

Big Data Analytics for the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030

(Case study in Saudi Arabia environment)

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Abstract:

Big data is data that contains greater variety arriving in increasing volumes and with ever-higher velocity. This is known as the three Vs.

The current trends in data analytics have led to larger amounts of data collection and process resulting in Big Data. As data is being captured everywhere for each action done online or offline, an Analytics study has resulted. All systems start generating data, which can be combined to create a better picture and to observe the prospects of an individual. With the potential of Big Data to ascertain deeper insights into the scientific decision-making process,

Big Data Analytics can become part of the solutions to achieve for the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030, This paper reviews the state of Big Data Analytics, consider possible applications in the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030, and finally yet importantly, identify challenges and concerns about Big Data Analytics. This article found that Big Data Analytics presence in Saudi Arabia in the development of Hajj, Umrah and the visit still in its very early stages and there is much yet to be done to have the promised value of Big Data Analytics.

Key words: Big Data Analytics, development of Hajj, Umrah and the visit, Saudi Arabia.

1- Introduction:

According to Gartner's Big Data Definition [1], this definition reflects relativity of big data. this definition not just to set a common ground, but to point out where big data challenges and opportunities are.

"Big data" is high-volume, -velocity and -variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making [1].

To really understand big data, it's helpful to have some historical background. Here's Gartner's definition, circa 2001 [1]. (which is still the go-to definition): Big data is data that contains greater variety arriving in increasing volumes and with ever-higher velocity. This is known as the three Vs.

Put simply, big data is larger, more complex data sets, especially from new data sources. These data sets are so voluminous that traditional data processing software just can't manage them. But these massive volumes of data can be used to address business problems you wouldn't have been able to tackle before.

2- The Three V's of Big Data [2]

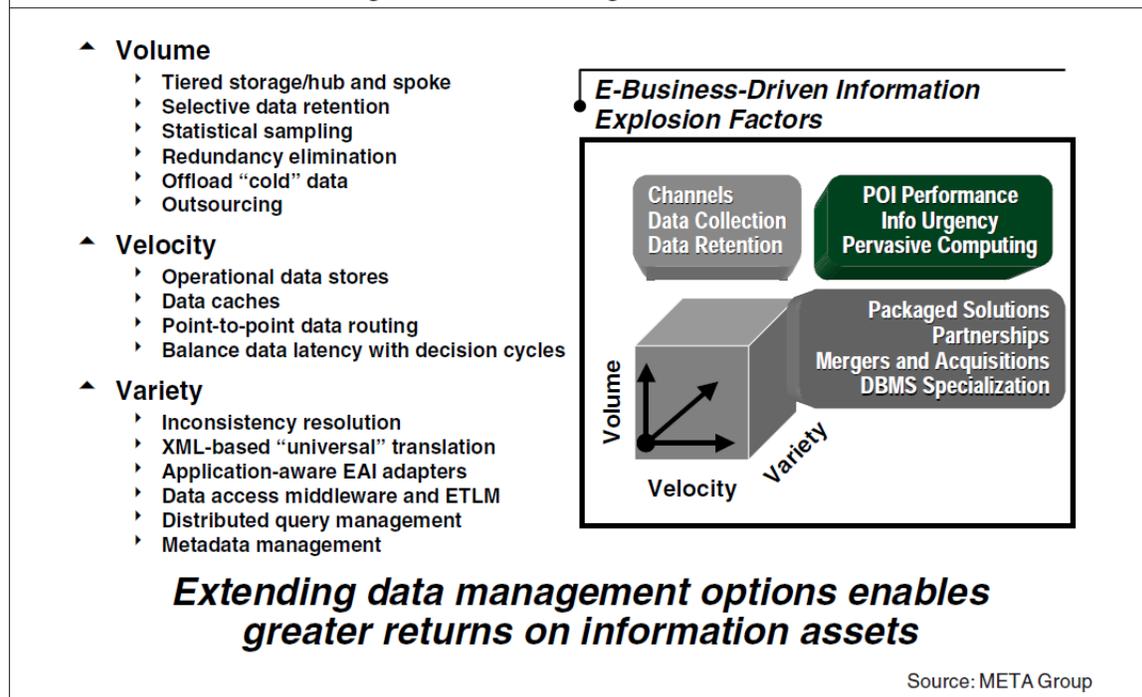
- 1. Volume :**The amount of data matters. With big data, you'll have to process high volumes of low-density, unstructured data. This can be data of unknown value, such as Twitter data feeds, clickstreams on a webpage or a mobile app, or sensor-enabled equipment. For some organizations, this might be tens of terabytes of data. For others, it may be hundreds of petabytes.
- 2. Velocity :**Velocity is the fast rate at which data is received and (perhaps) acted on. Normally, the highest velocity of data streams directly into memory versus being written to disk. Some internet-enabled smart products operate in real time or near real time and will require real-time evaluation and action.
- 3. Variety :**Variety refers to the many types of data that are available. Traditional data types were structured and fit neatly in a relational database. With the rise of big data, data comes in new unstructured data types.

