Big Data for Supply Chain Management: An Insight to the Analytical Aspects of Tableau & Power BI

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Abstract: *Today's world is the world of data inundated everywhere starting from a small purchase/procurement transaction to the big deal accolated with high commercial value. Supply chain professional are thinking, analysing, executing and creating strategies about how data are produced, organized and analysed. Now this has further motivated many organizations to adopt efficient data analytic strategies in order to enhance data quality, supply chain processes and finally efficient and productive results. Now, in this paper we will introduce the challenges in Big Data in Supply Chain Management and our need of various tools to cop-up with those challenges. Every tool has his own pros & cons, now because of rapidly growing industry and emerging markets, various tools for Data Collection, Data Cleaning, Data Mining, Data Integration, Data Analysis, and Data Visualization have been introduced. We will study the current need of those tools used in Data analytics & Big Data Management in Supply Chain Management and their pros and cons.*

Keywords: Big Data, Supply Chain Management, Datasets, Dashboard, DAX, Tableau, Power BI

1. Introduction

Now a day in the current rapidly growing environment, challenges & competition is changing from company to company, Industry to industry, to "Supply chain perspective". So scarcely it seems there is any necessity of supply chain optimization. And it became a crucial focus for the industry to be in the market and gain competitive advantage. Growing market standards and current need reveals the need to re-work on the supply chain strategy and process. To reduce the cost of operations through various strategies, using different tools & techniques became an important goal but on same side very challenging in the fast growing competitive market. One has to meet the consumer expectations, to win the competitive advantage and commercial benefits should not be diluted. Now to meet the specifications, expectations, and to attract consumer inclination – one has to make their process much more efficient and strategic.

It has been observed that companies or organizations which are not leveraging their reach towards most advance data analytics tools and technology are falling down gradually. Since data analytics tools capture the data that automatically collect, clean, and analyse it, which further used to deliver information and predictions, we can improve prediction accuracy and refine the models.

Every tool has his own pros - & cons – due to which its use and capabilities are extended. We will study those capabilities and limitations to the factors which are out of the boundary for a specific tool.

2. Big Data

The term Big Data was first introduced by two NASA scientists in the year 1997. They were referring to the data visualization challenge they faced due to quite huge data. Since then researchers, scholars, specialists & experts became interested in the related field or area. Indeed, Big Data has a vital and positive role in all different domains. It

helps in refurbishing supply chain; optimising real time path to make operations more efficient; to reduce operational and transportation cost; minimising financial risk and enhancing the efficiency of many procedures and technique related to health industry; and consequently increasing customer loyalty towards a specific brand.

Now a day, Big Data term is used to refer the use of predictive analysis, behaviour analytics, data visualization analysis and certainly many other advance data analytical method that extracts the value from data for various decision making. There is no doubt that now a day, quantity of data is not too large. In manufacturing, servicing, consulting, monitoring and other industries are generating data sets in bulk.

Big Data originally describe extensive and huge heterogeneous data values in the digitized, networked, sensor-laden, technology engraved, information driven and managed systems. Big Data covers 5 V's as Volume, Velocity, Variety, Veracity and Value. And that's why it is called as 5 V's model.

Big Data probably is going to be an advantage for the coming years and next generations. One of well known, research firm Gartner predicts IoT will generate $300 - $500 billion of revenue by 2020. Around 4 billion people will be connected by any means by 2020. And around 50-70 trillion GB's of data will be there in circulation.

3. Application in SCM

Industry is trying their best to turn out the big chunk of data into competitive advantage to make their best decision making. Forecasting of market demand, consumer orientation, and deep-seated customization of services. This section very generally explain the intention to extend the assistance to professionals or practitioners to make them understand where they could start to integrate Big Data Analytics (BDA) across their supply chains.

Now, as Big Data is important in terms of Supply Chain, so to summarize –

Planification: Big Data management reduce the risk which may arise due to lack of available facts.

