Applied Data Analysis Techniques for Businesses

Project Report

Application of Customer Data Analysis Techniques to Improve Customer Acquisition and Retention

FOR

Dinlinch International LTD

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1 Introduction

We live in a data-driven age and many businesses are using data analytics to understand their customers' buying behaviour.

This report would be analysing collection, processing, cleaning and data management techniques of data analysis while evaluating the application of these techniques with their commercial and open source software.

Using Dinlinch International LTD as a case study, we would be evaluating how this company can know its customers on a deeper level and delve into new trends to increase its customer acquisition and retention rates through the use of data and customer analysis for driving its business success.

2 Business Case

2.1 Introducing Dinlinch International LTD

Dinlinch International LTD is an agro trading company that sells its products to customers through its stores and warehouses that serve as its contact centres. Its main business is the sale of agricultural products like rice, millet, wheat and soya beans.

Dinlinch International started out in 2015 as a home business with a couple trading offline from their home in Nigeria, and is serving the Nigerian market alone at present.

The business grew its turnover to about £1m in 2019 and this growth is attributed to its client satisfaction.

Dinlinch Business Model:

Dinlinch's primary sales channel is its offline, wholesale and retail open market stores and warehouses in different locations in Nigeria.

Its business model has its customers grouped into the business to customer (B2C) category and the business to business (B2B) category.

The company recently recognized that its online channel could be a potential source of extra revenue; hence it is looking to take advantage of customer data

analytics to stream line the process of boosting its customer acquisition and retention rate.

Dinlinch's major competitors are companies trading in agro products in Nigeria and Africa, like Olam, stallion, Golden Penny Nigeria LTD, etc.

Goals:

To create the systematized and multiple-channel experience Dinlinch client's desire so that by the use of data, it can understand their buying behaviour while finding much better and customized ways to attract, serve, build stronger relationship with them, then ultimately retain them.

Defining Customer Data Analysis:

Customer data analysis is the extraction of data to draw inferences that helps the organisation know its customers and understand their buying behaviour so as to make better business decisions that would be pertinent to their goals.

Benefits of Customer Data Analysis for Dinlinch

Customer data analysis would help Dinlinch with information to better understand its customer's pain point while packaging its products in a way that suits its customer's expectation.

By using data and predictive analysis, inferences can be drawn from historical information and predictions can be made to foretell its customers' dissatisfaction.

By analysing Dinlinch transaction data, the business would be able to increase its profitability and narrow down its products to the ones that its customers truly want.

The possibility of connecting with customers is made possible by real-time data as Dinlinch would have an incline into what their customers are thinking, talking about and checking online; thereby enabling the creation of customized landing pages, adverts, etc. that meets its customers need.

Alongside increasing customer satisfaction for the old customers, products can be made to match its potential customers need through the use of behavioural data as that would boost the loyalty and retention of its customers

Problems:

Dinlinch International LTD is faced with the same the challenge as their competitor which is the running of an open market business model that lacks a sizable amount of data to draw needed insights.

Dinlinch does not have any precise blueprint for data and analytics in its organisation.

The business has been concentrating excessively on its offline channel which caused its online channel to suffer due to the lack of an action plan thus causing a slow acquisition of new customers and lowering of its revenue and market share.

3 Discussion of the Data Analysis Techniques

3.1 Collection

Krzysztof (2020), defined data collection by stating that:
'Data collection is a process of gathering and measuring information on variables of interest, in an established systematic fashion that enables to answer queries, stated research questions, test hypotheses, and evaluate outcomes'.

Figure1: Diagram showing Categories Customer data types (Indrajeet, 2019)

Critical to the gathering of data is where and how to get the data that is most relevant to the objectives of the analysis. These Data can be either quantitative (numeric) or qualitative (non-numeric) can be further split into four categories (Personal, Engagement, Behavioural and Attitudinal), see figure1.

- Personal Data is classified as personal identifiable information (PII) like the customer's gender, name, phone number, etc. and non-personally identifiable information (Non-PII) like IP address, phone ID.

- Engagement Data: reveals customers' interaction with the business online e.g., social media like, post shares, website visits, email sign-up, etc.
- Behavioural Data provides quantitative insight on customers buying pattern e.g., product usage and quantitative data like quantity of goods purchased.
- Attitudinal data: shows the customers emotions, giving qualitative insights like product reviews, customer satisfaction, etc.

The collection of data can be done in three ways; directly asking the customer –e.g., surveys and interviews, indirectly tracking the customer - e.g., website analytics and by integrating with those from other sources –e.g., government dataset.

The data collected are used to evaluate the customer's behaviour for better understanding to meet their expectations and draw insights on their engagement to remodel the business marketing strategies for the new opportunities in the marketplace.