Unstructured and semi-structured data types, such as text, audio, and video require additional preprocessing to derive meaning and support metadata.

Researchers, Big Data Trends, By Cynthia Harvey, Posted January 24, 2018 [3] say the adoption of big data technologies is unlikely to slow anytime soon. IDC predicts that the big data and business analytics market will increase from \$130.1 billion this year to more than \$203 billion in 2020. "The availability of data, a new generation of technology, and a cultural shift toward data-driven decision making continue to drive demand for big data and analytics technology and services," said Dan Vesset, group vice president, analytics and information management. "This market is forecast to grow 11.3 percent in 2016 after revenues reached \$122 billion worldwide in 2015 and is expected to continue at a compound annual growth rate (CAGR) of 11.7 percent through 2020."

While it's clear that the big data market will grow, how organizations will be using their big data is a little less clear. New big data technologies are entering the market, while use of some older technologies continues to grow.

Figure 1 — Data Management Solutions



3- Big Data Trends

Big Data Analytics (BDA) is increasingly becoming a trending practice that many organizations are adopting with the purpose of constructing valuable information from BD. The analytics process, including the deployment and use of BDA tools, is seen by organizations as a tool to improve operational efficiency though it has strategic potential, drive new revenue streams and gain competitive advantages over business rivals. However, there are different types of analytic applications to consider [4].

Therefore, prior to hasty use and buying costly BD tools, there is a need for organizations to first understand the BDA landscape especially in for the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030.

Big Data trends is like trying to monitor the daily shifts in the wind – the minute you sense a direction, it changes. Yet the following trends are clearly shaping Big Data going forward [3].

3-1 Big Data and Open Source

Open source applications [5] like Apache Hadoop, Spark and others have come to dominate the big data space, and that trend looks likely to continue. One survey [6] found that nearly 60 percent of enterprises expect to have Hadoop clusters running in production by the end of this year. And according to Forrester, [7] Hadoop usage is increasing 32.9 percent per year.

Experts say that in 2017, many enterprises will expand their use of Hadoop and NoSQL technologies, as well as looking for ways to speed up their big data processing. Many will be seeking technologies that allow them to access and respond to data in real time. “Hadoop is a high-profile example of an open source Big Data project.

3-2 In-Memory Technology

One of the technologies that companies are investigating to speed their big data processing is in-memory technology. In a traditional database, the data is stored in storage systems equipped with hard drives or solid-state drives (SSDs). In-memory technology stores the data in RAM instead, which is many, many times faster.

A report from Forrester Research [8] forecasts that in-memory data fabric will grow 29.2 percent per year. Several different vendors offer in-memory database technology, notably SAP [9], IBM [10], Pivotal [11].

3-3 Machine Learning

As big data analytics [12] capabilities have progressed, some enterprises have begun investing in machine learning (ML). Machine learning is a branch of artificial intelligence that focuses on allowing computers to learn new things without being explicitly programmed. In other words, it analyzes existing big data stores to come to conclusions which change how the application behaves.

According to Gartner [13] machine learning is one of the top 10 strategic technology trends for 2017. It noted that today's most advanced machine learning, and artificial intelligence systems are moving "beyond traditional rule-based algorithms to create systems that understand, learn, predict, adapt and potentially operate autonomously."

3-4 Predictive Analytics

Predictive analytics is closely related to machine learning; in fact, ML systems often provide the engines for predictive analytics software. In the early days of big data analytics, organizations were looking back at their data to see what happened and then later they started using their analytics tools [14] to investigate why those things happened. Predictive analytics goes one step further, using the big data analysis to predict what will happen in the future.

The number of organizations using predictive analytics today is surprisingly low—only 29 percent according to a 2016 survey from PwC [15]. However, numerous vendors have recently come out with predictive analytics tools, so that number could skyrocket in the coming years as businesses become more aware of this powerful tool.

