

# VIEW IN BIG DATA

The parking industry has access to more data today than ever before, and the amount of data collected is growing quickly and exponentially. We generate incredible amounts of data from a variety of sources, including space availability tools, meter and parking management systems, credit card and other electronic payment transactions, financial systems, and social media. This does not include data created by other entities, such as weather, traffic, and event-related data.

All of this data created across the industry lends itself to the concept and tools called “big data.” The IPI Technology Committee has prepared a timely and relevant presentation on this topic to be shared at many regional parking shows, as well as the 2015 IPI Conference and Expo in Las Vegas, June 29–July 2. Here, we offer an overview of big data, shedding light on how it affects the parking industry.

It’s a popular topic, and many multinational companies, including Xerox, IBM, Oracle, and SAP, are devoting considerable resources to supporting related initiatives. There is no doubt that the movement will have an effect on our operations and future management of our parking and transportation systems, but what exactly are we talking about when we say “big data”?

## A Definition

As defined by many sources, big data is an all-encompassing term for any collection of data sets so large and complex that it becomes difficult to process using traditional data-processing applications. In layman’s terms, this means bringing together a lot of data from different sources to reveal patterns and trends associated with human behavior.

We are all familiar with using databases and running reports to gain an understanding of trends and the status of our operations. The field of big data is meant to assist in those cases in which there is so much data that a single database and the typical tools used to analyze the data cannot work. In these cases, we need big data tools and methods for analysis.

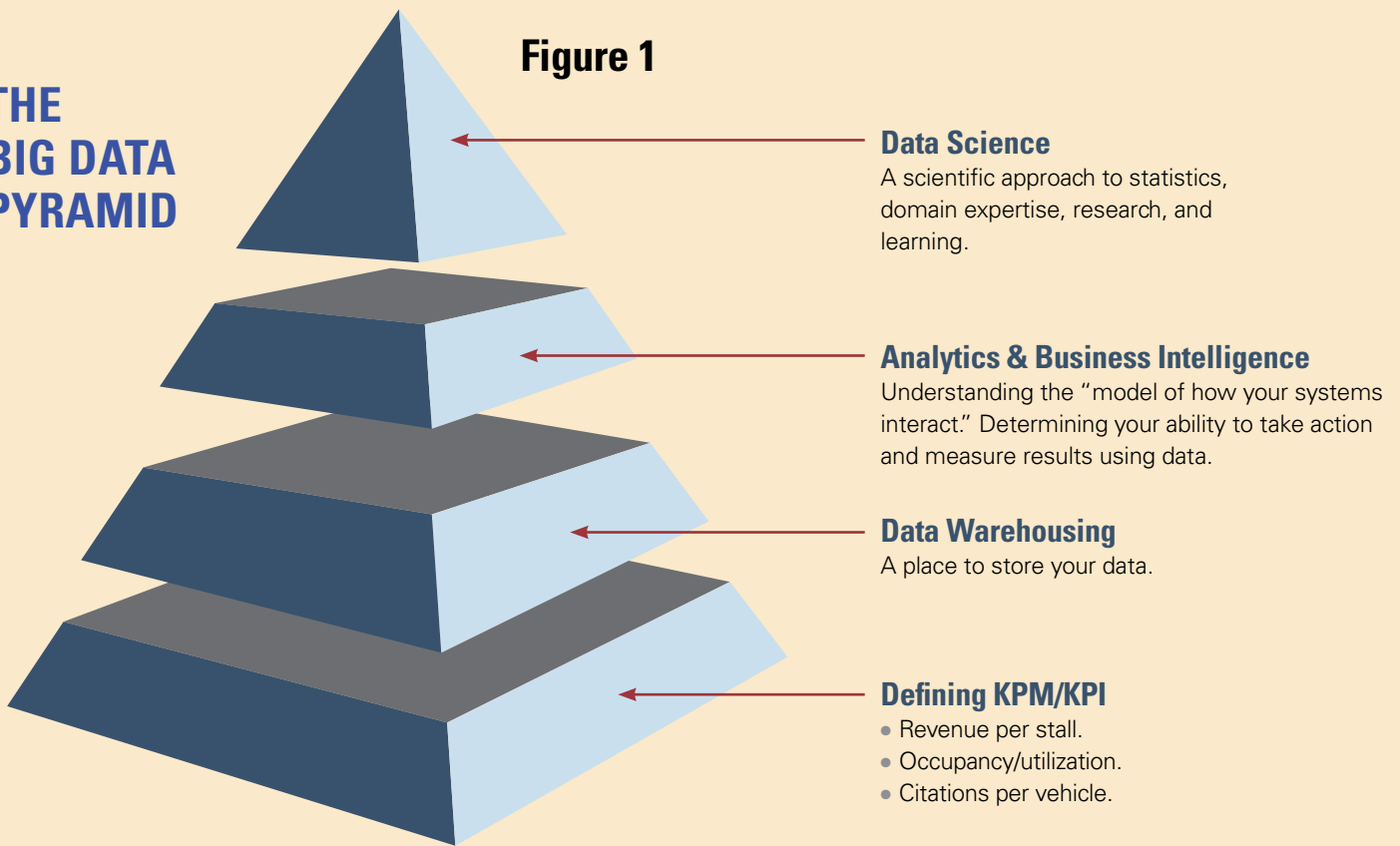
Believe it or not, you already have experience with this; these tools are already used by many of the companies we interact with on a daily basis. If you have ever watched a YouTube video, you have seen an advertisement presented before your selected clip. YouTube presents specific advertisements based on your video search history, as well as how you reacted to previous advertisements that appeared on your screen. The company tracks which advertisements you actually watch to learn your interests. It also tracks how quickly you skip advertisements—if you skip most advertisements but let certain ones progress for five seconds before skipping, for example, that is tracked.

