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Role of big data in decision making

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Abstract: *Information systems coupled with internet, cloud computing, mobile devices and Internet of Things have led to massive volumes of data, commonly referred as big data. It includes mix of structured, semi-structured and unstructured real-time data, constituting of data warehouse, OLAP, ETL and information. Business firms and academicians have designed unique ways of tapping value from big data. There is a great scope of using large datasets as an additional input for making decisions. The aim of the paper is to explore the role of big data in these areas for making better decisions. Here we explore how big data can be used to make smart and real-time decisions for improving business results. The paper undergoes literature review and secondary data to provide a conceptual overview of potential opportunities of big data in decision making. The paper discusses the concept of big data, its role in decision making and also the competitive advantage of big data for different firms. The paper also discusses aframework for managing data in decision making. The topic must be addressed for taking better decisions for firms which will contribute to high quality knowledge.*

Key Word: *big data, big data analytics, social media analytics, marketing analytics.*

I. INTRODUCTION

Information systems have evolved over the years from being transactions recording System to supporting business decisions at different levels. Traditional information systems depended primarily on internal data sources such as enterprise resource Planning systems (ERPs) for making business decisions. These datasetswere Structured and used relational database management system (RDBMS). These were Used for supporting internal business decisions such as inventory management, Pricing decisions, finding out most valuable customers, identifying loss making Products etc. Besides, data warehouse was built using this data for analysis and Mining purpose. These data sources were integrated with data from business partners Such as suppliers and customers using enterprise application integration (EAI) Platforms. EAI enabled seamless integration of information systems between Business partners. It enhanced speed of business to business transactions (B2B), Communication and reduced cost of inter-company transactions. In the next wave in early nineties, arrival of internet further simplified integration Of firms with their business partners. In the last decade, information systems Coupled with internet, cloud computing, mobile devices and Internet of Things have Led to massive volumes of data, commonly referred as big data. It includes structured, Semi- structured and unstructured real-time data, constituting of data warehouse, OLAP, ETL and information. Computer science has advanced to store and process Large volumes of diverse datasets using statistical techniques. Business firms and Academicians have designed unique ways of tapping value from big data. The Objective of this paper is to explore the role of big data in making better decisions And how big data can be used to make smart and real-time decisions for Improving business results In the current era, business executives are challenged with high Expectations from customers, high competition, rising costs of labor and materials And shorter product lifecycles. Globalization is blurring the boundaries among Nations. Location and distance from the market are no longer barriers to access the Markets. In such a volatile environment, firms need to continuously scan for risks And opportunities and make business decisions quickly based on available data. In This section, we discuss the role of traditional "small data" as well as "big data" for Making business decisions.

Traditional decision support systems:

Traditional decision support systems supported internal business Decisions based on data generated by transactions processing systems such as ERPs (Davenport & Dyché, 2013). Further evolution led to additionof similar Systems on supply and demand side (SRM and CRM). These systems helped to Integrate internal operations of the firm with their business partners such as suppliers (e.g. Ariba) and customers (e.g. Siebel). All these systems used well defined structured data in relational databases. Internal operational and tactical decisions were made from these decision support systems (such as how to price the products for optimizing sales, status inquiry of orders, inventory planning, cost analysis, outstanding balance payments according to their due dates etc.). This information helped in accuracy and speed of internal decisions. Traditional data sources provided inputs to data warehouse and data mining Operations. Over all.

