



Big Data & Tourism

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Big Data & Tourism

To promote innovation and increase
efficiency in the Tourism sector

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Summary

Big data is becoming the new frontier of information management given the amount of data current systems are generating and consuming. It has driven the need for technological infrastructure and tools that can capture, store, analyze and visualize massive amounts of disparate structured and unstructured data. Big data is perhaps the biggest opportunity in a generation for travel businesses to embrace the changing structure of data and maximize its use. It offers the potential for a substantial shift for all travel companies, empowering them to enhance both the business and experience of travel. As with any generational shift in technology, however, the opportunities attain hand-in-hand with the potential for significant disruption, which naturally bring many challenges – competitive and creative – for the tourism sector to consider.

Introduction

The amount of data in today's world has been exploding, and analysing large data sets, so-called big data, has become a strategic basis of competition, underpinning new waves of productivity growth, innovation, and consumer surplus. Businesses capture massive amount of information about their customers, suppliers, and operations. Millions of networked sensors are being embedded in the physical world in devices such as mobile phones, smart energy meters, automobiles, and industrial machines that sense, create, and communicate data in the age of the Internet of Things. Social media sites, smartphones, and other consumer devices including PCs and laptops have allowed billions of individuals around the world to contribute to the amount of big data available. And the expanding volume of multimedia content has played a vital role in the exponential growth in the amount of big data.

In near future, Big Data is expected to be deployed around existing advertising solutions and also around social networks. Big Data is also being used in various scientific research handling very large volumes of data (physics, weather, tourism, genetics, etc.) and trying to find patterns into those data sets. Moreover, Big Data is expected to offer new opportunities in all retail activities by leveraging the real time coming from smartphones, sensors and the several video formats. No doubt, Big Data should impact all sectors, including more industrial sectors, notably by fusing data from different departments of a same enterprise with external data.

Big data is more than just a matter of size; it is an opportunity to find insights in new and emerging markets based on data analysis, to make processes, businesses and public services more agile, and to answer questions that were previously considered beyond our reach. But while big data allows so many new opportunities, there are also many socio-economic, ethical, legal and privacy aspects associated to the sharing and reuse of data that must be analysed and taken into account.

In the tourism sector, most of the players have also had access to plenty of data for many years. Every airline reservation, every hotel stay, every rental car and train reservation leaves a data trail. It all adds up to hundreds of terabytes or petabytes of structured transaction data in conventional databases—big data by any standard of measurement. However, big data is not just about volume. It's also about the variety and velocity of data. Increasingly travel arrangements are discussed online in ratings and blog sites, liked and disliked on social networks, and complained about or praised in call center conversations. The data arrives at a pace much faster than customary structured data ever did. To understand

customer's travel experience, a company has to add new forms of data to its inventory. If the travel industry wants to embrace big data; it must embrace unstructured data in a variety of formats, and data that is constantly flowing. It must convert unstructured data into a form in which it can be analyzed, and then analyze it on a continuous basis.

Predominantly, it must make decisions and take actions on the data in real time. These steps are already being taken in the online segments of the industry, including online travel agencies, meta-search sites, and some travel distribution information firms. Other firms, such as airlines and hotel chains, are earlier in their big data journeys, but are increasingly employing the large volumes of structured information they generate internally.

Big Data

Big Data is primarily linked with two ideas: data storage and data analysis. So the key quest is how Big Data is different from conventional data processing practices. For primary insight as to the answer to this question one need look no further than the term big data. Here, “Big” implies importance, complexity and challenge. Moreover the term “Big” also incites quantification and thus it makes difficult to provide a single definition.

The widely known definition is that included in a Meta report from 2001. Gartner proposed a 3- fold definition incorporating the “three Vs”:

- Volume – large amounts of data generated;
- Velocity – frequency and speed of which data are generated, captured and shared; and
- Variety – diversity of data types and formats from various sources.

The Oracle definition is focused upon infrastructure highlighting a set of technologies like NoSQL, HDFS, Hadoop, R and relational databases. Though this definition is undoubtedly applied than others it equally lacks quantification. Intel links big data to organisations, for instance “generating a median of 300 terabytes (TB) of data weekly”. Intel expresses big data through quantifying the experiences of its business partners.