3.2: Processing

In past times, processing used to be done without the use of any equipment or automation and that made it prone to errors and consumed a lot of time, but in recent times, almost all processing is being done with the use of computers or automation which gives a faster and more accurate output.

Data takes any form, whether unstructured (e.g., pictures, videos, etc.) or structured (e.g., text file, excel file, etc.), which most times need processing.

Talend (2021) describes data processing, stating that:

'Data processing starts with data in its raw form and converts it into a more readable format (graphs, documents, etc.), giving it the form and context necessary to be interpreted by computers and utilized by employees throughout an organization'.

The initial step of data processing is **Data Collection** which is the gathering of information (structured or unstructured data) from several sources and in different formats like text files, videos, csv files, and images.

Data Storage: It is expedient to store the collected data in a digital format for ease of retrieval, processing and analysis at any time in the future.

Data Preparation: This stage can also be called Data Pre-processing as it involves the cleaning, arrangement of the raw data and scrutinizing for errors so that only the required data would be included.

Data Input: After the cleaning of the data, it is transformed into a form that allows for easy processing.

Data Processing: this is the stage where raw data is refined for analysis which can be done either manually or with the use of machines and automations.

Data Output: this is the stage where data gets transformed to a form that is readable to its users as useful information in form of plain text file, graphs, videos, spreadsheets, etc.

3.3: Data Cleaning

After the data has been processed, it may be have some missing data, duplications, typos and other errors, hence the need for cleaning.

Data cleaning is the process of improving data quality by removing duplicates and outdated information while correcting errors and inconsistencies in the data to make it useable.

This technique is important because maximizing data accuracy is fundamental as businesses depend on the data to draw insights for business decisions and there are benefits of data cleaning such as:

- The mistakes and disparities caused by the merger of data from different sources get eliminated.
- Productivity is boosted as the users are able retrieve information easily.
- Profit is maximized as wastage and the increased cost of operations from working with bad data is eliminated.

3.4: Data Management

This has to do with the people, processes, technology and systems for that retrieve, harmonize, and utilize data to increase its quality, boost customer acquisition and retention, improve customer experience and increase revenue.

Data management is important it helps the business reduces the problems of data silos and maintain its data consistency.

It works with first-party data which is the data a company has about it customers which was collected directly from them is used to create well suited offerings and personalized customer experience.

For the business to avoid data quality problems and establish a top-notch data management system, it should consider some factors:

- Clarity of goals- what does it wants to use the data for so that the data management software would not get disordered or saturated with irrelevant data.
- Data Storage: It would choose if the data needs to be stored separately or in a central location immediate they decide on the type of data to collect.
- Protection and security of data – This essential so as to avoid breach of data as the business follows applicable guidelines to protect its prospects' and customers' privacy.
- Data Quality: It is important to always ensure the data is updated and clean overtime.

4 Critical Analysis and Application of Techniques

4.1 Data Collection techniques

There are different techniques used in data collection, businesses need to apply the appropriate data collection technique to save time and gain the insights needed to handle the challenges of the constantly changing market.

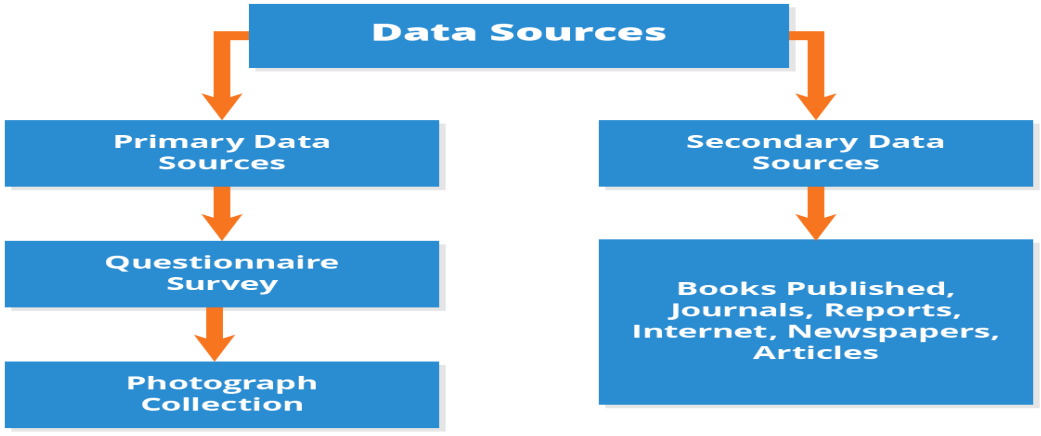

Figure 2: Diagram showing different sources of Data (Stewart, 2017)

Data is described by its source and there are two sources: the Primary and the Secondary as shown in Figure 2.