Table 1: 5 V's of Big Data & SCM

	Big Data	SCM
Volume	It refers to the vast amount of data generated by various sources	Enormous amount of data is generated through supply chain process
Velocity	Data produced by various mediums in a real time environment	Speed of Data collection, transfer, reliability of data, efficiency of data storage
Variety	Multiple data sets – unstructured, structured, semi- structured	Vast form of data in many varieties from diverse sources
Veracity	Refers to the trustworthiness of data	Process to verify and quality of data
Value	Subjected aspect	Impacts on the business process

Supplying: Big Data is revolutionizing supply chain networks from creation, growth, implementation to proliferation into new markets opportunities. Big Data delivers enough facts and figures that make supply chain more efficient and feasible as compared to previously untapped data. Combined effect can be easily seen.

Production: Analytical techniques enables to optimize production and manufacturing processes, logistics, operations. Which further allow companies to produce products in a more competent way to reduce the defects in ppm and further increasing the quality.

Distribution: Big Data analytics can be used to demand changes prediction and projections and accordingly supply chain is matched. It can surely help to integrate manufacturing, logistics, transportation, retail, maintenance, and service.

Reception: use of big data analytics enables to know customer's growing demands, perception and behaviour towards the offered products and services. It also help in analysing and discovering such characteristics to understand the market inclination and demand which were not observable previously.

4. Insight To Various Tools Used in Big Data Analytics

In the above sections we gave a brief insights of Big Data, SCM, Data Applications etc. In this section we will study the operational mechanism of various tools like Tableau, Power BI etc. We will drill down the analytical functionality of these tools and how they are relevant in terms of Big Data analytics.

Every tool has his own operational highlights. Depending upon the use and need of current requirement we need functionalities which could accomplish the objectives. And if after a period of time, any tool is not capable to do so, we need to upgrade the existing tool or replace it with the new

tool. In this section we are going to confine out research towards the two most accepted tool i.e. Microsoft Power BI & Tableau Software.

Microsoft Power BI
There are three major building blocks of Power BI which are: data sets, reports, dashboards. We cannot devour dashboards or any related report to be published withoutany data.

Datasets - A set of data that we import is collectively called as Dataset. Power BI make it much more feasible to connect to or to bring sorted form of datasets and keep all of it at one specific place. Which are listed under Datasets heading. And each dataset representing a single source of data, which could be from excel, drive, sales force, workbook. Single dataset can be used multiple times in different form of reports in Data visualization.

Figure 4a

Reports - We can have visualized report in Power BI in one or more pages and forms viz graphs, charts like pie chart, line chart, tree map, bar chart, and many more graphical views. We call these visualizations as *visuals.* These reports come from single or multi datasets and can be created when we connect to the datasets from different sources like excel which contain power view sheets, database, SAAS applications in two views *readable & editable view modes.*

Dashboards - a panel in the form of single canvas that contains tiles and widgets, which can be created and shared with others. Each widget or tile single visualization which is created from single dataset. Dashboards are the customized view of the subsets of the underlying datasets, as shown in figure 4a. If we have the access to the dashboard, we have the access to the dataset(s) as well. We can create a blank dashboard and import datasets or data from our colleague. If we gain any access to the dashboard then it does not mean that we have created that dashboard.

Dashboard that which we own will be shown under dashboard heading.

Tableau Software
A new generation of business intelligence software puts data into the hands of the people who need it. Slow, rigid systems are no longer good enough for business users. Competitive market and new sources of data again and again are creating new requirements. Users are demanding the ability to answer their questions quickly and easily. And that's a good thing. Tableau Software was founded on the idea that data

analysis and subsequent reports should not be isolated activities but should be integrated into a single visual analysis process—one that lets users quickly see patterns in their data and shift views on the fly to follow their train of thought. Tableau combines data exploration and data visualization in an easy-to-use application that anyone can learn quickly. Anyone comfortable with Excel can create rich, interactive analyses and powerful dashboards and then share them securely across the enterprise. IT teams can manage data and metadata centrally, control permissions and scale up to enterprise-wide deployments[1].

