Big Data Analytic and Visualization On Mobile Devices

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***Abstract*—**

This paper presents an Android Application that can be used by the higher level management, staff, salesman etc in their mobile phones and tablets. It gives the organization an analytical view in the form of Charts (Area Chart, Bar Chart, D3 Chart, Google Maps etc.). These applications help various organizations like Insurance, Manufacturing Companies, Banking in Decision-making, Developing new strategies of their organization. Business Intelligence is one of the areas that have the most benefit to offer a company that embraces mobile analytics for their staff. Business Intelligence solutions can be used to measure a range of key business metrics, from sales revenue, product sales and departmental costs and supply chain metrics. Earlier huge amount of data is available in the form of the excel sheets, which is too much complicated and time consuming in order to take decisions by the organization. Data Visualization for business intelligence displays a graphical view of all the data.

Keywords*— *Data Visualisation, Big Data, Business Intelligence, Android, Smartphone and Tablets.

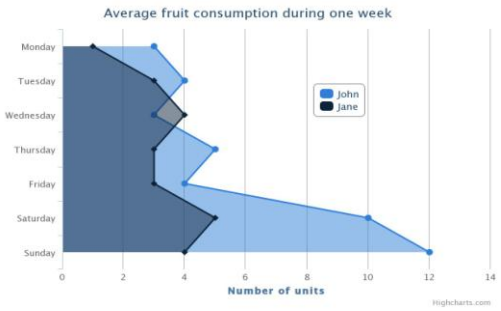
I. INTRODUCTION

Mobile devices are rapidly gaining popularity due to their small size and their wide range of functionality. With the constant improvement in wireless network access, they are an attractive option not only for day to day use, but also for in-field analytics by first responders in wide spread areas. However, their limited processing, display, graphics and power resources pose a major challenge in developing effective applications. Nevertheless, they are vital for rapid decision making in emergencies when combined with appropriate analysis tools. Big Data is a term applied to data sets whose size is beyond the ability of traditional software technologies to capture, store, manage and process within a tolerable elapsed time. The popular assumption around Big Data analytics is that it requires internet scale scalability: over hundreds of compute nodes with attached storage. Data visualization is the study of the visual representation of data, meaning "the information or data which has been abstracted in some schematic form". The graphical or visual representation of huge amount of data refers to data visualization. The main goal of data visualization is to communicate information clearly and effect-ively through graphical means that allows the higher level manage-ment to insight the business and help them in decision making. Mobile Business Intelligence (Mobile BI or Mobile Intelligence) is defined as "The capability that enables the mobile workforce to gain business insights through information analysis using applications optimized for mobile devices". Mobile business intelligence is soft- ware that extends desktop business intelligence applications so they can be used on a mobile device. In other words we can say that Mobile Business Intelligence is the ability to provide business and data analytics services to mobile device.

Big Data analytics refers to tools and methodologies that aim to transform massive quantities of raw data into "data about the data"—for analytical purposes. They typically rely on powerful algorithms that are able to detect patterns, trends, and correlations over various time horizons in the data, but also on advanced visualization techniques as "*sense-making tools.*"

"Big Data is the new definitive source of competitive advantage across all industries," writes Jeff Kelly [1] , Wikibon's Big Data analyst and lead author of the report. "For those organizations that understand and embrace the new reality of Big Data, the possibilities for new innovation, improved agility, and increased profitability are nearly endless."

Area Chart: The area chart displays graphically quantities data. It is based on the line chart. The area between axis and line are commonly emphasized with colours, textures and hatchings.



Pie Chart: A pie chart (or a circle graph) is a circular chart divided into sectors, illustrating numerical proportion. In a pie chart, the arc length of each sector (and consequently its central angle and area), is proportional to the quantity it represents.