Primary data Sources are those owned by the business which it collects about its customers e.g., Surveys, interviews, questionnaire, transaction data, etc. The benefit is its original, consistent with its purpose.

Secondary data Sources are those the company gets from other sources.eg Census, income levels statistics, birth statistics, etc. Its benefit is speed as someone else has done the work already and cheaper, while its downside is proneness to errors and may not be up-to-date.

The goal the company wants to achieve determines the source to be applied.

Data can be further classified as quantitative and qualitative data.

Quantitative data: refers to the collection of measurable numeric values, representing quantity, e.g. number of work hours, quantity of goods purchased, etc. It is structured, easier to analyze and provide definite measures.

Qualitative data: is not measurable (non-numeric values), is more of descriptive e.g., customer rating, product ranking, etc. This kind is unstructured and easier to establish and data can be derived from imprecise measurements.

Collection Methods:

There are diverse data sources and collection tools; we would be discussing a few of them.

- **Surveys**: Likely the most common method and considered highly efficient; It involves getting feedback from the company's customers directly from web-based surveys about their thoughts on the products and services. This method is popular for the collection of large amount of data from a sizable population.
- **Customers' feedbacks**: Organization can get information on how their customers behave towards their product by delving into their customer services records (complaint details, customer query checking for insights on what worked and what did not, what the customer complaints were about.
- **Interviews:** It is personal and one of the methods of asking customer directly over chat or a formal interview their opinion about the company's products or services. It provides information that is inaccessible with other impersonal collection methods.
- **Transaction Data:** Collection of data from records like sales record is effective and cheap; it can be used to evaluate the business growth rate. It can provide information like, amount sold, date and time of sales, details of buyer, quantity bought, etc.

4.2 Processing Technique

Data requires processing inspite its form, whether structured (e.g., excel format) or unstructured (e.g., videos), the level of processing would be a function of the specialization the data needs.

There are three main techniques of Data Processing:

- **Manual Data Processing**: For this method, there is no use of equipment, electronic device or automation for calculation, filtering, logical operations, or any of the processing tasks to achieve the desired result. The downside is it's slowness and prone to errors. Small businesses use this processing technique for financial calculations like Sales reports while educational institutions also use it for mark sheets.
- **Mechanical Data Processing**: This method is a lot quicker and more meticulous than the manual method because different machines like type writers and other electronic devices are used for the processing of data. The evolvement of more sophisticated machines have relegated this method of processing because it has limited output, yet printing

presses and examination boards still utilize mechanical data processing method.

- **Electronic Data Processing (EDP):** Also known as Automatic Information Processing involves the collection, manipulation, recording, classification and summarization of data using computers. Examples of EDP systems are computers, servers, etc. and they process data accurately and speedily.

4.3 Data Cleaning Technique

Data cleaning could be tedious and consumes a lot of time; hence I would discuss some techniques to apply for optimal results:

- Discarding of information not necessary for the analysis, –e.g. Customer's height is irrelevant to the monthly sales report.
- Dealing with missing values in ways such as imputing values, removing them completely, and much more. E.g., customer's details lacking phone number or email is useless, needs to be removed completely.
- Treatment of outliers which are non-fitting values in the data, -e.g., customers age at 200 is an extreme value to be deleted.
- Eliminating duplicates could be caused by the combination of multiple data from several sources, -e.g., Paul John could be duplicated as John Paul; this needs to be searched out and removed.

The type of technique to be applied depends on the intended use of the data and the kind of erroneous information detected.

4.4 Data Management Technique

It is expedient to have a system in place to take care of the free flow of data within the organisation while making sure data collected is of the right quality and gathered in a data management platform.

The conventional platform which usually sustains organisational data is the Database, it serves as a collector that holds all the information together and is useful in processing systems for transaction data. With the establishment of the database, monitoring of performance and tuning are important for the maintenance of a response time that is sufficient on database queries;

alongside other administrative tasks which is inclusive of data backup and recovery, data security, database design, etc.

The database is set up and managed by a Database Management System (DBMS) which is the leading software for the retrieval of data and handling of data storage.

5 Critical Review of the Commercial and Open-source Software

There are several types of tools available in the marketplace for data analysis and they are classified as commercial or open source.

5.1 Software for Collections

Data can be collected using several tools like Software, apps, forms, etc. Good data collection software is one that is uncomplicated and can retrieve data from different sources effortlessly.

Form Tools: Effectively handling of forms and data is done by this open source web-based data entry software. Its strength is its ease use as no programming knowledge is required for form creation, also equipped with data visualization module for data export.

Forms on Fire: This is commercial cloud based software for automation of workflow was designed for digitalizing forms. Its strength is its use both online and offline, efficiency of creating reports while grabbing analytics, with it's over 750 advanced integrations that deliver and retrieve data between systems and Microsoft, Google, etc.