This flexibility helps IT organizations get out of the reporting backlogs and empower the business users to be self-reliant. But this flexibility doesn't come at the expense of IT. In fact, it's the opposite. IT can deliver this service in a scalable, secure, and easy-to manage system which meets the Service Level Agreement of the organization.
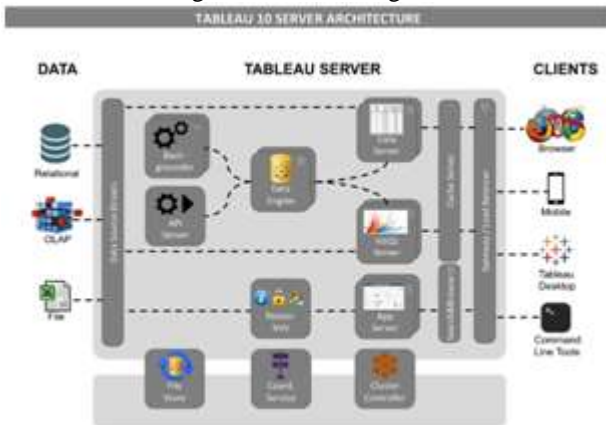

Tableau Server has very vastly scalable having n-tier client - server architecture that can assists mobile clients, web clients, and desktop-installed software. Primarily Tableau Solution has two major components – Tableau Desktop &Server.

Tableau Server is an enterprise class data analytical toll used for various business analytical decisions that can scale up-to more than hundreds and thousands of users. It offers powerful mobile and browser based analysis and works with existing data architecture, lifecycle management, security and governance constraints.

One of the basic and important characteristic of Tableau is that it can support any data architecture. Tableau can work for un-organized data as well it does not require data should be stored in any one system or any one owned space. Most of the organizations have assorted form of data from environment or in the clouds. Excel sheets are much more used in that space. It is not mandatory to capture all the data in the memory. Tableau allows us to use the database for any analytical results.

Any data analytical tool is expected to perform few basic operations and few other advance functional tasks. Few of them important ones includes – Data Visualization should be in scope and scope should be wider enough; tool should be simpler enough to deliver the easy results; Trends & Forecasting; categorical comparison; usable in both online & off-line mode; Story telling &Data narration; Cross-advocacy etc. We will discuss all above major operations in

details and will look which tool can accommodate them and why?

Power BI & Tableau are both interactive data visualization tools focussed on Business Intelligence. Both have their own pros- and cons- if compared to each other. Like – Tableau has a mapping functionality with the feature to plot latitude and longitude. It has various ways to access their products viz Online, Off-line, Server, Reader, and Public. Few analysts pointed out here that - view here is the in Power BI outliers are missing in various form of charts i.e. scattered charts or Plot charts. Although, it is not so severe for Power BI but with the series of many updated of the software this has been addressed already. In the latest (June'17) Power BI update high density sampling algo which is used for further reporting and charting (Area Charts, Pie Charts). The new algorithm will perceive the data in a much better way as compared to earlier one and with surface outliers. Tableau is capable enough to adore this functionality.

DAX – stands for Data Analysis Expressions, it is a library that contains functions & operators constitutes to build formulas and expressions in SQL Server Analysis Services and Power BI. Now, here important Question is – Do one need to learn DAX thoroughly to make common calculations to answer simple and easy questions? To counter that ithas been observed, quick calculations are crucial in most of the BI tools. But Microsoft recently released "Quick Measures" to perform common and powerful calculations in an easier way. Quick Measures runs a specific set of commands based on the input provided in a dialog box. After April'17 release range of common calculations can be performed without cramming DAX commands.

An important feature of any BI tool is its trend line capability with forecasting Power BI R custom visual option. Firstly we need to install R engine to use R visuals. In the previous version of Power BI (before June'17), we could implement trend lines. But after the inclusion of the new version Microsoft has made significant changes and improvement. Then we can draw / create dynamic reference lines& forecasting through this. Supported reference lines are - X & Y Axis contact line, Minima line,

Maxima line, Avg Line, Median line & Percentile line.

Next, fall short was related to categorical comparison. In Power BI user can view one category at one time. After June release as discussed earlier as well, Microsoft added new Data Bars, which can make comparison between the categories in a new tabular format in a much better way.

Tableau is much more capable to download dashboard instantly, and can publish back to web after editing and making changes. But contrary, we can only do basic editing and download feature too not available in Power BI. In the previous versions it was not available but might.

