LEARNING MADE EASY

CARTO Special Edition

Location Intelligence

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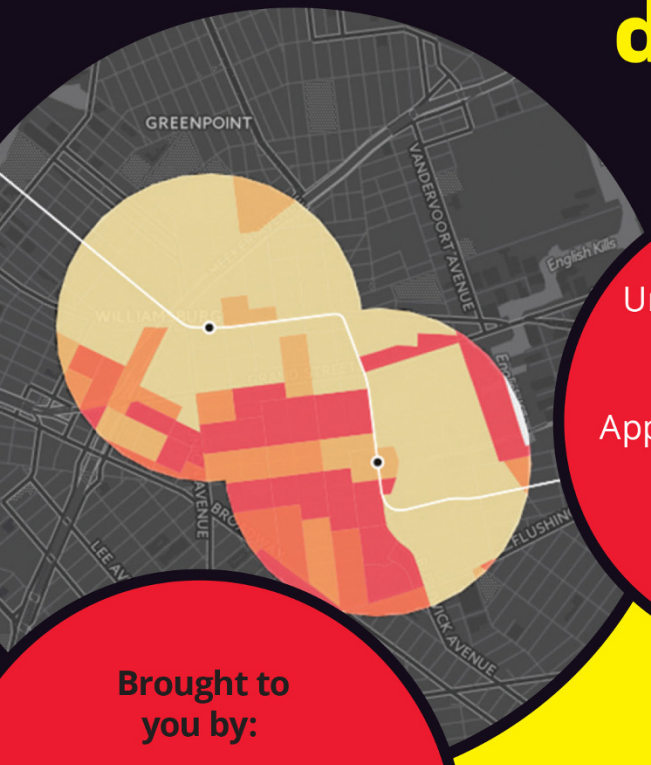

Understand location intelligence (LI)

Apply the methodology

Drive business outcomes

Brought to you by:

CARTO

Javier de la Torre
Santiago Giraldo

Location Intelligence

CARTO Special Edition

by Javier de la Torre and Santiago Giraldo

for dummies®
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Location Intelligence For Dummies®, CARTO Special Edition

Published by
John Wiley & Sons, Inc.
111 River St.
Hoboken, NJ 07030-5774
www.wiley.com

ISBN: 978-1-119-41658-6 (pbk); ISBN: 978-1-119-41659-3 (ebk)

Manufactured in the United States of America

10 9 8 7 6 5 4 3 2 1

Publisher's Acknowledgments

Some of the people who helped bring this book to market include the following:

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Introduction

When the iPhone first launched with GPS integration, the world changed. Location data started rapidly accumulating from millions of devices, and now, a decade later, location data is dramatically changing the way entire industries do business.

Location intelligence (LI) is an emerging methodology for turning location data into business outcomes, helping businesses solve their most complex questions and challenges.

About This Book

Welcome to *Location Intelligence For Dummies,* CARTO Special Edition. This book provides people who are involved with data analytics and data visualization, as well as those who are new to the field, with strategic information about how better enriching, visualizing, and analyzing location data can help your business solve its most difficult challenges.

In this book, we cover several topics:

- A brief look at what LI is and how it's used
- A four-step methodology to help you apply your location data to solve problems and make strategic decisions
- An examination of how LI affects a variety of industries and two specific case studies that demonstrate LI's value
- An overview of resources you can monitor to stay updated with developments in the field

Foolish Assumptions

When writing this book, we made the following assumptions about you, the reader:

- You are a data analyst, work in the field of Geographic Information Systems (GIS) or business intelligence (BI), and/or want more details about how LI can make a difference for your organization.
- You're collecting spatial data and want to apply it to improve your corporate decision making.
- You're interested in deploying LI software that will assist you in utilizing location data to its fullest capacity, and you want to know what to look for.

Icons Used in This Book

Throughout this book, you see different icons. Here's what they mean:

TIP

This icon provides you with ways to do things faster or easier.

REMEMBER

This icon points out things that are helpful to remember.

TECHNICAL STUFF

We use this icon when we want to include information for our readers who want to go deeper into the technical details.