Based on this analysis, YouTube refines its profile of you, and that profile is presented to various advertisers that might be interested. Understanding which advertisements are of interest to you helps YouTube generate advertising revenue, and the company hopes it puts ads on your screen that you’ll find interesting and be willing to watch.

Similar use of data concepts will help our parking and transportation operations by providing new insights that have not been previously identified. By correlating and testing various data sets, entities will learn of new relationships that can be used to improve their operations or service offerings to customers. While new research and ideas related to big data are being introduced on a regular basis, there are four key terms that should be understood. Refer to Figure 1, the Big Data Pyramid (p.22), which depicts how the four terms build upon each other.

# THE BIG DATA PYRAMID

Figure 1



## Term 1: Key Performance Metrics

At the base of the big data pyramid is the need to define key performance metrics (also known as key performance indicators or KPIs). KPIs are real numbers that help us judge the status of things being monitored. KPIs should be metrics that are actionable and lead to decision-making, not metrics that require more analysis or are interesting to ponder but do not result in actions. In a parking operation, these might be revenue per stall, occupancy or utilization, or citations per vehicle—the things you need to track to reach your objectives (regardless of whether your management objective is financial, equality, promotional, or in another area.)

## Term 2: Data Warehousing

The next level is to track KPI metrics over time. To do that, we need to find a means to store KPIs in a database system. Many systems are available for this, and you can use either your own software package or those available from vendors. If you do this yourself, you will need to make an upfront investment and dedicate ongoing development time and effort to build the infrastructure. In terms of big data (like, really big data), you would not do this yourself. For the size and scope of data for a typical parking operation, though, any typical database system can operate as a warehouse.

## Term 3: Analytics and Business Intelligence

Once you’ve established a data warehouse/database, you can move into analytics and business intelligence (BI). This is where we gain insights by reading data

visualizations (charts, graphs, dashboards, etc). Imagine receiving a daily emailed report about the status of your operations. These emails or readouts tell you the health of your operation (expressed through revenue received, week-by-week comparisons, etc.). The key is to be able to see a snapshot of how you’re doing, as well as track changes over time. Make sure your reports, dashboards, and tools give you—the data consumer—a way to ask questions related to how you are doing as an operation and what is driving the results you’re seeing.

## Term 4: Data Science

Once we define the business analytics and intelligence layer, we can look into what is called “data science.” In other words, now that we have quality data, how can we use data science to proactively analyze and generate meaningful insight from our data? While business analytics and intelligence are used to analyze data to explain the past, data science uses the data to predict the future.

Up to this point, we have talked about big data and the ability to manage and analyze very large amounts of data. It should be understood that many of the same concepts can be applied to smaller operations and data sets. While many of our operations do not generate large amounts of data, an operation should still take the opportunity to analyze its data to understand consumer trends and ways to improve the operation. In fact, we could analyze the data generated from a few garages quite easily using existing database and spreadsheet tools.



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Figure 2

## WHAT IS BIG DATA IN PARKING?



### Hot Topic

The real value of big data comes when we start to compile data from all of the garages, all of the meters, and all of the parking spaces that customers use in a region or the industry. We then merge that data with data from local events (sporting events, festivals, etc.), holidays, weather patterns, and other customer activity. By analyzing this large amount of data, we will begin to glean insight into what is driving demand peaks on a Thursday at Garage A but not on Tuesday night at Garage B just a block away. From these insights, garage operators will be able to refine their services and pricing to better meet the actual needs of customers using their facilities at different times during the week, month, or year.

Regardless of whether you plan to participate in a true big data initiative or establish a small initiative of your own, you can apply the data pyramid to any operation and gain results. However, participating in large-scale big data initiatives will require an operation to consider how it will support the initiative. Many large cities and universities have big data initiatives underway and are requesting other public and privately owned parking facilities to participate in their initiatives. The following are a few points that an operation should consider when participating in a big data initiative:

- Do your existing computer systems enable you to export data to other databases? When investing in new systems, make sure the systems support open data architecture.
- Do you have appropriate data lines to support transferring data to and from other parties? This is even more important as you desire to receive and send real-time

data to and from many parties. Lots of data being passed requires larger bandwidth to handle the traffic.

- Do you have sufficient data storage capacity to manage all of it? Have you established appropriate retention procedures to keep only the data that is necessary over time?
- Have you implemented appropriate privacy policies to protect sensitive information from your operations and your customers? This is currently the most overlooked aspect. There are increasing numbers of laws limiting the amount of data that an operation can send about its customers to other parties. In addition, an organization should consider always keeping certain types of information secure.

Big data concepts will become a larger consideration in all of our operations during the coming years, and many of our operations will be asked to participate in related initiatives sponsored by a variety of public and private organizations. Every operation should consider what it intends to achieve from participating in these projects and if its operation is structured to effectively support the initiatives. It is not always about large big data initiatives; many of the same concepts and tools can be performed on a smaller scale.

Each operation should evaluate the data it has currently and how it can leverage data analytics to learn more about its customers and opportunities for operational improvements.

*The IPI Technology Committee's research on big data will be presented in full at the 2015 IPI Conference & Expo in Las Vegas, June 29–July 2. For more information, visit [IPIConference.parking.org](http://IPIConference.parking.org).*



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