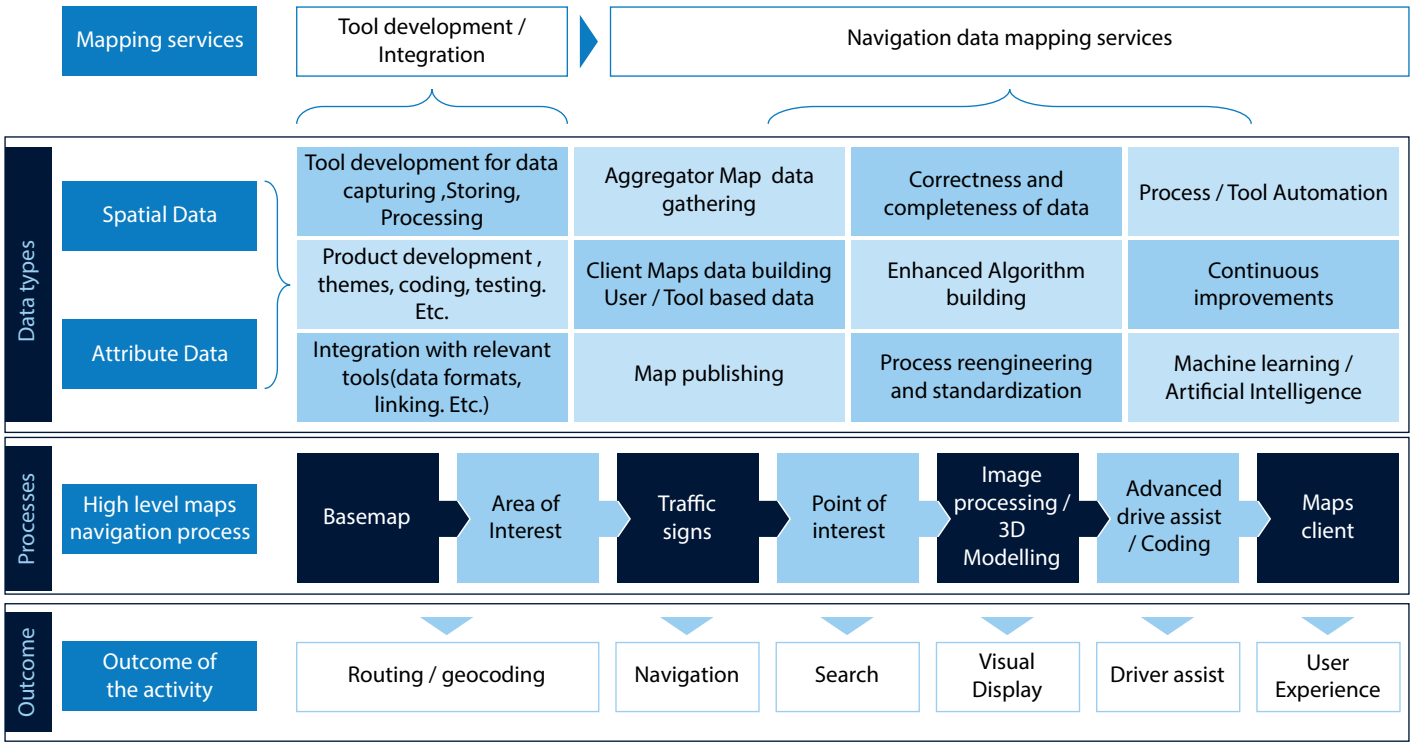
Navigation services have grown in the last decade and an ever growing number of companies and users are using these services today. One of the ways in which businesses have changed in how they interact with their customers is by reaching out to them even through maps. Companies are already building their own maps to provide value adds to their customer base. Further, technologies such as remote sensing, LIDAR (light detection and ranging), UAV (unmanned aerial vehicle), and high definition cameras are some major developments that are improving spatial data and helping both businesses and map users. Though the GIS (geographic information system) has been around for a long time, navigation and location based services as a domain today have been growing enormously with new and emerging competitors in this space.

Why is POI important?

Every map building company tries to enhance its map data, and it gets important for the companies to categorize it so as to get the accurate data and thereby provide efficient service to the users. A map building process is typically divided among several components including base map, street & address, area of interest, transit & pedestrian, point of interest, and an advanced drive assist system. Two important components that play a critical role in any navigation service are address point and point of interest. These components are used predominantly as a source and destination to navigate from one place to another. 99% of the times the search starts with a POI, or as a source or a destination. Hence it becomes critical to have appropriate, accurate, and complete POI data in maps to ensure efficient navigation.