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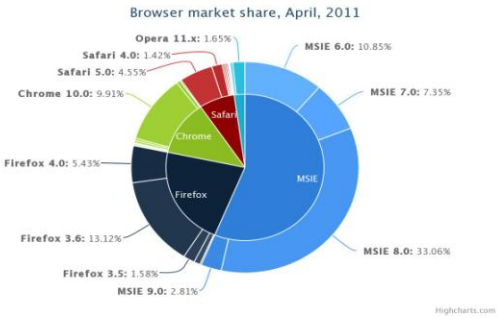
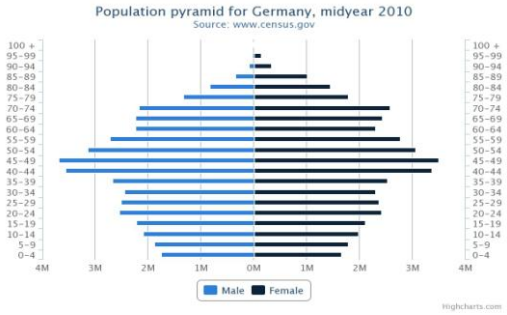
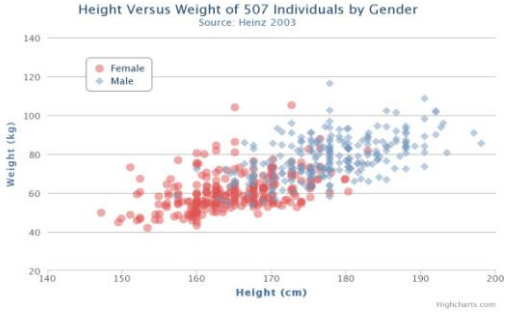


Line Chart: A line chart or line graph is a type of chart which displays information as a series of data points connected by straight line segments. It is a basic type of chart common in many fields.

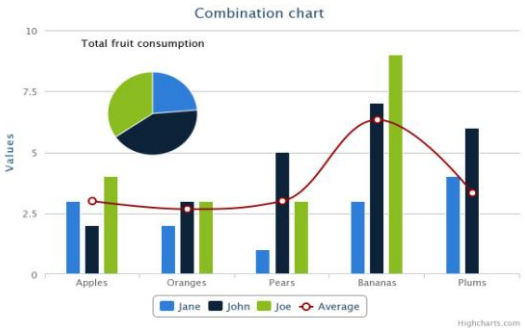
Bar Chart: A bar chart or bar graph is a chart with rectangular bars with lengths proportional to the values that they represent. The bars can be plotted vertically or horizontally. A vertical bar chart is sometimes called a column bar chart.



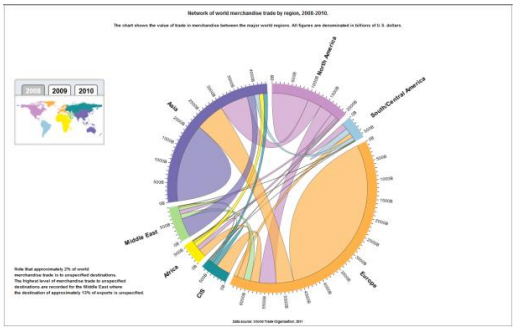
Scatter and Bubble Chart: A bubble chart is a type of chart that displays three dimensions of data. Bubble charts can be considered a variation of the scatter plot, in which the data points are replaced with bubbles. The data is displayed as a collection of points, each having the value of one variable determining the position on the horizontal axis and the value of the other variable determining the position on the vertical axis.



Combination Chart: The combination chart is a data visualization that combines the features of the pie chart, bar chart and the line chart. The combination chart displays the data using a number of pie bars and lines, each of which represent a particular category.



D3 Chart: D3 stands for Data-Driven Documents, which is a JavaScript library to display data in dynamic graphical form. In other words we can say that it is a tool for data visualization.



Google Maps: Google Maps is an application that was released by Google. In Google Map Application the web view display the Google map. To use Google Maps you need to create a valid Google Maps API key. A heat map in Google Map is a graphical representation of data where the individual values contained in a matrix are represented as colours.

II. SCOPE OF PROJECT

The strength and scope of "data visualization" is immense. The information presentation is categorized primarily into two main parts – statistical graphics, and thematic cartography. In relation to the scope, different approaches are used such as:

Mindmaps – A mind map is a diagram used to visually outline information. This tool is used in the generation and visualization of data and introduction of ideas that is used for observing and organizing data, making decision, team building, sales, marketing etc.Major categories radiate from a central node, and lesser categories are sub-branches of larger branches. Categories can represent words, ideas, tasks, or other items related to a central key word or idea.

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Visual Information **–** The visual information is presented on current event through tree map, broadcast, and internet. This is mostly used by media companies for news.

Data Visualization **–** The graphical or visual representation of huge amount of data refers to data visualization. The main goal of data visualization is to communicate information clearly and effectively through graphical means that allows the higher level management to insight the business and help them in decision making.

Displaying connections **-**It links the connection between factors like sales, marketing, and profit all in relationship to each other.