Where to Go from Here

As with all *For Dummies* books, chapters can be read in any order. Scan the Table of Contents to see what sections intrigue your inner explorer. If you want to find out more information beyond what's in this book, visit `carto.com/location-intelligence`.

IN THIS CHAPTER

- Looking back at the evolution of spatial data
- Understanding the catalyzing moment for location intelligence

Chapter 1
Recognizing Opportunities to Apply Location Intelligence

The world changed when the iPhone 3 launched with Global Positioning System (GPS) integration in 2009. Location data started streaming in from millions of smartphone users, and now, a decade later, location data is changing the way companies do business. Imagine the amount of location data that a company like Uber crunches every minute of the day. And, Uber isn't alone. Businesses are being built on location data because they understand the business impact of "where."

Yet, the use of location data by most companies is still in its infancy. Location intelligence (LI) is a discipline for turning location data into business outcomes through enrichment, visualization, and iterative analysis. LI is shaping businesses of the future by adding critical context to the decision-making process.

Data-driven maps and location applications created using LI reveal spatial relationships and correlations that otherwise may not have been apparent. Maintaining a competitive edge in today's marketplace requires a full understanding of your location data. There is more to data than meets the eye.

In this chapter, we introduce you to a brief history of spatial data and the rise in the importance of LI. Then, we discuss what growth in LI means for various industries.

Reaching Back into the History of Location Data

The analysis of location information isn't an entirely novel concept. However, it wasn't until the development of one of the first practical uses of geographic information for maritime navigation that analysis of location information set sail.

Ptolemy, a Greek geographer, astronomer, and mathematician, is credited with establishing the use of location information for the expansion of the Roman Empire in second century AD through navigational precision. Today we credit Ptolemy, as well as other geographers, for their contributions and impact on today's modern geographic nomenclature. He believed that the Earth was the center Universe. The word for earth in Greek is *geo,* so this idea is called a *geocentric theory.*

Although significant advances have been made in analyzing and using location data, the ultimate purpose is still the same: to solve the most challenging problems that we face today.

Modern use of location data came into use over 30 years ago to assist governments in mapping their resources to make better use of them. Transportation hubs and oil reserves were mapped, and the Geographic Information Systems (GIS) industry rose to prominence. While valuable, GIS applications required specialized software and expert-level training, making them difficult to implement and scale.

Then came the Internet. The Internet facilitated a great leap forward by making location data available on the cloud. Vendors like Google became pioneers in democratizing access to location data with its product, Google maps. This allowed business intelligence (BI) vendors to create *mashups* — combinations of discrete datasets brought together to create new applications. These mashups overlaid demographic data on top of geospatial data, bringing us closer to the LI that we know today.

Today's location information landscape focuses primarily on analyzing and using location data to gain real insights on society and services. Some of the most successful companies today, like Uber and Airbnb, leverage location data and use LI at the core of their business strategies, turning insights from analysis into business outcomes.

Recognizing the Importance of LI

Today, LI plays an increasingly important role for organizations and businesses by providing accessible insight into where things happen, why they happen, and what the next best move is.

According to a 2017 report by business research and advisory leader, Dresner Advisory Services, 63 percent of research respondents believe that LI is critical or very important to their business. In today's globalized economies, finding answers to challenging questions is crucial for companies.

LI helps executives gain valuable insights from a variety of growing location data sources:

- **Big data:** With the growing availability of data from every machine, business process, and e-commerce transaction, the opportunities to use data to solve problems are limitless. The analysis of this data can lead to productivity gains and the enhancement of business processes.
- **Mobile:** Mobile devices provide information about where your customers are and where they're going. This allows you to provide clients with context-rich information. You can also deliver valuable time-sensitive and location-specific alerts and information. Mobile devices also produce rich insights into traffic patterns, at the individual level and in the aggregate.
- **Social media:** From this data, you can extract customer sentiment and learn what consumers want to buy.
- **Cloud computing:** Cloud computing lets you access vast stores of information without having to own expensive hardware. With Software as a Service (SaaS), you can buy services that don't require you to add employees or customer support personnel. You can scale up your offerings as needed without having to expand your business.