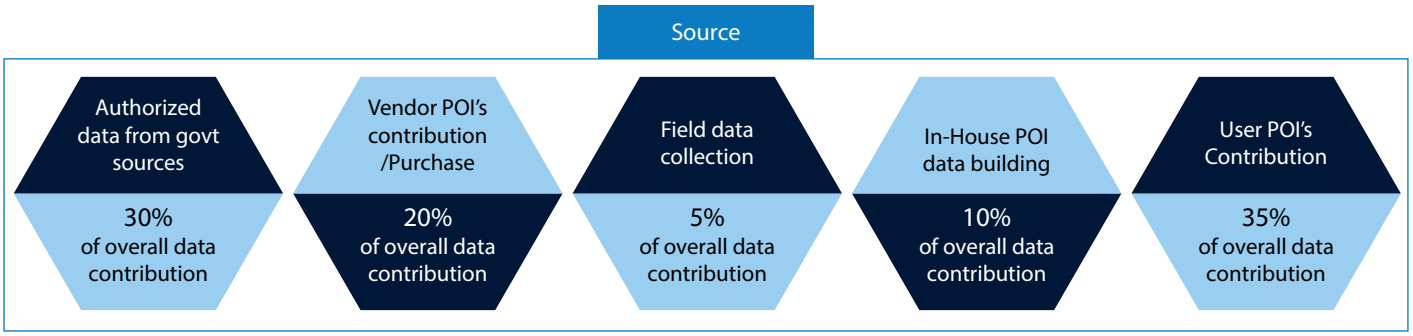
Understanding the high level navigation domain cycle:

The illustration below provides details on the end-to-end high level navigation domain cycle which covers all components that enable seamless navigation to end users.



POI data building

Typically, a map data consists of two parts - spatial and non-spatial data. The data which can be referenced to a location on earth and can be represented by numerical values in the geographic coordinate system is spatial data, e.g. a street or a restaurant. The data which describes a location and is independent of any geometric consideration is a non-spatial data, also known as attribute data, e.g. total number of trees in a street, or hours of operations in a restaurant. The map building companies collate the attribute data from multiple sources in the initial stages and then categorize, profile, and cleanse it according to their need. The image below is a high level snapshot of the sources and the corresponding data quality distribution:



- **Authorized data from government sources:** both spatial and non-spatial data purchased from authorized government entity such as Survey of India. This data includes address information, zip codes, landmark information, and business facilities.
- **Vendor POI contribution:** data purchased from multiple data aggregators based on the markets. Additionally, data can also be purchased from local guides or communities that provide relevant and accurate information.
- **Field data collection:** data collected from the field representatives (survey teams). The team provides ground images and collate firsthand information from the field and then send it to appropriate teams to work on the data.
- **In-house POI:** contribution by in-house resources and through enhancements by robots /algorithms to create datasets, maintain the data and enhance it later, on the basis of the accuracy percentage of the data.
- **User POI contributions:** contributions from map users based on their experience of the maps application. Users can highlight the errors or any issues with the help of the 'report a problem' option in-built in map applications. The map builders receive these issues as actionable items in the backend system, and rectify the application as necessary.

Challenges observed in the navigation domain with respect to POI:

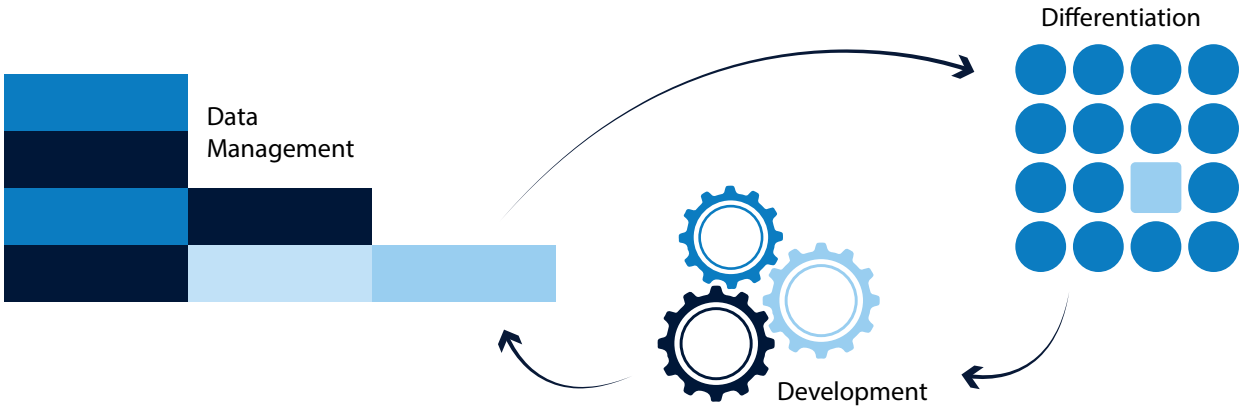
Global market research on spatial and non-spatial data types reveals that approximately 15% of navigation system data changes occur on a daily basis. These changes include road segments, movement of business from one location to another, business attribute changes, and road elements such as conditions, restrictions, and signs. To keep the map relevant, it is of the utmost importance to consistently monitor and update the map data with these changes.

Below is a list of some typical challenges:

- Frequent changes in real life scenarios (geographical changes)
- Temporarily moved, seasonal, and closed business appearing in live maps
- Data synchronization issues due to data gathering from multiple data aggregators
- High duplication of data due to the use of multiple sources of information for data building
- High availability of stale data in the system (attribute data)
- Unavailability of a web presence and source of information to get enough details about a location
- Spam contribution by users

3Ds Approach to address challenges

The challenges relating to POI arise at different stages of the navigation lifecycle. The 3Ds approach can address POI challenges according to the stages they arise in to ensure that users have better map data quality. This approach lays the foundation for quicker data enhancements and also managing, differentiating, and enhancing both spatial and non-spatial data.



3Ds approach

Data management: In this stage focus is on building data and managing the available data within the system. This can be done in three key steps:

1 **Data building:** the data is collated from multiple sources including data procured from aggregators, data built by the map owners themselves, and user contributions. The manual work involved is more in this step since it is important to review and validate the procured data accordingly.

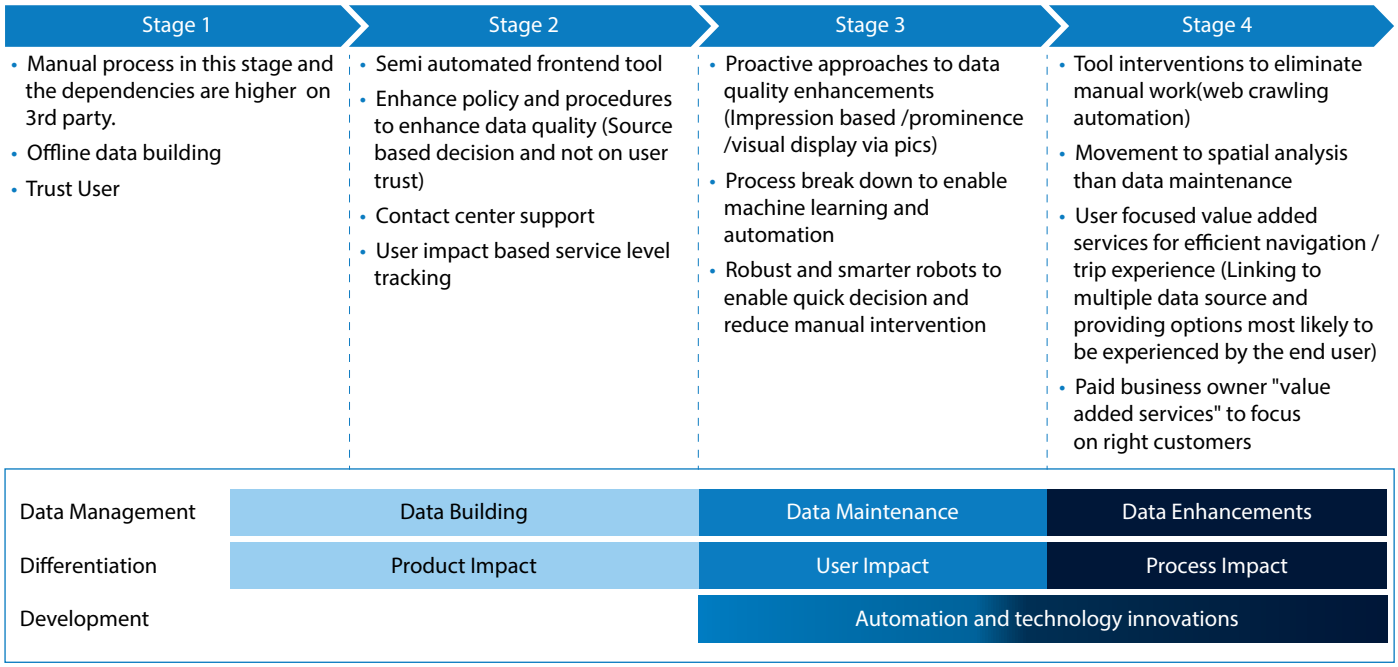
2 **Data maintenance:** involves identifying the right data sources, structuring a process for efficient data handling, and strengthening maps process policies related to POI to maintain the quality of data. This step also identifies and develops the technological intervention to remove unwanted data from the maps (spam removal, tool enhancement for better interface and issue reporting, reporting and analysis for product enhancements).