III. IMPLIMENTATION IN OUR PROJECT

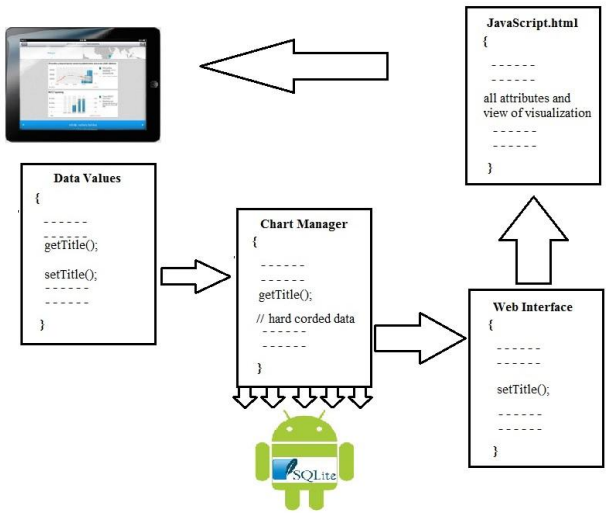

Chart Manager is a component that fetch the data from the database and also populates this data into Data Valurs component and then pass this data to Web interface. Chart Manager is responsible for managing all the data for visualization.

Web Interface component is responsible for passing the data to the html file. This component also converts the array of long integer into a single into a single string known as json string.

JavasScript is a html file which contains all the attributes like alignment, size, color and view for visualization

The device shown in the picture is mobile device or Tablet for the end user. It displays the data as visualization.

IV. APPLICATIONS

1> ***Reporting Applications*** **-** Reporting Applications are everywhere. They report anything from system performance to quarterly sales. Data visualization is as important to reporting solutions as the back-end server would be. Right from plotting System Throughput in a System Performance Report to the Sales v Revenue figures in a Sales Report, charts and graphs help condense heaps of data into easy digestible information.

2> Network Monitoring Applications **-** Whenever we are talking networks, we are talking about a massive number of log files, typically in the high thousands. Managing that high a number of log files is well....tough. But using data visualization, a network guy can get the overall picture at once & know what's right and what's not. Network monitoring applications help in discovering, communicating & strategizing logs and make extensive use of data visualization for it. Imagine when your Network Administrator sends nothing but a bunch of log files to the management - they will be left clueless until they see it in the form of charts.

3> Executive Dashboards & Business Monitoring **-** The bigger an organization grows, the more they need to monitor it. This is done by seeing a snapshot of the performance of the organization, and the various departments therein which is what a dashboard is all about. This helps in identifying the negative trends and weeding them out and also identifying where growth has been achieved. Creating BI dashboards like calculating Return on Investment (ROI) or displaying various Key Performance Indicators (KPIs) is pretty much indispensable to most of the medium and large-sized organizations.

4> Surveys & Polls **-** "2-way communication" is the buzzword of the web. And surveys and polls are at the heart of it. Data visualization is used extensively for presenting statistics of market research & analysis of survey data, as it helps in getting an insight into the same quickly and coming out with solid conclusions.

5> Interactive Maps **-** Visualization of data in the form of interactive maps is important in specific websites & applications which involve location-based decision-making. "Sales by Region" and "Airline Routes" maps are pretty commonplace nowadays. One of the best applications of integrating data with interactive maps is "Geo Targeted Advertising" or "Local Business Ads" on Google Maps .Google serves ads based upon latitude and longitude coordinates as specified by the advertiser.

6> Scientific Research **-** For scientific experiments, specialized graphs are needed to be used for analysis & interpretation of scientific data. It is mostly used in architectural, meteorological, medical, biological systems for visualization of three dimensional phenomena. In meteorological and medical systems, the graphs often need to be able to stream data continuously from a server, to keep them "up-to-second".

7> PowerPoint Presentations **-** Powerpoint Presentations essentially need to look good, but not with data being presented in boring tables. That's where 3D and other fancy data visualization comes in. Balancing aesthetics with functionality is a very critical part of using data visualizations in presentations.

8> Generic Uses **-** General charts like bar, pie & line are used by pretty much anyone and everyone. While teenagers might use to them to plot their weight loss chart, executives may use it to Annual Sales Chart for boardroom discussions.