- **The IoT:** Household items, machines, and a host of other objects can now produce usable data. For example, waste receptacle sensors can save a city millions of dollars by understanding when they need to be serviced and optimizing waste pickup routing.

Creating a New Way of Doing Things

The fact that you can enrich BI data with spatial data redefines what *place* means. Business leaders can

- Figure out where to put a store or hire a salesperson
- Quantify your risk based on potential events or socio-economic shifts
- Optimize real estate pricing based on foot traffic of target demographic customers
- Allow for real-time marketing and better, faster answers for physical store issues
- Optimize the routing of delivery or service vehicles for more efficient service


TIP

Use Moran's *I* analysis to identify outliers in your spatial data to determine where to focus time and resources. In statistics, Moran's *I* measures spatial autocorrelation that's characterized by a correlation in a signal among nearby locations in space.

DISCOVERING THE NEW FRONTIER

So what's ahead for LI? According to CARTO CEO, Javier de la Torre, he expects to see strong growth in location-based services (LBS) and the data analytics space. Here are a few of his predictions:

- More integrated products will include geospatial technologies, making the use of spatial intelligence mainstream.
- Companies will create significant competitive advantages if they can quickly integrate the new streams of location data and the emerging spatial analyses designed to understand that data.
- First generation LBS will transform into a new generation of LBS tailored to customer-specific challenges.

IN THIS CHAPTER

- Recognizing uses for location data
- Deploying location data to gain insights
- Implementing a four-step methodology to utilize location data

Chapter 2
Putting Location Intelligence into Practice

In Chapter 1, we discuss where location intelligence (LI) came from and the value it provides your organization or company. But how do you extract that value?

When implementing your LI methodology, begin by writing down the business problem(s) you need to solve. You can begin with the following exploratory questions:

- In what data streams are we not using location information relevant to current customers?
- Where are our target clients and where are the best places to focus campaigns?
- What efficiencies could we find with delivery of our services to our customers?

Implementing the LI methodology into your business processes and workflows is the best thing you can do to help solve your business's most complex problems. In this chapter, we better define location data and outline the four-step LI methodology.

Step 1: Enrich

Ensuring that you're using quality data is an important first step in the process. Before you enrich your data, determine whether it's accurate and reliable. The data should be cleaned and filtered before you integrate it with other external databases. Ask your LI platform provider about the best methods to clean your data before importing or connecting it to a database.

After your data is clean, you can begin to enrich it. What exactly does enriching your data mean? Data enrichment involves linking company data with additional sources of location data, such as financial, ecological, and demographic measurements. To determine what external sources of data are the most useful in the discovery of solutions, ask these questions:

- **What goal(s) do you want to achieve?** What do you want to learn? If you find the answers to specific questions, will they drive revenue and add value? Have you thought about how these goals will affect your organization?
- **Which datasets should you use?** Are you using the right combination of datasets from external sources, as well as your own? Are you aware of all the external sources that are available? Some examples of data you can use include home ownership or income levels in an area.
- **Where is your data located?** Do you know where your data is stored? How about external data? Is it accessible? Is there any additional cost to access this information?
- **What is the best way to aggregate the data?** Are you clear about how you will bring all these disparate datasets together?

Step 2: Visualize

In LI, the most important visual asset is the interactive map. The map is the grounding element for better understanding your data. It is the foundation for performing iterative analysis, which is Step 3 (see the next section). Moving forward, visualization and interactivity will guide deeper insight discovery. When selecting the best mapping method, consider the following:

- How will I need to interact with my data to model scenarios and findings correctly?
- Is my visualization easy to understand? When working with teams this is a necessity.
- Is my visualization method appropriately representing my data, and later, my findings? Are the color schemes, feature sizes, and data layers relaying information truthfully and accurately?