3-5 Big Data Intelligent Apps

Another way that enterprises are using machine learning and AI technologies is to create intelligent apps. These applications often incorporate big data analytics, analyzing users' previous behaviors to provide personalization and better service.

One example that has become very familiar is the recommendation engines that now power many ecommerce and entertainment apps.

In its list of Top 10 Strategic Technology Trends for 2017 [16] , Gartner listed intelligent apps second. "Over the next 10 years, virtually every app, application and service will incorporate some level of AI," said David Cearley, vice president and Gartner Fellow. "This will form a long-term trend that will continually evolve and expand the application of AI and machine learning for apps and services."

3-6 Intelligent Security

Many enterprises are also incorporating big data analytics into their security strategy [17]. Organizations' security log data provides a treasure trove of information about past cyberattack attempts that organizations can use to predict, prevent and mitigate future attempts. As a result, some organizations are integrating their security information and event management (SIEM) software with big data platforms like Hadoop. Others are turning to security vendors whose products incorporate big data analytics capabilities.

3-7 IoT

The Internet of Things is also likely to have a sizable impact on big data. According to a September 2016 report from IDC, [18] "31.4 percent of organizations surveyed have launched IoT solutions, with an additional 43 percent looking to deploy in the next 12 months."

With all those new devices and applications coming online, organizations are going to experience even faster data growth than they have experienced in the past. Many will need new technologies and systems to be able to handle and make sense of the flood of big data coming from their IoT deployments.

3-8 Edge Computing

One new technology that could help companies deal with their IoT big data is edge computing. In edge computing, the big data analysis happens very close to the IoT devices and sensors instead of in a data center or the cloud. For enterprises, this offers some significant benefits.

They have less data flowing over their networks, which can improve performance and save on cloud computing costs. It allows organizations to delete IoT data that is only valuable for a limited amount of time, reducing storage and infrastructure costs. Edge computing can also speed up the analysis process, allowing decision makers to take action on insights faster than before.

3-9 High Salaries

For IT workers, the increase in big data analytics will likely mean high demand and high salaries for those with big data skills. According to IDC [19], "In the U.S. alone there will be 181,000 deep analytics roles in 2018 and five times that many positions requiring related skills in data management [20] and interpretation."

As a result of that scarcity, Robert Half Technology [21] predicts that average compensation for data scientists will increase 6.5 percent in 2017 and range from \$116,000 to \$163,500. Similarly, big data engineers should see pay increases of 5.8 percent with salaries ranging from \$135,000 to \$196,000 for next year.

3-10 Self-Service

As the cost of hiring big experts rises, many organizations are likely to be looking for tools that allow regular business professionals to meet their own big data analytics needs. IDC [19] has previously predicted "Visual data discovery tools will be growing 2.5 times faster than rest of the business intelligence (BI) market. By 2018, investing in this enabler of end-user self-service will become a requirement for all enterprises."

Several vendors have already launched big data analytics tools with "self-service" capabilities, and experts expect that trend to continue into 2017 and beyond. IT is likely to become less involved in the process as big data analytics becomes more integrated into the ways that people in all parts of the business do their jobs, especially in the area for the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030.

4- Big Data Use Cases

Big data can help you address a range of business activities, from customer experience to analytics, especially in for the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030. Here are just a few. (More use cases can be found at Oracle Big Data Solutions.) [22]

4-1 Product Development

Companies like Netflix and Procter & Gamble use big data to anticipate customer demand. They build predictive models for new products and services by classifying key attributes of past and current products or services and modeling the relationship between those attributes and the commercial success of the offerings. In addition, P&G uses data and analytics from focus groups, social media, test markets, and early store rollouts to plan, produce, and launch new products.

4-2 Predictive Maintenance

Factors that can predict mechanical failures may be deeply buried in structured data, such as the equipment year, make, and model of a machine, as well as in unstructured data that covers millions of log entries, sensor data, error messages, and engine temperature. By analyzing these indications of potential issues before the problems happen, organizations can deploy maintenance more cost effectively and maximize parts and equipment uptime.

4-3 Customer Experience

The race for customers is on. A clearer view of customer experience is more possible now than ever before. Big data enables you to gather data from social media, web visits, call logs, and other data sources to improve the interaction experience and maximize the value delivered. Start delivering personalized offers, reduce customer churn, and handle issues proactively.

4-4 Fraud and Compliance

When it comes to security, it's not just a few rogue hackers; you're up against entire expert teams. Security landscapes and compliance requirements are constantly evolving.

