**Data Analytics**

**Unleash the Power of Machine Learning for better Predictability**

**September 2016**

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**DATA ANALYTICS**

CIO David Guzman told CIO.com, "*Analytics and data are gold for our suppliers and customers in pharmaceutical industry*." (Boulton, 2013)

***So what is Data Analytics?***

Data Analytics (DA) is the process of extracting information from large data sets with the use of algorithms and techniques drawn from the field of Statistics, Machine Learning and Database Management Systems. It is used in many industries to help companies and organization to take better business decisions and to verify existing models or theories in science. (Rouse, 2008)

***How helpful for Health-Care/Pharmaceutical/Biotechnology companies is Data Analytics?***

In the health-care, pharmaceutical and biotechnology industries, data growth is generated from several sources ranging from R&D, patients, caregivers and many more. The problem that arises is that such companies struggle to utilize these data effectively. In certain scenarios, the R&D suffers from diminishing success rate and a stagnant advancement. Data analytics could be a key element to the cure. Proper recourse will help companies better identify new potential drug candidates and develop them into potent, approved and functional medicines more quickly.

Health-Care/Pharmaceutical/Biotechnology companies can use the following 8 technology-enabled measures to expand the collection of data and improvise on the approach of managing and analyzing these data. They are as follows:

* Integration of all Data
* Internal & External Collaboration
* Employ IT-enabled portfolio-decision support
* Leverage new discovery technologies
* Deploy sensors and devices
* Raise Clinical-Trial efficiency
* Improve safety and risk management
* Sharpen focus on real-world evidence

(Cattell et al. 2013)

**INDUSTRY CONCERNS**

For an industry as data-intensive as Health-Care/Pharmaceuticals/Biotechnology, innovations in ‘big data’ and analytics have the potential to revolutionize the sector, allowing companies to tackle many of the challenges inherent in drug development.

Some of the major concerns of this industry:

* Huge financial penalties
* Flattened scientific productivity
* Costs per approved molecules are unsustainably high
* Spend a very small percentage of their budgets on target selection and validation

***PROBLEM (CASES) EXAMPLES WHERE DATA ANALYTICS WAS ABSENT***

The following scenarios describe 2 use cases where one of our clients came across certain problems that required immediate attention. Let us observe the problems first.

**SCENARIO 1:**

In this scenario, a study was conducted on 10 sites and each site had an enrollment target of patients for assessments. The eventual result showed that the number of subjects enrolled had discontinued at the sites each month.

According to the study conducted, majority of the patients (atleast 40%), found that the study requirements were too demanding, hence the reason for discontinuation at the sites. There were so many patients that it was difficult for the sites to manage them, thus they failed to follow-up with them. There was also another group who could not tolerate the treatment as it had side effects. Few patients were treated, but it was not effective enough as they did not get better.

Additionally, the subjects did not feel the urge to relocate to a different place just for a proper result. The effect of travelling is something too adverse for them. Certain restrictions are imposed on the patients that are overwhelming for them. Initially they join due to the handsome reimbursement but mid down the lane they are deemed to be uncooperative and leave the study incomplete.

Now let us give a deep-rooted thought. Is it always the subjects who found the requirements increasingly burdensome? Or there are other parties involved making it equally troublesome?

[Business Intelligence (BI) Dashboard & Reporting Overview. 2015]

**SCENARIO 2:**

In this scenario, there are 5 sites where Clinicians have to conduct assessments with Patients.

Let’s shift our focus to only 1 site as an example. There could be number of Patients and Clinicians on this site during the assessment session. After an assessment is complete, Clinicians record the data in the system and all the forms` information is stored in Central Database. What is being observed is that one or few of the Clinicians are not submitting the data into the system after an assessment with a patient has been complete. There is a significant time difference between a Clinician saving the data and submitting the data into the Database. This is definitely not normal and the management will raise questions as to why this is happening. There could be numerous reasons for example the Clinician forgot to submit the data, fell sick, server was unavailable, emergency issues, patient-clinician relationship etc.

[Business Intelligence (BI) Dashboard & Reporting Overview. 2015]

Considering the above 2 scenarios as an example, let us look at what branch of Data Analytics can help us solve these issues. At the edge of statistics, computer science and emerging technology, Health-Care/Pharmaceutical/Biotechnology industries have research communities that focus on the development of fast and efficient algorithms for real-time processing of data with a main goal to detect red flags and deliver accurate predictions. (Galetto, 2016)

This is where we dive into the branch of data analytics that is widely known as “**Machine Learning**”.

**ADVENT OF MACHINE LEARNING**

Before diving into Machine Learning and its benefits to a business, what do we exactly know about it? Machine Learning is simply about the comprehension of data and statistics. It’s basically a process where computer algorithms are used to identify patterns in data and then predict the possible outcomes. These algorithms are also defined in such a way that it can learn and adapt outputs based on new information. Once the functional model is designed, they do not need a human to become better.

As overwhelming as it sounds, there are certain challenges in implementing ML in a business. Few are as follows: **i)** Understanding what type of algorithm is used for the problem that needs to be solved, **ii)** Overfitting of data that causes the ability to generalize, learn and make predictions based on new data and **iii)** A problem which can be solved may not always be solvable through ML hence the process is never-ending leading an organization to chase the problem but never develop a functional model.