II. TRADITIONAL DECISION SUPPORT SYSTEMS

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Big data source	Big data drivenInsights	Actionable Decisions	Reference
Google search for a product or brand	• Customer intention to buy a particular product • Identify customer preference for a particular brand	Predicting demand for product	
Google search by specific key words	What particular information citizens are looking for or concerned about	Predict spread of flu by geography by regions	Mayer Schönberger & Cukier, 2013
Amazon search	Customer intention to buy a particular product	Reminder to customer next time she/he visits the site leading to chances of sale	Amazon.com website
Amazon Purchase history	Using association rules mined from billions of records, identify which different products are bought by customers	Product recommendation (customer who bought this also bought)	Amazon.com website
Walmart POS data	• Using association rules mined from billions of records, identify which products customers buy together (market basket analysis) • Facing disaster such as hurricanes people buy some unusual things like pop-tarts etc. in addition to usual water, batteries, shovels etc.	• Store layouts redesign to place such products together • Inventory planning based on buying patterns prior to disasters such as hurricanes	• Waller & Fawcett, 2013 • Dyché, 2014

Table 2 Role of big data in making decisions

Benefits of Using Big Data in Decision Making

In the last few years, with advent of big data, the information requirements of executives have changed. In addition to traditional datasets described above, there are large datasets coming from variety ofsources in structured, semi-structured or unstructured forms. There are several ways in which firms can tap value from these datasets to make strategic, tactical and operational decisions.

Competitive intelligence From social media	Comparative analysis Between competing products	Plan product strategy	Vries et al.,2016
Data from telematics sensors used by UPS vehicles	Information about speed, routes, direction, braking, drive train performance	Redesign Routes leading to saving of millions of gallons of fuel	Davenport & Dyché, 2013

Call center logs, online usage of accounts	Create complete profile for customer journey	Design future strategies for improved customer service	Davenport & Dyché, 2013

Business transaction data when mined for association rules provide key insights for decision makers about products bought together or predicting demand for certain items. Getting an understanding of patterns helpsretailers such as Wal-Mart to redesign their isles and placement of products together leading to improved sales (Shaw et al., 2001). Prediction of demand for certain items, helps in improved planning ahead of major natural disasters like hurricanes (Shaw et al., 2001). Analysis of terabytes of data coming from aircraft engine provides indicators of part failures thereby improving maintenance as well as safety (Dyche, 2014). **Table 2** below summarizes, how big data driven insights lead to information, prediction and actionable decisions.

Understanding Customer Journey

Leading banks such as Wells Fargo, Bank of America and Discover get to understand their customer relationship using big data gathered through variety of sources as described in **Figure 2** below. They create complete profile of customer journey's using mix of structured, semi-structured and unstructured data originating from call center logs, website clicks, transaction records, ATM transactions, click streams etc. This profile helps them to understand reasons for customer attrition, correlating journeys with customeropportunities and problems (Davenport & Dyché, 2013).

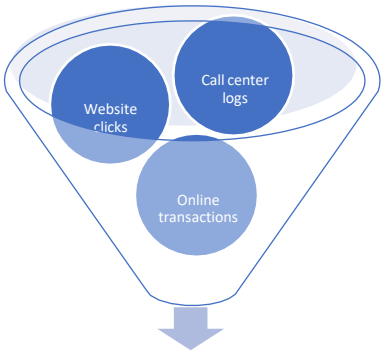

Figure 2 Customer journey

Competitive Intelligence

There are several studies conducted to understand consumer sentiments, attitudes and opinions using social networking sites (SNSs). In addition to consumer sentiment about their own products, business executives need to know what customers think about competitor's products. This intelligence will help to plan innovations in future products or design a strategy to market the products. Mining of a social media data can obtain comparative analysis of consumer opinions and sales performance of a business and its competitors.

Similarly, trends analysis provided by google provides a good mechanism of comparing product searches of two or more competing products. These analytics provides insights on how different products, services or persons are being searched over the web in different geographies. This can provide valuable intelligence regarding product awareness and designing future marketing strategies or new product launches. There are websites such as sentiment140.com which provide glimpse of possible ways in which this intelligence can be tapped.

Cost and Time Reduction

There are numerous opportunities of cost and time reduction using big data. Big data technologies such as Hadoop clusters are emerging as significantly low-cost option compared to traditional databases. It can play a role in real time decisions regarding promoting offers and services to customers based on their current locations. UPS saves millions of dollars in fuel by collecting, analyzing data from telematics sensors installed on its 46,000 vehicles and redesigning its vehicle routes using this large dataset (Davenport & Dyché, 2013).