Big data helps you identify patterns in data that indicate fraud and aggregate large volumes of information to make regulatory reporting much faster.

4-5 Machine Learning

Machine learning is a hot topic right now. And data specifically big data is one of the reasons why. We are now able to teach machines instead of programming them. The availability of big data to train machine-learning models makes that happen.

4-6 Operational Efficiency

Operational efficiency may not always make the news, but it's an area in which big data is having the most impact. With big data, you can analyze and assess production, customer feedback and returns, and other factors to reduce outages and anticipate future demands. Big data can also be used to improve decision-making in line with current market demand.

4-7 Drive Innovation

Big data can help you innovate by studying interdependencies between humans, institutions, entities, and process and then determining new ways to use those insights. Use data insights to improve decisions about financial and planning considerations. Examine trends and what customers want to deliver new products and services. Implement dynamic pricing. There are endless possibilities.

5- Big Data Challenges

While big data holds a lot of promise for the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030, it is not without its challenges. [22]

- 1- big data is...big. Although new technologies have been developed for data storage, data volumes are doubling in size about every two years, especially data for the Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030, doubling these numbers and for sure doubling these data more than once. Organizations still struggle to keep pace with their data and find ways to effectively store it.

But it's not enough to just store the data. Data must be used to be valuable and that depends on curation. Clean data, or data that's relevant to the client and organized in a way that enables meaningful analysis, requires a lot of work. Data scientists spend 50 to 80 percent of their time curating and preparing data before it can actually be used.

- 2- big data technology is changing at a rapid pace. A few years ago, Apache Hadoop was the popular technology used to handle big data. Then Apache Spark was introduced in 2014. Today, a combination of the two frameworks appears to be the best approach. Keeping up with big data technology is an ongoing challenge.
- 3- The concept of big is problematic to pinpoint, not least because a dataset that appears to be massive today will almost surely appear small in the near future (MIT Technology Review, 2013)[23] . Adding to the complexity of the BD itself, some practitioners argue that massive datasets are not always complex and small data sets are always simple, thus highlighting that the intricacy of a dataset is a significant factor in determining whether it is big. In this section, the authors [4] provide some theoretical conceptions related to Q1 and Q2.

5-1 Big Data Challenges – related to Q1

Though the benefits of BD are factual and substantial, there remain a plethora of challenges that must be addressed to fully realize the potential of BD. Some of these challenges are a function of the characteristics of BD, some, by its existing analysis methods and models, and some, through the limitations of current data processing system (Jin, Wah, Cheng, & Wang, 2015) [24] Extant studies surrounding BD challenges have paid attention to the difficulties of understanding the notion of BD (Hargittai, 2015) [25] , decision-making of what data are generated and collected (Crawford, 2013) [26] , issues of privacy (Lazer et al., 2009) [27], and ethical considerations relevant to mining such data (Boyd & Crawford, 2012) [28] .

Tole (2013) [29] ,asserts that building a viable solution for large and multifaceted data is a challenge that businesses are constantly learning and then implementing new approaches. For example, one the biggest problems regarding BD is the infrastructure's high costs (Wang & Wiebe, 2014).[30] ,

Hardware equipment is very expensive even with the availability of cloud computing technologies.

Furthermore, to sort through data, so that valuable information can be constructed, human analysis is often required. While the computing technologies required to facilitate these data are keeping pace, the human expertise and talents business leaders require to leverage BD are lagging, this proves to be another big challenge. As reported by Akerkar (2014) [31] and Zicari (2014),[32] the broad challenges of BD can be grouped into three main categories, based on the data life cycle: data, process and management challenges:

Data challenges relate to the characteristics of the data itself (e.g. data volume, variety, velocity, veracity, volatility, quality, discovery, and dogmatism).

Process challenges are related to series of how techniques: how to capture data, how to integrate data, how to transform data, how to select the right model for analysis and how to provide the results.

Management challenges cover for example privacy, security, governance and ethical aspects.

Fig. 1 [33] shows the classification of BD challenges – as adapted from Akerkar (2014) and Zicari (2014). [31] [32] The SLR findings for Q1 are based on three categories of BD challenges.

