



The Role of Business Analytics in Telecommunication Services

¹Christophe Nteziryayo*, ²Dr. Ann Kibe.

¹ University of Rwanda –College of Business and Economics (UR-CBE) Rwanda, Academic Staff

² School of Computing and Information Technology/ JKUAT, KENYA, Lecturer at JKUAT, Kenya

Abstract: Telecommunication companies in their daily operations generate a huge amount of data. Every telecommunication player is having high-quality and high volume data that are growing at a tremendous pace nowadays due to advancements in information technology and the operating environment which is highly competitive. These companies face a number of challenges due to the enormous size of their data sets, Legacy systems that are used to gain insights from internally generated data facing issues of high storage costs, long data loading time and long administration process.

This paper will provide you with a good understanding of how Business Analytics can help by Call Detail Records (CDR) processing, customer churn prediction, Geomapping/ marketing and network monitoring in telecommunication services.

Keywords: Telecommunications, Call Detail Record; Churn Prediction; Customer Relation Management (CRM), Customer retention; marketing, Fraud Detection; data mining, , network monitoring, geomapping.

I. INTRODUCTION

The telecommunication services operators routinely generates and store high volume of data and some telecommunication operators are using legacy systems developed for them some years ago. These legacy systems were developed using technologies that are now obsolete, but they are still in use because they are very critical because they are essential for the normal functioning of the business for the telecommunication operators.

Furthermore these legacy systems remain vital to their organization because replacing or redesigning them is very expensive and has a significant business risk to their organization.

2.1 Basic definitions

Definition: Business analytics (BA) refers to the skills, technologies, practices for continuous iterative exploration and investigation of past business performance to gain insight and drive business planning.

A legacy system is an old system that still provides essential business services

II. LEGACY SYSTEM COMPONENTS

Legacy system can be considered to socio-technical systems and not only software systems but include business processes, support software and hardware.

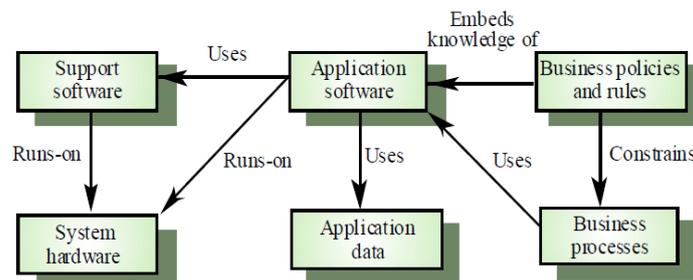


Figure 1: Legacy system components [1]

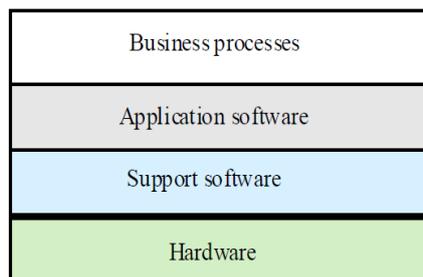


Figure 2: Socio-technical layered model for legacy systems. [1]

2.1 Challenges with Legacy Systems in telecommunication companies

The difficulty in accessing legacy applications is critical to business processes of the telecommunication organization. Legacy systems execute business policies and decisions that are hardwired by rigid, predefined process flows; therefore there is a significant business risk in simply scrapping a legacy system and replacing it with a system that has been developed using modern technology.

III. CALL DETAIL RECORDS (CDR) PROCESSING

Today, telecommunication companies strive to stay competitive by expanding their service offering. Specifically in Wireless telecommunication operators these increased number of service offerings and available functionality result in a very growing volume of data about the phone calls that traverse their networks.

These data are in form of call detail records (CDRs) which contain descriptive information for each phone call, these includes useful information like originating and terminating phone numbers, date, time as well as the duration of each and every phone call.

For the purpose of business continuity for the telecommunication company, these CDRs need to be processed and analysed and near real-time for several reasons including but not limited to : charging for mobile communicating using prepaid services , on-line subscriber access to their account, analytics for predicting subscriber usage as well as preventing fraudulent activities in the network of the telecommunication operator.

Real-time visibility into subscriber usage is a critical element in both business activity monitoring and real-time decision support solutions. Timeliness of the intelligence gained from real-time visibility into subscriber usage is important for revenue gain as Well as protection from revenue loss [2].

For many services (e.g., pre-paid),CDRs need to be processed and analysed in near real-time for several reasons, including charging, on-line subscriber access to their accounts, and analytics for predicting subscriber usage and preventing fraudulent activity.

Telecommunication services Providers maintain data about the phone calls that traverse their networks; these data are in form of call detail records which contain descriptive information for each phone call, these includes useful information like originating and terminating phone numbers, date, time as well as the duration of each and every phone call.

Real-time CDR processing requires ETL tools to extract, transform and load DCR data warehouse for supporting both the operational and business intelligence needs of the telecommunication services.

