COMPREHENSIVE STUDY OF METHODS TECHNIQUES AND TOOLS USED FOR DATA ANALYTICS IN FIELDS OF FINANCE

by

Parth Sarangi

A special study report submitted in partial fulfillment of the requirements for the degree of Master of Engineering in
Information Management

Examination Committee: Dr. Vatcharaporn Esichaikul (Chairperson)
Dr. Matthew N. Dailey
Prof. Sumanta Guha

Nationality: Indian
Previous Degree: Bachelor of Technology in Electronics and Communication
National Institute of Technology Srinagar, India

Scholarship Donor: AIT Fellowship

Asian Institute of Technology
School of Engineering and Technology
Thailand
April 2017

Table of Contents

List of Figures

List of Tables

Chapter 1

Introduction

1.1 Objectives

The overall objective of the study report is to build an understanding of the tools and techniques of analytics used by financial analysts and institutions. This study presents a brief of the current state of affairs analytics and subsequently a study of the techniques. Also there is a demonstration of some common methods.

1.2 Overview

Data analysis is an very robust topic in the field of data science and encompasses the various mathematical functions. The functions are statistical in nature and are performed on the data obtained. The goal of data analytics is to support (or reject) the hypothesis which the data scientist postulates. " By processing a steady stream of real-time data, organizations can make time-sensitive decisions faster than ever before, monitor emerging trends, course-correct rapidly and jump on new business opportunities." [BIG Data Analytics: A Framework for Unstructured Data Analysis pdf]

This paper tries to enlist most of the up-to-date techniques used by researchers and mathematicians to make sense of the data. Also the paper presents them in three groups of analytics. But then there arises a question which is, why the need for data analytics ? Well, to answer that the paper proposes the literature from an article of Kdnuggets (Balm, 2015).

Data analytics is already the next big disrupter in the financial sector (Culp, 2017). New startups are build solutions to automate mundane manual tasks of reconciliations and consolidations. Artificial intelligence is helping companies to redesign the traditional process flows and restructure work-flows for optimization. With complex algorithms of machine learning, artificial intelligence, "Bot's" are designed which learn the product usage and popularity among customers. These "Bot's" can also interact autonomously to users and deduce patterns of interaction. Such an exisiting example is cited in Cnbc's article (Taylor, 2016), about Bank of America deploying "Erica" an digital assistant based on models of artificial intelligence.

According to Paul following are use cases of data analytics :

1. Analytics powers our decisions – we do not need to guess while making bold new decisions, we should use the information from data at hand.
2. Your data analysis weighs down your opponent's argument.
3. Cut down on loss making ventures with data analytics.

4. Can be applied to all domains be it health-care, banking, marketing, sales, operations etc.

On the scenario when describing Data analytics it is very important to put the focus on Hypothesis.

Shown in the table 1.1 is some business areas

Application area	**Applications**	**Specifics**
Insurance	Fraud detection	Identify claims meriting investigation
Telecom	Churn	Identify likely customer turnover
Telemarketing	On-line information	Aid telemarketers with easy data access
Human resource management	Churn	Identify potential employee turnover
Retail	Affinity positioning Cross-selling	Position product effectively Find more products for customers
Banking	Customer relationship management	Identify customer value Develop programs to maximize revenue
Credit card management	Lift Churn	Identify effective market segments Identify likely customer turnover

Table 1.1: Data mining use cases

Figure 1.1 is a view of the data analytics with respect to the main fields.