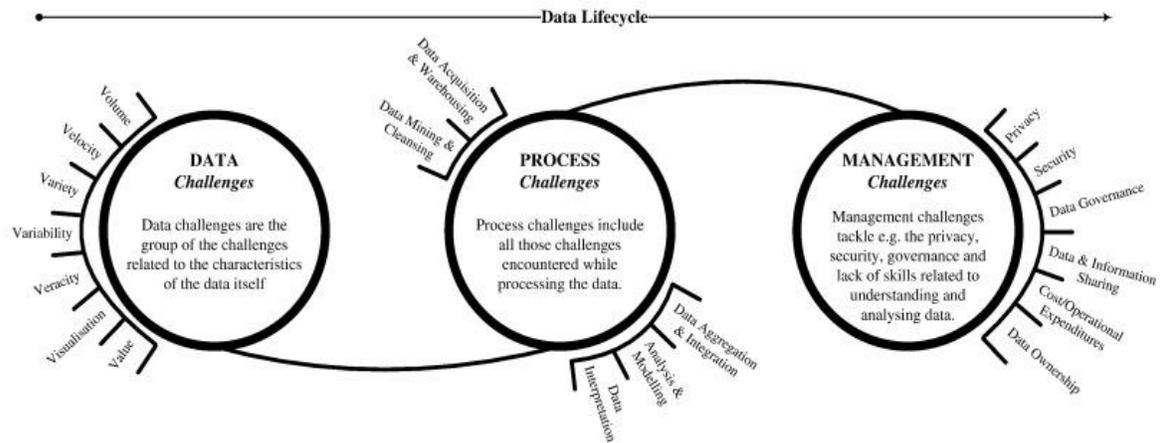


Fig. 1. Conceptual classification of BD challenges [46].

5-2 Big Data analytical methods – related to Q2

To facilitate evidence-based decision-making, organizations need efficient methods to process large volumes of assorted data into meaningful comprehensions (Gandomi&Haider, 2015). [34]The potentials of using BD are endless but restricted by the availability of technologies, tools and skills available for BDA.

According to Labrinidis and Jagadish (2012) [35], BDA refers to methods used to examine and attain intellect from the large datasets. Thus, BDA can be regarded as a sub-process in the whole process of *insight extraction* from BD. It is certain that for BD to realise its objectives and progress services in business environment, it requires the correct tools and approaches to be analyzed and classified effectively and proficiently (Al Nuaimi, Al Neyadi, Mohamed, & Al-Jaroodi, 2015) [36] . The potential value of BD is solved simply when leveraged to the drive decision-making process.

Extant research studies have demonstrated that substantial value and competitive advantage can be attained by businesses from taking effective decisions based on data (Davenport & Harris, 2007) [37] . But, BDA is more perplexing than merely tracing, classifying, comprehending, and quoting data.

Davenport and Dyché (2013) [38] emphasize that large organizations regularly gather BD and exploit analytics for support in decision-making as part of their usual procedures, and SMEs are the ones presently struggling to enhance top management decisions while adding more data for the analysis process. Aligning the people, technology, and organizational resources to become a data-driven company is problematic (Weill & Ross, 2009) [39].

Given BD can enhance the decision-making and increase organizational output; this is possible when a selection of analytical methods is used to extract sense from the data, such as:

descriptive analytics scrutinizes data and information to define the current state of a business situation in a way that developments, patterns and exceptions become evident, in the form of producing standard reports, ad hoc reports, and alerts (Joseph & Johnson, 2013)[40] ;

inquisitive analytics is about probing data to certify/reject business propositions, for example, analytical drill downs into data, statistical analysis, factor analysis (Bihani&Patil, 2014)[41];

predictive analytics is concerned with forecasting and statistical modelling to determine the future possibilities (Waller & Fawcett, 2013) [42];

prescriptive analytics is about optimization and randomized testing to assess how businesses enhance their service levels while decreasing the expenses (Joseph & Johnson, 2013) [43] ; and **pre-emptive analytics** is about having the capacity to take precautionary actions on events that may undesirably influence the organizational performance, for example, identifying the possible perils and recommending mitigating strategies far ahead in time (Szungott, Henne, & von Voigt, 2012) [44]. Advocates assert that these types of analytical methods support in improved decision-making and organizational performance by making everything more translucent and quantifiable, while further uncovering inconsistencies as well as potential concerns and opportunities.

Fig. 2 [45] illustrates the classification of BDA methods and the SLR findings for Q2 are based on these five categories.