Step 3: Analyze and Iterate

Iterative analysis is one of the most important components of LI and a main differentiator from business intelligence (BI) and GIS. Deciding the best initial analysis for your specific needs depends on your desired outcomes. LI embodies a broad range of analysis functionalities:

- **Spatial data analysis:** This unique analysis methodology to LI enables scientific modeling and machine learning. Examples include detecting clusters and outliers, predicting market volatility, and predicting future consumer patterns.
- **Database analysis:** Examples include data manipulations, filtering, numeric aggregations, joins, and many other methods found in traditional BI tools.
- **Geospatial analysis:** This analysis includes practical spatial functionalities, such as measuring distance, proximity, counting points in polygons, spatial manipulations, and spatial joins, often found in GIS platforms.


REMEMBER

Selecting the appropriate combination of analyses is important for creating valuable results. LI combines different analysis types into one interchangeable toolset, greatly increasing the potential of location data when multiple methodologies are applied. Analysis between multiple datasets or measurements also creates deeper levels of insight. Multiple dataset analysis can include the following:

- Exposing the current and future patterns between neighborhood changes in median income and store performance over the course of five years
- Preemptively planning and optimizing for distribution network disruptions based on civic improvement projects

- Understanding how demographic shifts over time will affect the effectiveness of marketing assets in a city

The final component of this analysis step is empowering your colleagues, clients, and strategic teams to iterate on your analysis by using an LI dashboard easily created and shared through your LI service provider. Using an LI dashboard allows for greater communication, collaboration, and informed follow-through for the next step: Take action.

Step 4: Take Action

In this step, you determine the best way to leverage your findings and share them with stakeholders. Ask yourself these questions:

- **What can you do with this information to help reach your initial goal(s)?** Do you know which decision makers you need to inform?
- **What new actions do you need to take and what can you make decisions about?**
- **Can you develop new applications based on what you've learned?** Are there new product opportunities?
- **What can you gain by pursuing these opportunities?** Can you increase profit margins or revenue?

DISTINGUISHING BETWEEN BI AND LI

So what's the difference between BI and LI? BI answers present-state questions such as, "Where *are* my stores?" LI solves moving-forward challenges such as, "Where *should* I put my next store(s)?"

Traditional BI delivers basic spatial capabilities — specifically, putting a single layer of data points on maps, based on the output of time-based analysis. With BI, users aren't performing new analyses of their own. They're simply interacting with a published result set on a map. LI lets users perform iterative, spatial analysis. Rather than consuming result sets on published maps, decision makers use interactive location applications to solve complex business and societal problems related to the physical world.

IN THIS CHAPTER

- Reviewing the impact location data has on retail
- Unlocking location data for the financial and real estate industries
- Assisting local government
- Observing location intelligence in action

Chapter 3
Impacting Your Business

Data-driven companies are creating new solutions by enriching their business data with location, visualizing the result, and merging traditional temporal analytics with spatial analytics. This location intelligence (LI) approach impacts the way executives make decisions and develop strategies across industries. The result? Faster time to insight and discovering new relationships between variables that you otherwise weren't aware of.

In this chapter, we discuss how LI impacts a variety of industries and show specific use cases that demonstrate its value.

Looking Across Industries

This section looks at a sampling of industries that use location data to gain valuable insights, deliver innovative technology, and provide better services.

Innovation for retail

After the 2008 recession, retailers began investing in LI technology to better understand their customers. According to a study by consulting firm A.T. Kearney, location is one of the top five areas of tech investment for retailers.

Retailers can now better serve their customers both online and offline by using a few new LI innovations:

- **Location planning:** Retailers use location planning to determine the best places to physically locate their stores and distribution centers. This information helps them maximize their investment and serve areas where most of their profile customers live.
- **Indoor mapping:** Retailers use indoor maps of foot traffic patterns to maximize the utilization of spaces inside their store, giving valuable insight into which internal areas generate the most revenue. By establishing traffic patterns around these areas and understanding the combinations of areas in stores and malls that shoppers visit, retailers are armed with the information they need to create valuable cross-promotions and turn lookers into buyers.
- **Beacons:** Retailers use *beacons* for real-time customer promotions. When customers enter a retail store, an app connects their smartphones to the store's app. This allows the store to send customers personalized discounts or ads that they can use immediately based on their preferences.