Fulcrum: This is a commercial mobile data collection tool that functions via an Android or iOS app. It's used for the creation of personalized forms and managing of field data collection. Its strengths are its capacity to retrieve data both online and offline, synchronizing easily to the cloud and use for capturing videos, audios, barcodes, signatures, etc.

5.2 Software for Processing

Available software for data processing is numerous and we would be discussing some of them.

Ooze: it's an efficient open source workflow processing system. The definition of several categories of written or programmed work is set across multiple languages, been linked together and permitting the mention of dependencies.

Tableau: It is popular software that works with data sources and can be used by professional and non-professionals. It is offers both free and commercial version. Its core is its production of outstanding data visualization that communicates insights for businesses, has an advantage of ease of report generation and a disadvantage of size limitation.

Clear Story: commercial cloud based software that works with different types of data sources whether structured or unstructured and automates data preparations, blending and integration. Its strength is smart data discovery that helps its users quickly find every pattern, values and correlations in the data.

5.3 Software for Data Cleaning

A lot of time gets saved when the appropriate cleaning tool is used and we would be discussing some tools those that can help improve the business improve its data quality.

Open Refine: This is an open source data cleaning software once known as GoogleRefine and is available in 15 languages. It is extremely useful when handling messy data; it cleans and converts data formats. It also has to capacity for data exploration and extension of datasets with web services. Its

strength is its speed of cleaning while its downside is its clustering of algorithm.

Tye: a Commercial data cleaning software that is good for removal of invalid emails, duplicated data, etc. It normalizes the data for email automation, works with third party tools for data apprehension. It strength is its fixing of invalid email addresses and its best for small businesses.

Data Profile Engine: Open source software that examines data quality, functions with csv files, relational databases (RDBMs) and NoSQL databases. Its strength is it works within the database the business already owns.

Winpur: a commercial on-premise tool for all business sizes that is good for data matching, cleaning, address and email verification. Its benefit is its capacity to overhaul data and manage every kind of data from excels to web applications.

5.4 Software for Data Management:

Database Management systems are classified as either relational also called SQL which means the database is Table Structured and has clear dependencies, or the non-relational, also known as NoSQL meaning the databases are Document-Oriented with no table structure limitation.

	Data Structure	Licensing	Documentation	Scalability	Other data structure	Learning curve
MySQL	SQL	GNU Generally Public License	✓✓	Vertical, complex	*	mild
Maria DB	SQL	GNU Generally Public License	✓✓✓	Vertical	SQL, NoSQL	mild
Oracle	Multi-model, SQL	Proprietary	✓✓✓	Vertical	SQL	hard

Figure 3: Examples of database Management Software (Altexsoft, 2019)

MySQL: It's very popular open-source solution was developed by the Oracle Corporation and their stable version was released under the Oracle Licence on 7th October, 2018. It is written in C and C++ language, a relational database system that supports SQL and has multiple storage engines such as CSV, Inno DB, etc. for data storage. It is cloud compatible, fast and easy to use, and functions with operating systems like Windows, Linux, Mac OS, etc.
The advantage of this DBMS is its simple and individuals can start off easily while it has a disadvantage of not being built for scalability. It's excellent for small businesses with sized amount of data because it's free and easy to setup.

MariaDB: A 2019 relational based open-source database management software. It has commercial support and works under a GNU General Public License. It has some resembling libraries, commands and API with MySQL, and usually viewed as its higher version. This software uses a wide array of high performance storage engines to work with the relational database management system (RDBMS) and it functions well with a several operating systems and programming languages. MariaDB originated from the MySQL engine, has plugins available at MySQL through third parties that can enhance its performance and has a great number of commands that are not available in MySQL

Oracle: A 1977 commercial relational database Management system that is run by Oracle Corporation. It works with various data forms like graphs, documents, etc., and is fully scalable. It runs on most operating systems like Windows, Linux and Mac OS. The advantage of this DBMS is its capacity to operate on large amount of data while the downside is the high cost of acquisition, difficulty of installation. It's utilized by international companies for the maintenance and handling of their organisational data across their local and international systems.

6 Conclusion:

This is a report on the customer data analysis techniques that Dinlinch Int'l LTD could use customer data analysis for the improvement of its customer acquisition and retention rate.

Based on the analysis of the techniques and tools discussed in this report, I recommend that the Dinlinch's customers acquisition and retention rate would be boosted if it generates data from its transaction reports, website and surveys using the Fulcrum software; processes the data collected electronically using Tableau to draw insights, adopts the OpenRefine software for the cleaning of the data then uses MySQL for its database management.

This recommendation was done base on Dinlinch's size and business model and receptiveness to technology.

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The Harvard Style referencing was applied.

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