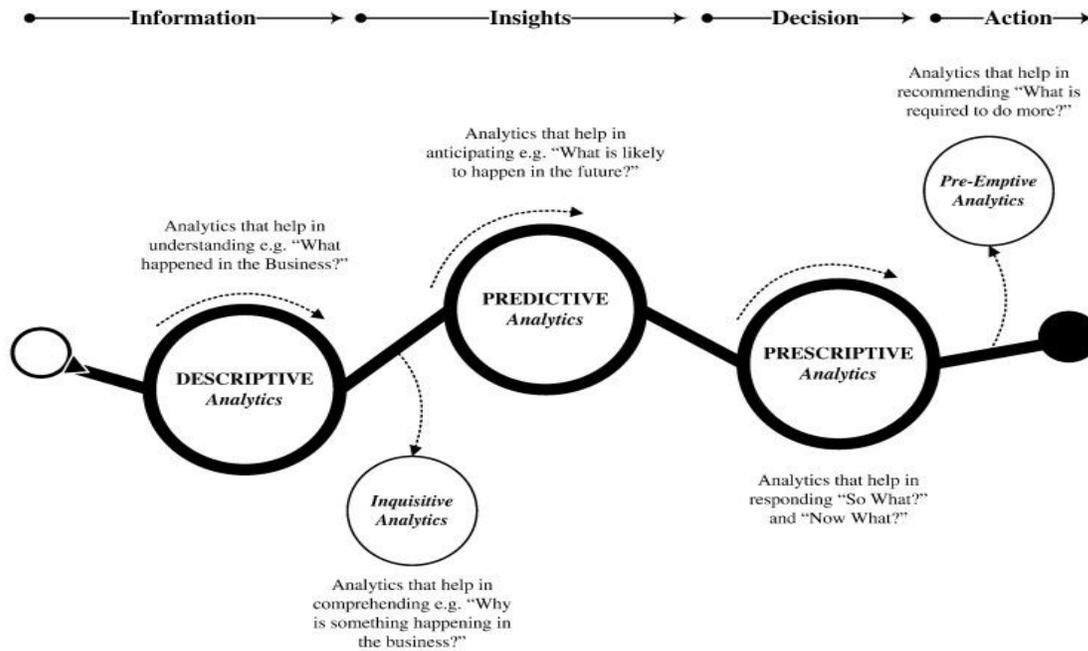


Fig. 2. Classification of types of big data analytical methods. [4]

6- Big Data Solutions in Saudi Arabia in the pursuit of the ambitious vision of the Kingdom in 2030

Today’s organizations are producing instillation of bytes of data from different sources every day. The different sources include mobile phones, Electronic devices, log files, networks, sensors & videos etc. Big data consulting services in Saudi Arabia are the use of advanced analytics tools & techniques against very large & diverse data sets in the form of different sizes from terabytes to Megabytes include structured, semi-structured & unstructured data [4].

Big data is very difficult to analyze process & visualize & it comes in high velocity, high volume & high variety. Big data is the game changer in a lot of industries but with the help of Big Data Consulting Services in Saudi Arabia it turns to the easier task. Analysis of the big data can help businesses inaccurate smart decision making, forecasting and enhanced customer experiences that accelerate business growth [46].

Alrasmyat Big data services & solutions in Saudi Arabia enables companies & organizations to implement big data services & solutions across industries, multiple domains & focus areas. Business Intelligence in Saudi Arabia helps clients to analyze their business-critical data & make better business decisions. Alrasmyat Big data services & solutions in Saudi Arabia can contribute significantly to the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030.

Big data consulting services use this approach to provide business decision outcomes & overcome business challenges faced by customers. 1. Discover 2. Design 3. Deliver

Discover: Understanding of client's business big data challenges & recommend them suitable approaches according to their business needs.

Design: Recommend suitable solutions based on big data technologies by developing proof of concept for them. Big data consulting services also recommend tools & frameworks to provide technology-based & tailor-made solutions.

Deliver: Big data consulting services work with client collaboratively to implement a big data solution (Architect, Design, develop, QA & deploy).

big data experts always help you navigating all stages of big data solution from start to end.

Alrasmyat OFFERINGS/SERVICES:

- 1-** Data Lakes 2- Stream Analytics 3-EDW Optimization

Data Lakes:

Alrasmyat Data lakes offer deals with define design & development steps of any size of data, speed & shape. Give abilities to big data experts, data scientists & developers to use the right tools for huge amount of data to find the insights from the data. Alrasmyat Data Lake offers including: Design the strategy & roadmap, Tool evaluation, Integration of data, access & services, and Constructing and go-live enablement

Stream Analytics:

Alrasmyat Stream Analytics Offer helps redefine the real-time processing. To get the insights from the data streams & Alrasmyat implements cutting-edge solutions that include:Analysis, Dashboards & alerting, Efficient, Scalable data processing & storage and Real-time Ingestionand we can take advantage of Alrasmyat Stream Analytics activities to the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030.