(Christopher, 2016)

***ReliSource Database Engineering Expertise***

Our company, ReliSource, a technology consulting and services firm is well-equipped with Database Engineering resources who are experts at using various widely known ML tools such as Amazon Web Services ML (AWS ML), IBM SPSS Modeler and BigML.

***Solution to the Problem (Cases) Examples discussed earlier***

**In Scenario 1**, when our Database Engineers were given the problem, they leveraged the use of Machine Learning tools to analyze and detect the reasons why many subjects eventually discontinued at the enrollment sites. Using the historical data as references, specific logics were applied and fed to a ML tool to generate reports, create interactive statistical dashboards and demonstrate the reasons for discontinuation of study by scrutinizing the enrollment target and actual target. Few reasons of discontinuation are given below:

* Study requirements too demanding
* Lost to follow up
* Cannot tolerate treatment (side effects)
* Did not get better

Now questions may arise such as what if these trends continue and how would it impact on the growth of the organization? What may happen next and what’s the best that can happen?

This is where we provided a projection dashboard that predicted the answers to the above questions.

**With regards to Scenario 2**, our experts use their logic to leverage a ML tool to extract the information and then layout the reasons for the delay by identifying the time difference and any other mishaps between saving an assessment and final submission of that assessment. The results are then collected and produced in certain file formats such as CSV, TAB, PIPE etc. These data are then fed into the ML tool which tracks the delay and helps in predicting future possibilities of such delays and how it can be controlled in order to make better decisions.

**BENEFITS OF USING MACHINE LEARNING FROM OUR EXPERIENCE**

* Reduced Information Bottlenecks
  + Provide audience specific, role-based dashboards that ensure the most important data for day to day operations.
  + Provide up-to-date information in real-time reports about the current business state.
* Better Decisions
  + Save the user from manually combining data in spreadsheets due to the availability of data warehouse.
  + Clear view of target vs. actual figures which forces the organization to achieve defined goals
* Risk Management
  + Quickly detect unexpected incidents through analytical dashboards.
  + Easy access of critical information like screen fails and early terminations.
* Enhanced Security and Scalability of Client’s data
  + Cloud database (Redshift) offers better security through relative encryption.
  + Improved Client satisfaction.

[Business Intelligence (BI) Dashboard & Reporting Overview. 2015]

**RELISOURCE AT A GLANCE**

ReliSource is a Technology Consulting and Services company headquartered in Boston, USA with an R&D center in Dhaka, Bangladesh. We pride ourselves as being a “One Stop Solutions Provider for your Products & Services” and work as an extended part of development team to deliver improved **ROI** (Return on Investment).

***HOW RELISOURCE COLLECTS THE DATA FOR ANALYSIS:***

There are many ways our experts collect data. Below are few:

* Data can be collected by gaining access to the Central Database Repository.
* Electronic Data can also be captured through Proprietary Electronic Tablets. ReliSource has experienced Engineering Resources who possesses the ability to design such tablets as well as applications that can run according to the specifications of the client. As a security measure, we can also ensure that there are no ways that a third-party application can be used to breach data security.

***Other relevant expertise that ReliSource offers:***

ReliSource offers the following services as part of its key competencies:-

* Clinical Trial Services & Data Management
* [Embedded &](http://www.relisource.com/handheld-and-embedded-system) Engineering Solutions
* [Custom](http://www.relisource.com/big-data) Web and Desktop Application Development
* [Enterprise Mobility Solutions](http://www.relisource.com/mobility-solutions)
* [Quality Assurance](http://www.relisource.com/software-quality-assurance) (QA), Testing and Validation Services
* Data Center Operations (DCOPS)
* Advisory Services (provide resources such as Business Analysts, Project Managers and Engineers)

**WHY RELISOURCE?**

* One of the oldest IT companies in Bangladesh – for more than a decade in business.
* #1 choice for engineers from top-tier Engineering schools.
* High job satisfaction for work Environment & Quality, office location, recreational facilities, compensation and Benefits.

|  |  |  |
| --- | --- | --- |
| **0%attrition** | **6.72%** | **4.65years** |
| **Lowest Attrition Rate** | **5 years Attrition Average** | **Average Employee Tenure** |
|  |  |  |

(Company Profile\_ReliSource. 2016)

**CONCLUSION**

ML can help you solve enormous problems and make predictions in a way that will help your organization in better decision making. As we all know that organizations are drowning in data today. Yours is probably no different and all of it impacts the organizational growth. Even having an onsite data scientist on staff, analyzing and understanding what it all means is next to impossible.

ReliSource being an offshore company with an onsite presence in the US ensures in providing quality services and that resources are fully utilized. We strongly believe that our expertise, in-depth domain knowledge of multiple industry verticals and working experience with top Pharmaceutical companies in the world will add leverage to your company. We had the opportunity to work with **Fortune 500** clients like **UTC, Warner Brothers and Electronic Arts (EA)** and thus we can deliver significantly high **ROI** to your company, at least an average of up to **500%.** (Company Profile\_ReliSource. 2016)

Therefore, we look forward to a fruitful collaboration where we as a company would thrive to build a better long-term rewarding relationship with your organization.

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