V. BENEFITS OF BIG DATA ANALYTIC AND VISUALIZATION ON MOBILE DEVICES

The mobile applications have become more prevalent across a number of vertical markets. The drivers and patterns of mobile application adoption vary across industries, but a common framework has begun to take shape that explains these activities. Put simply, organizations have started to apply mobile technology to those processes where the integration of real-time information can drastically improve process quality. Although the definition of process quality varies by industry, some general characteristics include the following:

A. ***Better decisions:*** To many field employees, the value of information is situational having the right materials in front of a

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sales prospect, knowing what parts will be needed to fix a remote problem, figuring out which products to cross sell based on what the customer is using.

B. ***Faster decisions:*** Not having information in the field can impede responsiveness to customer needs. Insurance adjusters can't adjudicate claims in the field, brokers can't provide "instant" price quotes based on credit scores, and financial planners can't view a customer's portfolio in real time.

C. ***Shortened cycles:*** Bridging the gap between the field and the office can shorten core process cycles. Remote reporting of retail inventory can shorten replenishment, the ability to customize contracts in the field can shorten the sales cycle, and the ability to track logistics in real time enables manufacturers to shift their production plans more quickly.

VI. CHALLENGES

Screen size - Devices on which the mobile applications display and receive data usually have small screens and keyboards. So, developers must pay special attention to usability—for example, offering one-touch navigation and removing certain features and facilities to display data sensibly. Interface design should also consider options such as voice activation, touch-sensitive screens, innovative menus and styluses, and handwriting and gesture recognition. Mobile applications must be designed to suit a variety of handsets, which operate on different platforms and with different interfacing capabilities. The same application must work on multiple mobile devices with varying presentation formats, so we must consider device features and their operating platforms. Clever use of small battery power to extend the duration of device operation before recharging also poses challenges. The physical size of the screen, measured across the screen's diagonal. Android groups all screen sizes into four standard sizes: small, normal, large, and extra large.

Screen density-The quantity of pixels within a physical area of the screen; usually referred to as dpi (dots per inch). For example, a "low" density screen has fewer pixels within a given physical area, compared to a "normal" or "high" density screen. For simplicity, Android groups all actual screen densities into four generalized densities: low, medium, high, and extra high.

Orientation- The orientation of the screen from the user's point of view. This is either landscape or portrait, meaning that the screen's aspect ratio is either wide or tall, respectively. Be aware that not only do different devices operate in different orientations by default, but the orientation can change at run time when the user rotates the device.

User Location, Usage, and Content- Mobile devices are more personal than desktop computers, and a growing number of people are now "living" with their mobile devices. The related applications require personalization because different mobile users like to receive information or alerts (or respond to them) in different ways, according to personal preferences and depending on the type of device being used. Mobile applications should also adapt to the user's dynamic profile as his or her location—and the context of requested information—changes. For instance, we should consider parameters such as location, time of use, current task, and history of use in providing relevant information and functionality.

Dynamic Communication and Networks- Mobile application development must consider the bandwidth of mobile communication networks and the potential for interruptions in communication. Similarly, the security of wireless communication across various tiers of mobile networks and satisfactory completion of a transaction despite any breakdown in communication must be addressed.

Resolution- The total number of physical pixels on a screen. When adding support for multiple screens, applications do not work directly with resolution; applications should be concerned only with screen size and density, as specified by the generalized size and density groups.

Density-independent pixel (dp) - A virtual pixel unit that you should use when defining UI layout, to express layout dimensions or position in a density-independent way. The density-independent pixel is equivalent to one physical pixel on a 160 dpi screen, which is the baseline density assumed by the system for a "medium" density screen. At runtime, the system transparently handles any scaling of the dp units, as necessary, based on the actual density of the screen in use. The conversion of dp units to screen pixels is simple: px = dp * (dpi / 160). For example, on a 240 dpi screen, 1 dp equals 1.5 physical pixels. You should always use dp units when defining your application's UI, to ensure proper display of your UI on screens with different densities.

VII. CONCLUSION

Data Visualization allows designers to present a large amount of information using abstract representations. The mobile applications have become more prevalent across a number of vertical markets. Mobile application plays an important role in maintaining business and future development of the company. Large amount of data can be displayed on mobile devices using various techniques. It over shadow the various problems like no need to open laptops, no need to maintain large excel sheets. It also helps the sale person to track their tasks.

Rendering graphics on handheld devices is still considered a formidable task. In this paper we presented a solution for Big Data Analytic and Visualization on Mobile Devices and we showed that interactive frame rates can be achieved with large amount of displayed data.

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