EDW Optimization:

Alrasmyat EDW optimization offer helps to design & architect of the data warehouse to face & tackle the growing huge volume of data (Big data) Integrating data from all sources and building the central repository to maintain data quality and giving you answers of all questions when users need it and we can take advantage of it to the development of Hajj, Umrah and the visit Data integration , Designing the ETL offload architecture, Data quality, Data Security & Governance and Discovering Insights/ Self-services BI Dashboards.

Alrasmyat Big Data Solutions in Saudi Arabia that we can take advantage of it to the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030.includes:Managed Big data Services, Data Analysis Platform, Hadoop as complete data warehouse solution, Data migration & integration services and Hadoop as Active Archive, Relation DB2 to MongoDB Migration

7- Using Hadoop and Spark as as Big Data Analytics to Enrich the HAJJ AND UMRAH Experiences and exploring religious pilgrimage as an engine of growth in KSA

Saudi Arabia has two of the holiest places in Islam – the Al-Masjid al-Haram in Mecca and the Al-Masjid an-Nabawi in Medina. The country thus plays a key role in providing access for pilgrimage and extending warm hospitality to all religious pilgrims. Given the central role of Islam and the aspects of Hajj and Umrah, Saudi Arabia has embarked on an ambitious plan to enrich the experience of Hajj and Umrah pilgrims as part of its Vision 2030 plan. Such a move can be considered the country's biggest step in diversifying its revenue base and reducing its dependence on oilrevenues [47].

Data from Saudi Arabia's General Authority of Statistics reveals that during the five-day Hajj period, over two million pilgrims from across the world come to the country annually. Umrah, being held for a longer season, accounts for a high number of pilgrims, with the larger share being from within the country. It has been noted that 8.3 million pilgrims spent SAR 83.6 billion (USD 22.3 billion) in 2016 alone and that expenditure from pilgrims is expected to expand in double digits between 2016 and 2021.

Following a period of sustained high oil prices from 2000 to 2013, the rapid decline in oil income since that time has highlighted the need of the kingdom to generate alternate stable sources of indigenous development. Tourism, specifically religious tourism, is expected to provide numerous benefits. In addition to generating substantial revenues, religious tourism will also provide a sustained boost for Saudization strategies – i.e. generating new employment opportunities for the young Saudi population in the service sector [47].

Currently, the economy is at a transition point. Significant labor reforms, modification of business regulations, restraint on indiscriminate fiscal expenditure, and controlling inflation through strong monetary policy intervention is required to put the economy on a path of balanced growth.

Boosting religious pilgrimage and inbound tourist flow is seen as one of the key solutions to fuel gross domestic product. This could be done with enough private and public investment in the accommodation segment, transportation segment, and construction segment. The report details how this could be achieved in line with the government's Vision 2030, thus ushering in prosperity for the economy and satisfaction for the pilgrims. Data from the Ministry of Hajj and Umrah reveals that Hajj and Umrah annually contribute ~50% of 20 million foreign tourists⁹, i.e. ~10 million. International pilgrims account for over 60% of total pilgrims who come to perform Hajj every year. The Ministry of Hajj and Umrah further reported that for Umrah, 6.7 million visas were issued in 2017 compared to 6.3 million in 2016, reflecting a year-on-year increase of 6%¹⁰. Umrah accounts for around 80-85%¹¹ of the total pilgrim base every year.

It has been estimated that Umrah, being held for a longer season, will contribute 88%¹² of all pilgrims by the year 2021, which will lead to a significant rise in hotel occupancy rates and room rents during the full season, rendering marginal costing benefits to hoteliers, especially the middle-price range hotels. There is a steady increase in spending during the pilgrimage; in 2016, around 8.3 million pilgrims spent SAR 85.1 billion (USD 22.7 billion)¹³. This is expected to grow at a CAGR of 11% between 2016 and 2021. Spending on Hajj and Umrah is projected to expand at a CAGR of 14.1% over 2016-2021 and reach SAR 166.1 billion (USD 44.3 billion) by 2021¹⁴.

In line with the objectives noted under Vision 2030, the country, however, plans to spend SAR 310.1 billion (USD 82.7 billion)¹⁵ on infrastructure projects over 2016-2021 to support the growth in pilgrimage spending. Total global spending on outbound tourism was SAR 5,051.2 billion (USD 1,347 billion) in 2015, of which Muslim spending on outbound tourism was SAR 566.2 billion (USD 151 billion)¹⁶. Besides the direct contribution to the GDP, travel, and tourism in Saudi Arabia is instrumental in providing job opportunities in the country.