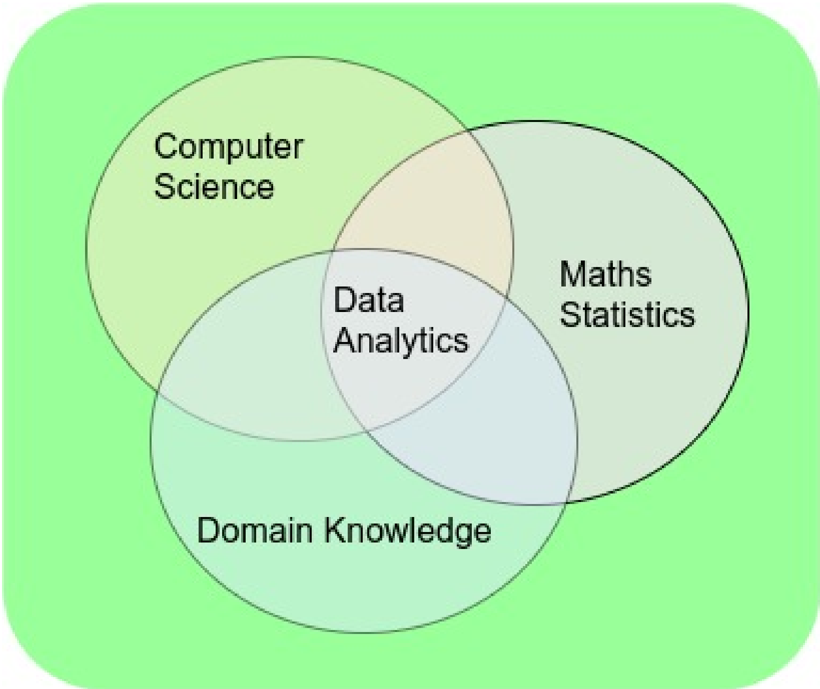

Figure 1.1: Data Analytics

1.3 Why Analytics for financial institutions ?

According to a joint research study, by Boston Consulting Group and Morgan Stanley with analytics professionals, it was reveled that the financial institutions lagged behind other verticals in the use of data analytics (Malhotra et al., 2017) and it is shown in figure 1.2. One of the findings of the research was that FI's are investing a lot of capital, an estimated total of about $1bn. In addition it was found that for near term value creation the FI's expected data analytics to optimize customer acquisition, customer retention, operational efficiency, and risk mitigation.