In the current scenario Power BI tool falls short in Story telling feature. "Dashboards show us data at a high level, but they should also tell a story. Power BI does not provide any such feature which can provide the data in a narrative information, leaving you with the too many annotations and labels. In Tableau, Story points help you compile a seamless, interactive narrative to wow your team. Story Points, a Tableau feature, will help to tell data story in a beautiful, interactive narrative manner.

Cross questions are very common in any analytics. User wanted to test every, if and else conditions to analyse the situation from different angles. And for that user often require to input different values of the data sets. What if quota was 108 instead of 82? But we cannot have this piece of work in Power BI. So "What-ifs" are not entertained in Power BI tool. On the counterpart Tableau allow easy input of data to address such "What-ifs"

5. Limitations

Tableau
Cost - If we compare with other analytical tools merchants, tableau has offered efficient licensing opportunities. But in trial or free versions of tableau functionality is very limited. And to access complete functional viable version ones need to purchase license costing around $ 1500 appx. Per year per person. Which is certainly higher side.

Database Resource - Data can be easily analysed with lot many viewable options if our data lies in excel or csv files. But if we need to fetch the data from the database to proceed with our analytics we need to have strong command over sql or other query language. And for that we need to have one expert of the same field who is well versed with database knowledge to create the database to begin with.

*Change Management –*With Tableau there is no pulling back option available with. Once the reports are published on to the server irrespective of whatever the version is. Previous versions cannot be pulled back.

*Risk, Governance, Security –*Tableau is enabled with row-level security functional features. Before setting up this security, tableau needs database user account for each user. It means every row-level security needs database user account. Now, more the database user accounts more would be the potential risks for hackers to access the insights

*Report Notification –*Traditional production reporting is not featured in tableau. As we cannot see static data tables, layouts & other related features that includes data distribution, notification of reports, scheduling. Although tableau is good in data visualization but still it is not ahead of BI for many companies working a lot over the data.

Power BI
*CRM Reports –*Power BI is capable enough to extract CRM data which can further feed into data model. But supporting options or functionalities are not available through which user can view CRM reports or dashboards. To view such reports or dashboard, one need to access another application which is obstruction to its usability.

*Aggregate View –*Power BI reports / dashboard are not supportive for other entity parameters or dashboards like user accounts. And it is not possible to create dashboard entity specific for accounts, case or any other entity. So we can say here is Power BI has restricted view to accumulated entities.

*Real-time connections –*There are fewer data resources which can have real time connections to Power BI reports. And these connections limits the access of power bi to single data sources.

*Datasets –*Power BI can only include data from single data source only, although it can have multiple data types but not multiple data sets.

*Size –*Power BI does not support or accept higher file sizes. It can support pbix file format which is the reduced or compressed from of zipped files. But size cannot be higher than 300MB.

Power BI reports can only be shared with users having their email addressed with similar domains.
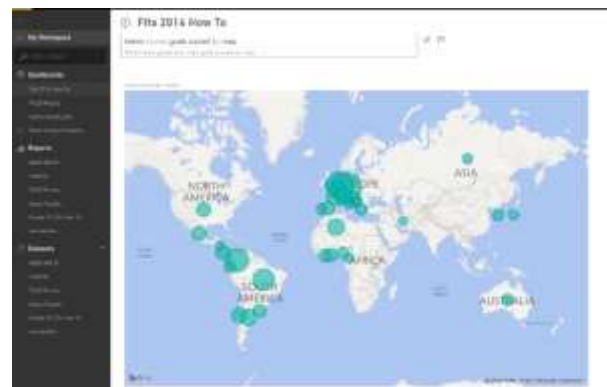
6. Conclusion

Tableau Server provided a robust, redundant, infrastructure, through which we can meets all our requirements whether security, scalability, architectural requirements of administrators or stakeholders. It offers options to widen the scope and gauge up to the largest business requirements. It can support any data architecture and decision making is much better due to the live connection with many other scalable databases.

Tableau provides organizations what they need today to compete the market demands and to gain competitive advantage.

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