In 2016, travel and tourism directly generated approximately 600,000 jobs accounting for 5.1%17 of the total employment generated in the country during that year.

we can Use Hadoop and Spark Big Data Analytics to Enrich the HAJJ AND UMRAH Experiences and exploring religious pilgrimage as an engine of growth in KSA, Spark has been found to run 100 times faster in-memory, and 10 times faster on disk. It's also been used to sort 100 TB of data 3 times faster than Hadoop MapReduce on one-tenth of the machines. Spark has particularly been found to be faster on machine learning applications, such as Naive Bayes and k-means. Spark performance, as measured by processing speed, has been found to be optimal over Hadoop, for several reasons: 1- Spark is not bound by input-output concerns every time it runs a selected part of a MapReduce task.

It's proven to be much faster for applications, 2- Spark's DAGs enable optimizations between steps. Hadoop doesn't have any cyclical connection between MapReduce steps, meaning no performance tuning can occur at that level. However, if Spark is running on YARN with other shared services, performance might degrade and cause RAM overhead memory leaks. For this reason, if a user has a use-case of batch processing, Hadoop has been found to be the more efficient system.

Hadoop uses Mahout for processing data. Mahout includes clustering, classification, and batch-based collaborative filtering, all of which run on top of MapReduce. This is being phased out in favor of Samsara, a Scala-backed DSL language that allows for in-memory and algebraic operations and allows users to write their own algorithms. Spark has a machine learning library, MLlib, in use for iterative machine learning applications in-memory. It's available in Java, Scala, Python, or R, and includes classification, and regression, as well as the ability to build machine-learning pipelines with hyperparameter tuning.

Conclusion

This paper reviews the state of Big Data Analytics, consider possible applications in the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030. This paper reviews the state of Big Data Analytics, consider possible applications in the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030, and identify challenges and concerns about Big Data Analytics. This article found that Big Data Analytics presence in Saudi Arabia in the development of Hajj, Umrah and the visit still in its very early stages and there is much yet to be done to have the promised value of Big Data Analytics.

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Big Data and Open Source applications like Apache Hadoop, Spark, and others have come to dominate the big data space, and that trend looks likely to continue. One survey found that nearly 60 percent of enterprises expect to have Hadoop clusters running in production by the end of this year. Hadoop usage is increasing by 32.9 percent per year. Experts say that in 2017, many enterprises will expand their use of Hadoop and NoSQL technologies, as well as looking for ways to speed up their big data processing. Many will be seeking technologies that allow them to access and respond to data in real time.

“Hadoop is a high-profile example of an open source Big Data project. Companies like Netflix and Procter & Gamble use big data to anticipate customer demand. They build predictive models for new products and services by classifying key attributes of past and current products or services and modeling the relationship between those attributes and the commercial success of the offerings. In addition, P&G uses data and analytics from focus groups, social media, test markets, and early store rollouts to plan, produce, and launch new products[47].

While big data holds a lot of promise for the development of Hajj, Umrah and the visit in the pursuit of the ambitious vision of the Kingdom in 2030.it is not without its challenges that we reviewed in detail in this paper. One of the most important Big Data Solutions in Saudi Arabia in the pursuit of the ambitious vision of the Kingdom in 2030, Big data consulting services in Saudi Arabia are the use of advanced analytics tools & techniques against very large & diverse data sets in the form of different sizes from terabytes to Megabytes include structured, semi-structured & unstructured data with all different sources for big data include mobile phones, Electronic devices, log files, networks, sensors & videos etc.

Data from the International Monetary Fund (IMF) reveals that the global Muslim population will grow by 24% between 2014 and 2030 to reach 2.218 billion by 2030. The growth is supported by an average GDP growth of 4.2%¹⁹ p.a. in Organization of Islamic Cooperation (OIC) economies. Performing pilgrimage at religious sites to fulfill promises made to Allah helps in fueling pilgrim spending year after year. This cyclical impact boosts revenues generated every year.

So, is it Hadoop or Spark? These systems are two of the most prominent distributed systems for processing data on the market today. Hadoop is used mainly for disk-heavy operations with the MapReduce paradigm, and Spark is a more flexible, but more costly in-memory processing architecture.

Both are Apache top-level projects, are often used together, and have similarities, but it's important to understand the features of each when deciding to implement them.

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