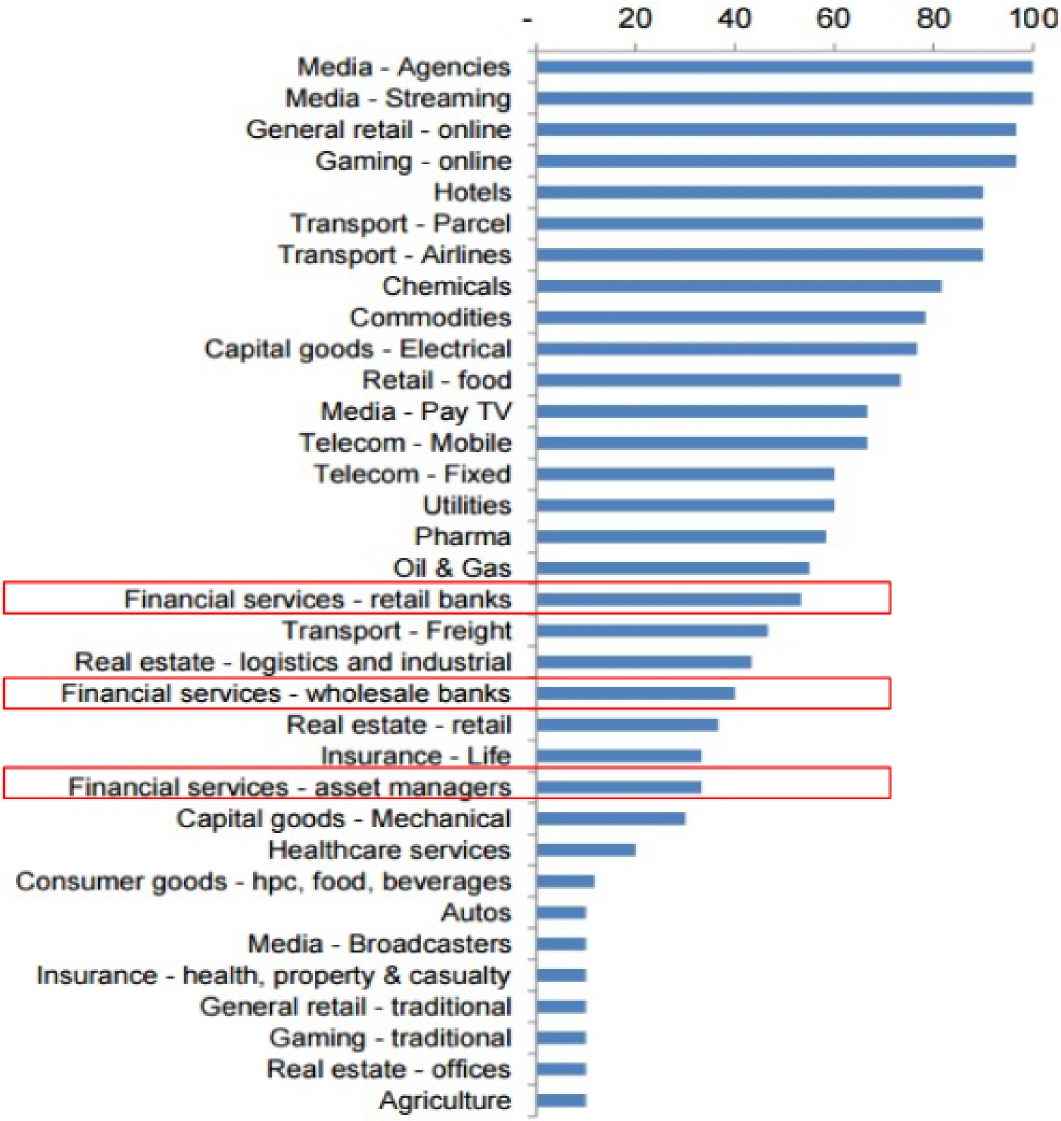

Figure 1.2: Reprinted from the Morgan Stanley Digitization Index ranks

1.4 State of analytics in financial companies

From the survey of FI's, a mix of interviewees representing payment companies, service providers, insurance, commercial banks, BCG made some interesting discoveries. It was found that most organizations have invested in analytics techniques to generate market perceptions. Some of the most used were those of social media, log, text and location analytics as shown in figure 1.3.