Optimization and Simulations of Supply Chains

Supply chains are getting increasingly complex with multitude of suppliers and business partners. Over last two decades, members of supply chain have implemented enterprise systems which record every transaction. With advancement of EAI information sharing happens between business partners such as suppliers and customers. For efficient movement of goods across supply chains, technology plays an important role. Scanning devices such as sensors and RFID, location tracking devices like GPS, video recordings etc. – all these churn large volumes of data with inventory movement. Supply chain analytics enhances capability of decision makers by getting an integrated view of the data within supply chain. We can extract, transform, analyze data from data sources within supply chain system and run analytics to derive intelligence. Supply chain analytics provide several advanced capabilities such as dashboards, pattern and trend analysis, drill down views, forecasts,

knowledge base, scenario and what-if analysis, simulations and optimization capabilities. These enhance decision making capabilities and interpretations of situations whichis very crucial for firms in competitive business environments (Nair, 2012).

Predicting Future Outcomes

There are several opportunities of using datasets for predicting future outcomes. Analytics frameworks can be developed to analyze different datasets and make predictions as listed below-

a. Based on historical transactional data, using forecasting models such as regression predict future sales for the product or services for a firm.
b. Based on correlations found in historical purchases, identify products purchased together by customers. Referring to these correlations and purchase history of a customer, predict which products a customer is most likely to buy and make online recommendations.

(Artun & Levin, 2015)

Figure 3 Conceptual frame work on big data and decision making

Analyze historical data, study patterns of customer attrition from the past data and identify which variables contribute to customer attrition. Predict which customers are most likely to leave, take proactive steps to retain them.
(Artun & Levin, 2015)

There are many more applications of predictive analytics such as predicting which customers are most likely to buy which products based on their historical purchases. Also, based on Google searches, outbreak of diseases in certain geographic locations can be predicted.

Real-time Decision Making

Several visionary companies have developed real-time decision making capabilities using supply and demand side information. Using analytics, they have online real-time decision-making capabilities that cannot be matched by traditional business models. Transport service providers such as Uber uses big data for real time routing of cars to minimize pick up times and optimize customer experience of a ride (Woodie, 2015). Ola and Uber provide real-time information to both customer and cab driver on Google map. They receive continuous stream of high volume cab demand data and availability of cabs in different geographic areas. They come up with demand management strategies based on real time demand information. City of Singapore has recently introduced a demand driven, shared private transportation concept enabled by data analytics and mobile technology called as Beeline. This system uses crowd sourced travel patterns, transportation data to identify potential travel routes and dynamically allocates buses to routes based on demand patterns. This reduces travel time for commuters and increase use of shared transport services (Askari, 2015).

III.CONCLUSION

We have come a long way since information revolution has changed the way business firms work. Big data is Helping Firms to get competitive advantage using different analytics techniques. These techniques help us to Get insights, patterns, correlations and associations which could not be understood through traditional small Data. These support decisions making process for business executives with the help of social media data, Competitive intelligence, cost and time reduction strategies, supply chain analytics, web analytics etc. Firms Which recognize significance of big data and developing products around data have received huge dividends in Recent years. Many firms use analytics in almost all aspects of conducting their business to reap the benefits of Analytics based decision making. In this paper, we present a conceptual framework for developing analytics Capabilities and how this emerging knowledge can be help small and medium firms to compete using lesser Resources. It can be adopted by such companies with changes in line with their business domain and model. This framework can be a starting point for further analysis, enhancementand future research opportunities. With continued digitization of every aspect of society as well as business, pace of generation of high speed high Volume data is going to continue. This provides a sound opportunity to exploit the field of analytics for decision Making in different business domains. There are several unique research opportunities in different business, Scientific and government domains wherever data is generated continuously.

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