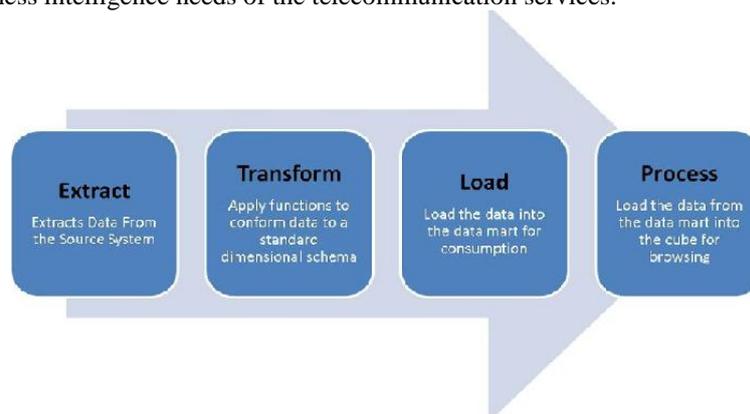


Figure 3: ETL process in the data warehouse

IV. CUSTOMER CHURN PREDICTION

The enabling framework for the liberalization of the telecommunications sector around the world promoted the proliferation of telecommunication market players and the later have launched numerous innovative business models as well as offering better services to customers.

Due to telecommunication sector liberalization and greater number of telecommunication service providers as well as more intense competition, customers today have a variety of options to churn because customers have given powers to make choice in relation to their satisfaction with the telecommunication operators. Thus, the telecommunication market players strive to retain their existing customers as opposed to acquiring new ones.

Recognizing the significance of customer retention telecommunication services providers are now putting more efforts in prediction and prevention of customer churn which is losing valuable customers and this leads to loss of telecommunication company's revenue.

Taking an example of telecommunication company offering mobile communication services there are many factors that influence customers to churn, like customers communicating using pre-paid services, customers are not bound by service contract, therefore they can churn for their own simple reasons and it is very difficult to predict their churn rate.

Another pressing factor that may promote customer churn is customer loyalty that may be determined by customer service as well as quality of services offered by the service providers. There are numerous issues like network coverage issues and reception quality that may influence customers to move to the competitor with broader reach and better reception quality.

In addition issues related to customer care like slow or inadequate response to complaints and billing errors, factors such as packaging prices, inadequate features, and older technology may also increase probability of customers defecting to

the competition. Customers often compare their providers with others and churn to whoever they feel provides better overall value.

Therefore Customer churn prediction in telecommunication sector is very important for the telecommunication market players in order to protect their loyal customer base as well as company/organization growth.

V. GEOMAPPING/MARKETING

Today telecommunication companies are operating in competitive environment and in order to win the market they have to anticipate their customer needs and grow revenue while enhancing their telecommunication networks. Thus achieving the above goals telecommunication companies need geographical data which is very critical for network planning and management in the telecommunication industry.

In line With visualizing internal and external data such as demographics and market trends, based on geographical data telecommunication companies can make smarter decision about their network expansion these include but not limited to making decision about cables to be used, towers and service coverage.

In today's increasingly competitive environment, telecommunication companies must find ways to adapt to changing technologies while maintaining a consistent process throughout the enterprise.

As networks grow and become increasingly complex, solving the telecommunication business company problems requires a good understanding of where your telecommunication company is today and where it will be in terms of network assets, facilities and customers.

Today many most of the telecommunication companies use **Geographical Information System (GIS)** which is a technology that allow them to capture, manage, analyze and display spatial data for use in solving complex problems [3].

Many GIS applications are being used by telecommunication operators to automate business processes and increase the efficiency of operations, this is done by integrating GIS into the overall work flow which enables telecommunication companies to make better decisions.

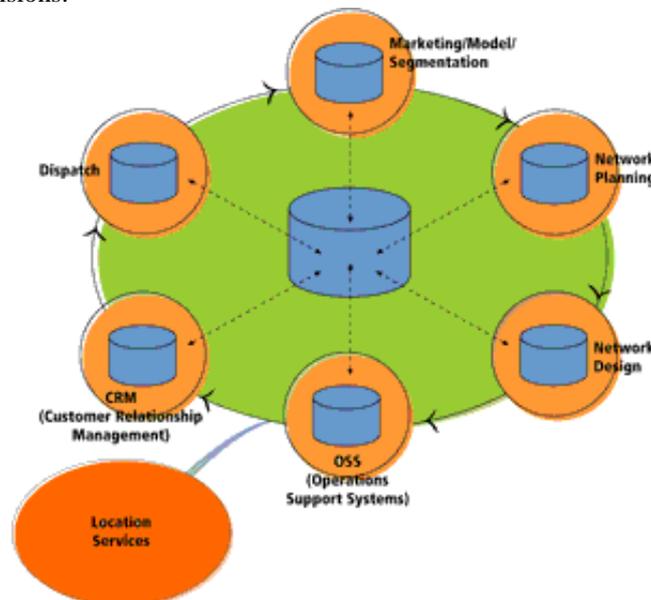


Figure 4: GIS integration into the telecommunication companies overall work flow.

Telecommunication operators also use **GIS** to make geographical segmentation of characteristics for both consumer and business customers that help them market more effectively as well as forecast the demand for services.