  A *beacon* is a Bluetooth-enabled technology that uses location data on customers' smartphones to send notices to customers when they enter your store.
- **Improved supply chain planning:** Retailers make distribution decisions based on location data (like weather information) so that product delivery is never disrupted. They can also determine the best locations for distribution centers, based on optimal location, minimizing excess inventory in stores and shortest time-to-store delivery.
- **More targeted Internet advertising:** Deliver discounts from the web to exactly the right customers when they view advertising based on their locations.


TECHNICAL STUFF


TIP

Insights garnered from LI can improve the customer experience by meeting the needs of different types of shoppers. You can analyze where they shop and how much they spend, and then relate that to their home or work locations to determine what kind of products and services will be profitable in specific neighborhoods.

Improving services from local government

State and local governments use LI to increase transparency, accountability, and responsiveness to citizens' needs by focusing on the following areas:

- **Emergency readiness:** Real-time monitoring allows for quick evaluation and responses to emergency situations, ranging from fires and crime to weather.
- **Social services distribution:** Agencies pinpoint where those who need services are located.
- **Planning for and supporting infrastructure projects:** Workers determine where best to locate heavy construction equipment to avoid pedestrian accidents and the most cost effective way to expedite repairs and upgrades.
- **Locating crucial services:** Government employees decide more effectively where to locate health services, public daycare centers, and clinics based on predictive models that better inform where to reach key demographics.
- **Providing location data to citizens:** Locals acquire access to location data so they can make better decisions about where to live and work.

Making better real estate decisions

The real estate industry previously used GIS for map plotting and distance documentation, but the analysis was rudimentary and not iterative. Adopting the LI methodology provides a new way to analyze data. New software applications allow for a more in-depth analysis of

- Where to locate new company buildings
- How to price rental properties (residential and commercial) by combining occupancy rates, income levels, and other demographic factors
- Mapping transportation, business, crime, and zoning to uncover where the most interested renters would be
- Using *machine learning* to better predict trends in home prices so sellers know when to sell

TECHNICAL STUFF

Machine learning refers to a type of artificial intelligence (AI) that allows programs to improve their understanding based on new information without additional programming.

Protecting finance industry assets

The finance industry greatly benefits from the use of LI in the following ways:

- Helping businesses that are buffeted by changing political, economic, and social conditions to develop better strategies to overcome them
- Minimizing risk from conflicts around the world by alerting employees to keep them safe
- Protecting assets such as banks and ATMs from weather disasters
- Quantify risk based on exposure to natural events and more

TIP

To be successful, financial institutions need to factor in data on natural disasters, weather events, and geographic employment patterns that would give them a fuller picture.

Observing Use Cases

In this section, we give you two ways that show how companies have used LI powered by CARTO to solve problems and gain valuable insights that promote the common good as well as impact the bottom line.

Viewing NYC mayor's interactive dashboard app

NYC Mayor Bill de Blasio and his aides needed to be in constant touch with complex data generated from all parts of city government so they could preempt and predict problems. An LI app created by Vizzuality and Hyperakt, in partnership with CARTO, allowed them to put real-time data in one place in a host of different visual formats.

The app collects information, such as crime statistics, health figures, and environmental indicators, from city agencies and

marries it with LI and other data to help City Hall staff manage the intricate workings of city government. The dashboard displays a series of indicators of current conditions to provide a high-level overview of multiple city sectors.

As a result, city officials improved workflows, communication, and efficiency. Residents benefited because the city deals more effectively with events in real time.

The mayor can also assess how well he's delivering on his campaign promises. According to *The New York Times*, the mayor has begun work on 94 percent of his promises. An app like this allows people to think about the future of modern government in more creative ways.

Optimizing tourism spending data in Spain

Banco Bilbao Vizcaya Argentaria (BBVA), Spain's second largest financial institution, wanted to develop a deeper understanding of how tourists spend their money on holiday in Spain. They collaborated with CARTO and Vizzuality on an online visualization that geographically and chronologically analyzed the number of credit card transactions in Barcelona by both locals and visitors in the summer of 2014. BBVA used four years of data on spending from 5.4 million anonymized credit card transactions to produce the visualization.