Microsoft provides a concise definition: “Big data is the term increasingly used to describe the process of applying serious computing power - the latest in machine learning and artificial intelligence - to seriously massive and often highly complex sets of information”.

Big Data is the collection of large volumes of varied information, used to extend our understanding of the environment, medicine, science, business and human experience.

Despite the variety and differences existing within each of the aforesaid definitions there are certain elements of similarity. Especially most definitions make at least one of the following affirmations:

1. Size: the volume of the datasets is indispensable feature.
2. Complexity: the structure, performance and mutations of the datasets are important features.
3. Technologies: the tools and techniques used to process a huge dataset are crucial features.

Big Data is the most innovative instrument to date for providing insights into consumer behavior patterns and improving process efficiencies that were previously quite difficult or impossible to achieve. Because of the strategic insights Big Data can provide, it has a clear role within corporate travel agencies who need to provide clients with tailored reports designed to help them better manage their travel programs.

In fact, many travel agencies are already working with both their own datasets and those supplied by third parties to make significant business improvements.

For example, using Big Data you can:

- Negotiate better rates with suppliers;
- Maximize revenues for each booking, whilst maintaining agent productivity;
- Workflows can be created using relevant information to improve the profitability of the business as a whole;
- Big Data technologies can constantly monitor transactions so that when one supplier limit is reached, agents can be redirected to focus on promoting another supplier.

Big Data Analytics in the Travel Sector

The travel industry is highly complex with multiple players and systems interacting with each other at every given point of time for smooth functioning of the business. There are various other prospects of using business analytics in the travel sector, including:

- Demand/sales forecasting
- Inventory management
- Multi-channel campaign optimization
- Revenue outflow and cancelations
- Customer Life Time Value and trustworthiness

Data from numerous sources needs to be consolidated and analyzed using different parameters to improve sales and marketing effectiveness. Part of the data is already available in the organizational data store. However, when this data is blended with numerous external sources like data from travel companies, online portals, carriers, and most notably, from social media, its value increases significantly, giving superior insights into customer behavior patterns. This information helps organizations analyze trends and customer preferences – their likes & dislikes and sentiments. This can then act as an effective tool for devising strategies and uncovering hidden sales opportunities with the right decision-making strategies, and also, in identifying unknown risks in market segments.

Social media provides a wealth of information about sentiments and can help in predictive analytics. But, this data is massive with real information hidden within a huge amount of irrelevant data. Leveraging the power of technology, this huge volume of data can be analyzed using big data analytics that can bring out meaningful information.

It is possible to apply business analytics to analyze customer buying patterns. It can suggest which segment of customers prefers higher baggage allowance. The carriers can accordingly create more personalized products or offerings for the set of customers, thereby creating differentiation and beating the competition.

Business analytics helps understand trends, and accordingly forecasts demand and supply situations of the near future. When this input is fed into the pricing engine, it can dynamically change pricing, thus boosting revenue and reducing loss.

Suggestions for Travel Sector

Every organization in the travel sector should begin investigating and following the development of big data. Are competitors adopting it? Are customers beginning to use it? What is the trajectory of big data adoption and use within your segment of the travel business? And most prominently, can you afford to be a follower rather than a leader in this area?

Company managers need to consider what is happening with big data in the sector, and how they might participate in the trends. Where in the business is there a need for much better data and better decisions? Where is there already data that could be useful either internally or to customers, but is currently being overlooked? Considering both questions meticulously can yield a plan of action for big data.

As with other potentially revolutionary technologies, seizing the potential of big data is not just about implementing technology. To make effective use of big data, organizations will have to change business and operational processes, decision styles, employee skills, and corporate cultures. Continuous data flow, for example, requires a continuous decision-making process. The level of change may well be dramatic, but so is the potential benefit.

Since big data skills are deficient in the tourism sector, organizations need to begin assembling them now. You must start exploring what vendors or consulting firms can supply them to you. Make sure they are adept at data management, analytics, and solving and communicating about business problems.

Big Data Applications

Big Data is also highly applicable in travel for fraud and identity theft prevention by detecting, in real time, abnormal behavior patterns.