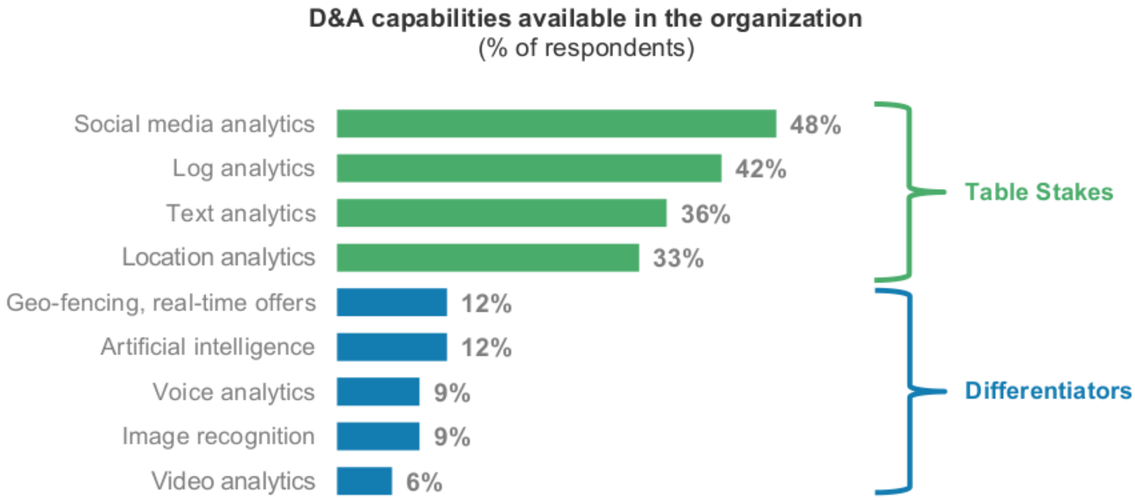

Figure 1.3: Reprinted from the work of Boston consulting group

Researchers have highlighted that most of the interviewees claimed that institutions are yet to make substantial gain from investments in analytics. They identified that companies can make gains from automation and digitization of manual processes. Additionally, it was noted that financial institutions are adopting digital processes to automate data collection for KYC (Know Your Customer) service and Anti-money laundering Customers are loyal consumers of products, which give value for their monetary investments. Big institutions tend to over look the need for value creation and focus their analytics and metrics to improve profit (Reichheld, 1996). In the HBR report Reichheld makes certain observations that customers of large companies witness degrading value standards and secondly increasing rate of customer churn is a good variable to predict cash flow from consumer to company. He also noted that companies can replace old customer with new ones but the profits are lower as cost of induction is high.

1.5 Challenges faced by analytics

For every new technology there are certain common challenges, such as those of acceptability and usability. Finding out the actual benefit or Return on investment for newer technologies and solutions such as those of digital assistants remains a mystery. There is no quantifiable or tangible benefit, but only a perception that it could revolutionize the method of banking and investing. Some hurdles, such as of vision, budget, and getting all members on board, are faced early in the life-cycle of adopting such bold complex projects. Institution leadership faces the tough task of decision making and if rests on them to perceive value at the end of project. Even after adopting analytics and tools, management faces challenges of educating shareholders, staff and customers to be literate enough to invest and interact with solutions for effective usage.

Chapter 2

Descriptive Techniques

The sole purpose of using the methods in this category would be to describe the Hypothesis. Descriptive analytics or data mining are at the bottom of the big data value chain, but they can be valuable for uncovering patterns that offer insight. A simple example of descriptive analytics would be assessing credit risk; using past financial performance to predict a customer's likely financial performance. Descriptive analytics can be useful in the sales cycle, for example, to categorize customers by their likely product preferences and sales cycle.

To summarize data into meaningful charts and reports, for example, about budgets, sales, revenues, or cost. They allow managers to obtain standard and customized reports, and drill down into the data and to make queries to understand the impact of an advertising campaign, for example, review business performance to find problems or areas of opportunity, and identify patterns and trends in data. Typical questions that descriptive analytics help answer are: How much did we sell in each region? What was our revenue and profit last quarter? How many and what types of complaints did we resolve? Which factory has the lowest productivity? Descriptive analytics also help companies to classify customers into different segments, which enable them to develop specific marketing campaigns and advertising strategies. [1]

There are two main approaches to apply in this topic Data warehousing and Visual analytics with reporting.

Descriptive analytics is very common and basic form of data mining technique to derive meaning and trend from data. Almost all of the companies in financial sector utilize the tools based on these techniques. The techniques in this are relatively basic compared with those of predictive models and prescriptive models. Institutions generally use tools which can generate reports regularly, some are printed monthly while some others are generated as a yearly routine. Such demands for reports describe the status quo of the balance sheets, organizational debts and cash flows. Daly transactions and updates of balances are maintained in the books or accounts and reports are generated daily for accountants and auditors. Thus it is imperative that vital functions of reporting, updating and auditing are functionalities of some business analytics.

There are several techniques employed by businesses to analyze and display data. They are as follows:

1. OLAP
2. Datawarehouse
3. Graphical views
4. Performance dashboard and KPI's

2.1 Social media analytics

2.2 Log analytics

2.3 Text analytics

2.4 Location analytics

Chapter 3

Predictive Techniques

Predictive analytics use big data to identify past patterns to predict the future. For example, some companies are using predictive analytics for sales lead scoring. Some companies have gone one step further use predictive analytics for the entire sales process, analyzing lead source, number of communications, types of communications, social media, documents, CRM data, etc. Properly tuned predictive analytics can be used to support sales, marketing, or for other types of complex forecasts.