Furthermore shared telecommunication operators' GIS database helps companies staff members have instant access to customer status and history and the information obtained from this database when critically analysed drives network investment and marketing campaigns.

Another system that helps to get geographical data for network planning and management in the telecommunication sector is the **Global Positioning System (GPS)** which is a space- based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the earth where there is an unobstructed line of sight to four or more GPS satellites.

The emphasis of marketing in telecommunication industry is also linked to improving company customer relationship Management (CRM) [4], this is done by making tremendous changes such introducing new services, technological advancement, etc.

Customer Relationship Management requires the telecommunication organization to know and deeply understand its markets and its customers and retain the most profitable customers instead of acquiring new customers which is very expensive, as well as making related marketing strategic plan or updating the existing one in order to minimise the organization revenue loss that may be inherited from customers churn.

Geo-marketing allows telecommunication marketing officers to geographically segment consumer and business statistics kin order to provide input for planning activities and make marketing campaign efficient due to availability of customer profile.

VI. NETWORK MONITORING

Monitoring and maintaining telecommunication networks is very important for quality of service provision to customers. However Telecommunication networks are extremely complex configurations of hardware and software which makes this important task very difficult.

For the smooth running of the telecommunication networks the most network equipments that are used are capable to at least do self-diagnosis and display the equipment status in good condition and generate an alarm messages when there are network faults.

For premium customer service, telecommunications providers need to monitor network performance and resolve outages quickly and easily.

Given the volume of the data and the fact that single fault may cause many different unrelated alarms to be generated and sometimes it is quite difficult to isolate network fault, alarms must be analysed automatically in order to identify network faults in a timely manner in order to prevent them degrading the network performance.

Given the complexity of telecommunication networks and these need to be managed effectively expert systems were developed to handle the alarms generated by the network elements, specifically the **Telecommunication Alarm Sequence Analyser (TASA)** which is a data mining tool helps in identifying network fault by looking for frequently occurring temporal patterns of alarms [4].

Another approach is to use Bayesian Belief Networks to identify faults, since they can reason about causes and effects (Sterritt, Adamson, Shapcott & Curran, 2000).

VII. CONCLUSION

The problems with legacy systems within the telecommunication industry have been well known and as a result, several solutions have attempted to minimizing organizational risk because legacy systems are still business critical, they are essential for the normal functioning of the business.

The competitive and changing nature of the telecommunication industry, combined with the fact that the telecommunication companies generates enormous amounts of data, generated numerous problems related to maintaining and upgrading legacy systems and this is the most pressing challenges telecommunication companies face today.

Based on this critical analysis finding, challenges found in this analysis faced by telecommunication companies that are still using legacy system in order to positively overcome them in future the researcher must focus on developing a plan for modernizing these legacy systems while keeping their functionality intact because despite their obsolescence, legacy systems continue to provide a competitive advantage through supporting unique business processes and containing invaluable knowledge and historical data for the telecommunication companies.

Lastly but not least, telecommunication companies shall recognize the interoperability between systems and to opt utilizing the **Business Analytics techniques such as Data mining, Expert systems, Pattern recognition, Machine learning, Neural networks** [5] in concert with existing legacy systems in order to ensure success of the future of their organizations.

REFERENCES

- [1] Legacy Information Systems: Issues and Directions'. An overview of the problems of legacy systems with a particular focus on the problems of legacy data (J. Bisbal, D. Lawless, B. Wu and J. Grimson, IEEE Software, September/October 1999. [Online], Available: [HYPERLINK "http://ifs.host.cs.st-andrews.ac.uk/Resources/Notes/Evolution/LegacySys.pdf"](http://ifs.host.cs.st-andrews.ac.uk/Resources/Notes/Evolution/LegacySys.pdf) [20 August 2015]
- [2] Wireless Telecommunications Call Records Data warehouse, [Online], Available: [HYPERLINK "http://www.ijcsit.com/docs/Volume%203/vol3Issue3/ijcsit20120303128.pdf"](http://www.ijcsit.com/docs/Volume%203/vol3Issue3/ijcsit20120303128.pdf) [16 Mar 2015].
- [3] GIS for Telecom "An Enabling Technology & Integrated Approach", [Online], Available: [HYPERLINK "http://www.alkancit.com/backend/UploadedFiles/Downloads/PdfFiles/99489053-027b-416f-bc0b-0a3f7f7e094.pdf"](http://www.alkancit.com/backend/UploadedFiles/Downloads/PdfFiles/99489053-027b-416f-bc0b-0a3f7f7e094.pdf) [19 Mar 2015].
- [4] Marwaha, R. Data Mining Techniques and Application in Telecommunication Industry, [Online], Available: [HYPERLINK "http://www.ijarcsse.com/docs/papers/Volume_4/9_September2014/V4I9-0171.pdf"](http://www.ijarcsse.com/docs/papers/Volume_4/9_September2014/V4I9-0171.pdf) [17 Mar 2015].
- [5] Wei, C., & Chiu, I (2002). Turning telecommunications call details to churn prediction: A data mining approach. *Expert Systems with Applications*, 23(2), 103-112.