Big Data can support dynamic personalization by configuring pages based on recent-past behavior as revealed from close analysis of clickstream data. The utilization of dynamic intervention relates largely to hotel and resort traffic — as opposed to flight choices. Among the most valuable and interesting analysis models are those that look at past purchase behaviors of consumers and on that basis launch dynamic on-the-spot promotions.

Predicting when air fares will go up or down is an inherently difficult puzzle — particularly since several factors impact the outcome, including inventory-control recommendations from revenue management, response-to-competitor fare changes and promotional fares.

By capturing a customer's intent to travel as an extension to the customer profile, in a Big Data environment, it is possible to make individual targeted offers based on intent to travel. The intent to travel can be based on pre-defined criteria such as departure date (or range), departure time window, return time window, carrier(s) preference and budget. In addition, by capturing form of payment, if a customer opts in, instead of generating a real-time one-to-one offer, the best itinerary that fits the predefined criteria can be auto booked.

Moreover, real-time collection of flight delays at airports, user-generated content and sensor data about changing weather patterns can serve as significantly critical early warning signals that enable airline operations to minimize flight delays and cancellations. Proactively speeding up a delayed aircraft and delaying the departure of subsequent flight legs to preserve aircraft, crew and passenger connections can effectively minimize disruptions.

Challenges in Data Intensive Tourism

Big data provides new insights about customers' preferences and behavior. It also helps businesses to get a glance through customers' "minds" to offer them a customized experience. This makes travel more receptive and pleasant for the travelers because it is centered around their individual preferences. This vast amount of data also gives companies an opportunity to create better products and services that will help them to stay notches ahead in this competitive industry.

Hence, to a greater extent companies in the hospitality and tourism sector are looking to tap into the power of big data. Nevertheless, the implementation of big data is easier said than done because of the many technical aspects that come with it. The existing conventional databases and servers cannot handle these large amounts of data. Relational databases currently used by many tourism companies divide data into rows and columns, but since big data comes in many formats, the same strategies cannot be used. This demands companies to invest deeply in new generation processing tools, storage devices, servers and intelligent software to handle big data. The tourism sector also need a new technology environment covering of new kinds of databases, new programming languages and people with the skills to use them. These investments are necessary to make the best of big data.

Furthermore, the tourism companies have two kinds of big data on their hands – structured and unstructured. The structured data comes from websites, blogs and the property management software used in hotels. This data is easy to collect, but it accounts for only 25% of the total data. The remaining 75% is the unstructured data scattered around the internet. This data includes posts on Facebook, Twitter, user-generated content on Yelp, TripAdvisor and other forums, emails, photos, videos, testimonials and any content that affects the e-reputation of the company. Integrating this unstructured data and getting meaningful insight from this data is additional challenge facing tourism companies these days.

By and large, the tourism sector is commencing to handle with big data to harness the immense benefits that come from it. However, it also comes with many technical challenges that require substantial investments. The good news is that these benefits will offset the cost and will give more by way of revenue and brand building over the next few decades. For these reasons, it's vital for the tourism players to jump onto the big data carriage.

Conclusions

The Internet has changed our businesses tremendously - how we look, book, pay for and consume travel services. With that change has come entire new ways of tracking and measuring travellers' wants, behavior and needs. Thus, nowadays, suppliers are better able to understand their customers and competitors. In addition, these data are easier than ever to produce, capture, collect, analyze, integrate and use.

Big Data indicates a great opportunity for all travel and tourism entities. However, the opportunities attain hand-in-hand with the potential for important challenges - increased Competition, the need for new flows of Creativity and Content as well as the need to better understand and satisfy Customers.

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Bibliography

- 1) R. Akerkar, P. Lingras. Building an Intelligent Web: Theory & Practice, Jones & Bartlett Publishers (USA), ISBN 9780763741372, Sudbury, 2007.
- 2) Davenport TH and Harris JG. Competing on Analytics: The New Science of Winning. 2007, Cambridge, MA: Harvard Business School Press.
- 3) Baggio, R., & Klobas, J. E. (2011). Quantitative methods in tourism: A handbook. Bristol, UK: Channel View publications.