The basis of Predictive modeling is the use of data mining techniques to forecast future results. Data mining is the process of sorting data to find patterns or infer relationships. Thus a formulation of a statistical model with relevant variables is essential for prediction. ref from site (http://searchdatamanagement.techtarget modeling) and (http://searchsqlserver.techtarget.com/definition/data-mining)

Data mining techniques are used in credit card systems to detect fraud, in loan approval systems, identifying customer types and targeting specific promotional schemes. It is used to model customer behavior and detect churning to certain financial products. Insurance schemes and bank deposits are volatile instruments due to the uncertainty of the free economy. site (https://hbr.org/1996/03/learning-from-customer-defections).

There are many techniques to modeling predictive analytics

1.
2. Regession methods
3.
4.

e)

3.1 Geo fencing

3.2 Artificial intelligence

AI was developed a long time ago, but it has for recent years gained much traction and entered our lives. AI was present from the 1950's, but it has only gained popularity. According to an article by PwC (PWC, 1996), some companies have invested in AI, Machine and Cognitive learning tools and have implemented solutions for Chatbots, Personal assistants etc. Big data coupled with faster computing and ubiquitous implementation with cloud computing has certainly boosted research and development. As per a Forbes research projection, in the next 10 years, implementations of AI will increase economic growth by 100% in about 20 countries. Also there could be an increase in productivity of around 40% of banks financial labor (Culp, 2017).

3.3 Deep learning

3.4 Voice analytics

3.5 Image recognition

3.6 Video analytics

Chapter 4

Prescriptive Techniques

Prescriptive analytics is really valuable, but largely not used. According to Gartner, 13 percent of organizations are using predictive but only 3 percent are using prescriptive analytics. Where big data analytics in general sheds light on a subject, prescriptive analytics gives you a laser-like focus to answer specific questions. For example, in the healthcare industry, you can better manage the patient population by using prescriptive analytics to measure the number of patients who are clinically obese, then add filters for factors like diabetes and LDL cholesterol levels to determine where to focus treatment. The same prescriptive model can be applied to almost any industry target group or problem.

Chapter 5

Optimization Techniques

Chapter 6

Visualization Techniques

Chapter 7

Conclusion and Recommendations

This section presents the conclusion of study report.

7.1 Conclusion

In this paper we have tried to present a picture of the methods and tools of data analytics. They are summed up under three categories. Our motivation was to study the various methods and practices used by researchers and businesses. We hope this paper encourage new companies to apply softwares and schemes to analyze data. The analytic results could give them insights about To achieve what was not perceived, to deduce what was not understood is all made possible with data analytics. Thus it is our effort that the topics discussed in this paper would be of use to those who step into the world of Analytics without knowledge of background. References :

`http://www.cbpp.uaa.alaska.edu/afef/business_analytics.htm`

7.2 Recommendations

Text..

References

Balm, P. (2015). *10 reasons why i love data and analytics — kdnuggets.* http://www.kdnuggets.com/2015/06/10-reasons-love-data-analytics.html. (Accessed: 2017-05-10)

Culp, S. (2017, February). *Artificial intelligence is becoming a major disruptive force in banks' finance departments — forbes.* https://www.forbes.com/sites/steveculp/2017/02/15/artificial-intelligence-is-becoming-a-major-disruptive-force-in-banks-fi #39f25de14f62. (Accessed: 2017-06-27)

Malhotra, S., Hizir, B., Badi, M., & Grealish, A. (2017, May). *The journey from insight to value — data analytics for financial institutions.* https://www.bcg.com/publications/2017/technology-digital-transformation-data-analytics-financial-institutions.aspx. (Accessed: 2017-06-17)

PWC. (1996). *Artificial intelligence in financial services — from pwc's financial services institute.* https://www.pwc.com/us/en/financial-services/research-institute/artificial-intelligence.html. (Accessed: 2017-06-16)

Reichheld, F. F. (1996). *Learning from customer defections — hbr.* https://hbr.org/1996/03/learning-from-customer-defections. (Accessed: 2017-06-16)

Taylor, H. (2016, October). *Bank of america launches chat bot erica — cnbc.* http://www.cnbc.com/2016/10/24/bank-of-america-launches-ai-chatbot-erica--heres-what-it-does.html. (Accessed: 2017-06-27)