The location data included country of origin and travel destinations in Spain, as well as data about hotels, restaurants, and so on. This real-time display allowed BBVA to understand where and how each country's visitors were spending their money, which created a foundation for a proactive marketing strategy. It also showed emerging commercial areas of Barcelona that BBVA might otherwise not have been aware of, which could influence new customer acquisition strategies.

IN THIS CHAPTER

- Presenting CARTO online
- Looking at resources for data visualization
- Reporting on new developments in geospatial technology

Chapter 4
Ten Resources to Learn about Location Intelligence

Because of the great strides being made in the field of location intelligence (LI), it's critical that you stay up to speed with the latest developments on technology and business applications. This chapter gives you ten great resources to help you monitor the fast-changing developments in the LI industry.

CARTO Blog

`https://carto.com/blog`

CARTO is an open, powerful, and intuitive platform for discovering and predicting the key insights underlying the location data in our world. Its blog features all the best LI resources on the web, from best practices to case studies to easy hacks that help you solve your business problems.

CARTO LI Resource Center

carto.com/location-intelligence

CARTO's LI resource center is a one-stop shop for everything LI. Take a look at new resources and white papers, blog posts, and additional information about how to implement LI into your organization.

CARTO Learn

https://carto.com/learn

Find quick reference guides for learning about additional features in CARTO Builder.

CARTO Resources

https://carto.com/resources

CARTO's Resource Center is designed like its platform — with easy access in mind. Find all the documents you need to learn about CARTO's many capabilities. Located in one place, peruse white papers, case studies, and brochures. Explore more and learn more through CARTO.

CARTO Gallery

https://carto.com/gallery

See dozens of examples of how businesses in a variety of industries are using data-driven maps and LI to create valuable insights.

Mapzen Blog

`https://mapzen.com/blog`

Mapzen is an open mapping platform that builds bespoked maps and provides them as a service. The Mapzen blog shares the latest interesting interactive projects and how to apply maps to solve problems.

Socrata Blog

`https://socrata.com/blog`

Socrata is a software company that offers cloud-based services exclusively for city, county, state, and federal government organizations. Socrata helps these agencies utilize the data they have locked away in silos and complies with strict government standards. This blog covers a variety of topics related to the public sector and LI.

Geoawesomeness

`http://geoawesomeness.com`

Geoawesomeness is a blog about everything related to geospatial technologies. The virtual writing team is based around the world, with contributors sharing their perspectives about what's happening in the field. The topics covered include apps, maps, and startups.

GIS StackExchange

`https://gis.stackexchange.com`

The Geographic Information Systems (GIS) StackExchange is a question-and-answer site for all things analytics, integration, and visualization. With a community first approach that includes active engagement from industry professionals, forum-style

tech support, and the very latest in technology development, you can find encouragement and contribute to the growing LI community.

Directions Magazine

www.directionsmag.com

Directions Magazine is the geospatial industry's oldest and most respected source of information and news. Offering a rich selection of content, get inspired to solve business, education, and government challenges with geospatial technology.

Turn location data into business outcomes

LI methodology helps businesses use location data to solve their most complex questions and challenges. Many companies aren't leveraging LI to its fullest capacity and don't know where to begin. Shape your business strategy with a spatial approach to your location data.

Inside...

- What is LI and how is it used?
- A four-step methodology to apply your location data
- How LI affects a variety of industries
- Specific case studies that demonstrate LI's value
- Resources to stay updated on LI developments

Javier de la Torre is CEO of CARTO. A pioneer of location intelligence, Javier founded CARTO in 2008 to democratize data analysis and visualization. **Santiago Giraldo** is a recognized environmental and urban scientist. His current work at CARTO seeks to push the possibilities of data, design, and technology.

Cover Image: © Mamata Akella, CARTO

ISBN: 978-1-119-41658-6

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