3 **Data enhancements:** enhances the available data with backend process improvements and with the right investment in automation and artificial intelligence technology. The actions performed in this step are mostly research based which involve extracting valuable information from the data and the respective stakeholders using it accordingly. With this, business owners can get valuable information from backend data profiling.

Differentiation: This phase focuses on identifying the possible impact of the challenges on the relevant stakeholders. It also categorizes the data information to help prioritize and strategize the actions needed such as spam removal, data cleansing, end-to-end attribute updates, and proactive identification of anomalies. We can categorize the impact of the challenges in three ways:

- **Product Impact:** the data available in the system that are causing issues and thereby having an impact on the maps application. These issues need to be prioritized and handled accordingly.
- **User Impact:** data challenges that have an impact on the end-user. The output of these issues can lead to end-user dissatisfaction, lost customers, and opportunities to serve customers.
- **Process Impact:** map process policies encourage users to contribute data. But with continuous spamming, map companies have to take extra efforts to eliminate the inappropriate content from the database.

Development: In the third and last phase, the companies identify opportunities for automation and machine learning process to enable automation. Since there is a plethora of data available in the database, and with constant changes, it becomes imperative to automate certain activities to avoid manual intervention. Once an issue is raised, it goes through a backend review to check for the suggested updates and changes. These changes are made real-time with the help of enhanced robots and ability of the tools to enhance user quality contribution.



Typical roadmap to data building and the maturity model with 3D's approach

Conclusion

Today when there is an abundance of available data, the ability to make sense out of it is the key to achieve success for a business. Maps data play an important role in most industries today with location based services. Technology giants have ambitious projects in collaboration with automobile manufacturers to make the dream of self-driven vehicles a reality in a couple of years from now. The investments in these areas are huge and the opportunities anticipated are also equally huge. Data navigation will play an important role in this journey, and hence it is crucial to have complete and accurate real-time data. Though its accuracy is highly dependent on several data attributes such as road conditions, traffic updates, and restrictions on a road, and most importantly, the real-time updates of these. Also, high dependency on players such as government departments and traffic departments make it a difficult task to manage. With the help of the 3D approach, companies are trying to overcome these difficulties. With all said and done, accurate POI can not only provide a superlative user experience with quick and efficient navigation for map users, but also help avoid any loss of opportunities for businesses.

Mothiraj R - *Practice lead, GIS Delivery, Digital Business services, Infosys BPM*

Mothiraj has over 15+ years of experience spanning customer service, operations management, training center of excellence and solution design. In his current role as a practice lead, he is responsible for designing & customizing GIS solutions, identifying best practices and implementation in GIS space. He holds a bachelor's degree in business management and a post graduate diploma in business administration.

Gopala Reddy Sanagala - *Senior Domain lead, GIS Delivery, Digital Business services, Infosys BPM*

Gopala has over 10 years of work experience in geo spatial industry with experience spanning across operations, training, project management, quality assurance and solution design. In his current role as a senior domain lead, he is responsible for supporting solution design, due diligence and implementation of GIS services. He has worked with high paced clients in domestic and international markets in geo spatial industry (navigation, telecom, utilities & land information systems). Gopala holds a post graduate in Information Systems from Andhra University and has one Post graduate degree in from JNTU Hyderabad specialized in GIS, RS.

For more information, contact infosysbpm@infosys.com

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