Transition From Observation To Knowledge To Intelligence (TOKI)

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Evaluation of Diagnostic Analysis and Predictive Analysis for Decision Making

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Abstract. Organizations operating in todays' business environment are moving towards the use of data to improve decision making. Data analysis is not just the collecting of data but, the processing and visualization which is crucial for decision makers to be able to obtain organizational benefits. There are mainly four types of data analysis: Descriptive data analysis, Diagnostic data analysis, Predictive data analysis, and Prescriptive data analysis. This paper seeks to understand if diagnostic data analysis and predictive data analysis complement each other or if one is better that the other for decision making. Both analysis methods were evaluated based on applications in different industries, benefits they offer and drawbacks. This paper concluded that it is difficult to say diagnostic data analysis is better than predictive data analysis as both can be used equally at various point in an organization to enhance decision making.

Keywords: Data Analysis, Predictive Analysis, Diagnostic Analysis, Decision support

1. Introduction

Organizations operating in todays' business environment, are moving towards the use of data to improve decision making. Data is becoming an essential component of decision making at various levels of management in an organization. This information support is applicable for decision making processes at all levels of the enterprise, and the way of organizing them is also becoming increasingly important. As digitalization takes centre stage across services and sectors in various economies, the volume of data keeps growing daily and analytics is becoming more relevant especially for organizations. Data analysis is not just the collecting of data but the processing and visualization, which is crucial for obtaining organizational benefits. The application of data in todays' organizations allows these organizations reach a better competitive advantage. Data analytics and data science although used interchangeably are different, data analytics focuses on processing and performing statistical analysis on existing data sets (Kościelniak & Puto, 2015).

According to Amos (2018), Data science is an interdisciplinary field that uses scientific methods, processes, algorithms and systems to extract knowledge and insights from data in various forms, both structured and unstructured, similar to data mining. It is not only a synthetic concept to unify statistics, data analysis and their related methods but also comprises its results. It includes three phases, design for data, collection of data, and analysis on data. Good data scientists will not just address an organizations problems; they will pick the right problems that have the most value to the organization. There are mainly four types of data analysis: Descriptive data analysis, Diagnostic data analysis, Predictive data analysis, and Prescriptive data analysis. This paper however focuses on comparing Diagnostic data analysis and predictive data analysis for decision making. It is extremely difficult to capture and analyse data from the future however, there is a way to forecast the future using data from the past, it is called predictive analytics, and a few organizations currently use predictive analysis.

2. DiagnosticAnalytics

Diagnostic analysis is sometimes seen as reactionary, it is analysing past data to discover cause-effect links, gaps in procedures and policies. Diagnostic analysis uses past data, to arrive at a conclusion about "what went wrong and why it went wrong," the information generated helps decision makers make decisions on how to rectify errors after they occur. Improved by machine learning, diagnostic analytics helps decision makers avoid bias and misinterpretation of causation factors.

It has being observed that diagnostic analytics blended with artificial intelligence (AI), machine learning and proficient expert knowledge may adequately answer the question: Why did it happen? When decision makers understand why it happened they can then step ahead to address the issue: What is next after the incidence or error occurs? Vesset et al. (2018), predicts that by 2021, 25% of big companies will have augmented data analysts with data ethnographers to contextually interpret data through a high-quality research methodology that reveals peoples inner core as emotions, personal stories, and outlook on the world.

2.1. Examples of Diagnostic analytics in Decision- making processes

Diagnostic data can be automatically recorded by infrastructure, vehicles, machines, software and devices for the purposes of troubleshooting problems (Spacey, 2017).

Infrastructure: For example, a telecommunications base transmission station (BTS) system can send diagnostic reports to the maintenance system that analyses the data for problems.

Transportation: A planes' engine can send diagnostic reports to operational databases that can be used by maintenance teams to troubleshoot things such as faults.

Systems: A banking website maintains error and access logs that can be used to troubleshoot incidents.

Devices: Devices such as mobile phones may transfer error and usage data to a centralized repository that is used to identify and fix

bugs. It is usually possible to use data anonymity techniques to protect the privacy of users.

2.2. Benefits of diagnostic Analytics

One of the top benefits of diagnostic analytics is its ability to offer perspective to an organizations problem through selected data models.

Diagnostic analytics is an important phase after a business has carried out descriptive analysis. Diagnostic analytics takes advantage of organizations past data available through several internal sources.

2.3. Drawbacks and Criticism of diagnostic Analytics

Even though diagnostic analysis relies on promptness and precision of machines, it is key that data analysts do not to misread patterns as the cause of an organizations problem. Rather this findings ought to be used to enhance decision making. Several organizations, who understand "what" the problem was and "why" it occurred may not be satisfied with diagnostic analysis alone. Having a futuristic mind set to the possibilities the future holds may be of better value, hence predictive analytics.

3. Predictive Analytics

Predictive analytics is a classification of data analytics focused on forecasting the possibility of future outcomes in various industries based on past data and analytics methods which includes statistical modelling and machine learning. Predictive analytics may be able to create forecast with substantial accuracy. Predictive analytics, enables organizations use past and present data to project patterns and behaviours days, months or years ahead. For every organization, big or small, the ability to anticipate the future is the key to sustainable growth and sometimes even the very existence of the organization depends on it. Usually, data patterns are utilized in building a model that tracks key trends after the data collected has been analysed. The result can subsequently be used by decision makers to propose steps to follow for getting the best result.

When considering predictive analytics, organizations can choose a proactive method by forecasting outcomes prior to implementing a

procedure. According to Datta (2015) IBM noted that this approach not only knows how to forecast when something may go wrong or improve but when to intervene in the first place. It is fundamentally taking an immediate response method to organisation procedures. The result can maximise outcomes and profit for any product launch, advert or key organisation activity. It also keeps decision makers more knowledgeable giving them the opportunity to make effective decisions for improving profitability. In the very near future, it will not be sufficient to depend on past data only. Organizations will require informative data from its structured and unstructured data to understand the possibilities of what to look forward to in the future. Predictive analysis uses "telescopic" and "microscopic" views to link seemingly unlinked patterns for more focused results. This is achieved by using some methods such as; regression model, decision tree, clustering, neural nets, text mining etc.

According to Amos and Ndjock (2018), it is erroneous to think that Big Data can produce patterns, trends, from a huge collection of data without (1) reflecting on end-users of the information, particularly for solving decisional problems) and (2) specifying what data to collect. However, using the seven steps of Economic Intelligence (EI). Predictive analysis can be carried out at the fifth stage after calculation of indicators. According to Amos and Ndjock (2018), Economic Intelligence (EI) is the process of collection, processing and distribution of information with the goal of reducing uncertainty in taking strategic decisions. The Economic intelligence process is a seven-step process as follows:

- Identifying and specification of a decision problem.
- Transforming a decision problem to an information problem.
- Identifying relevant sources of information
- Collection of information
- Calculation of indicators
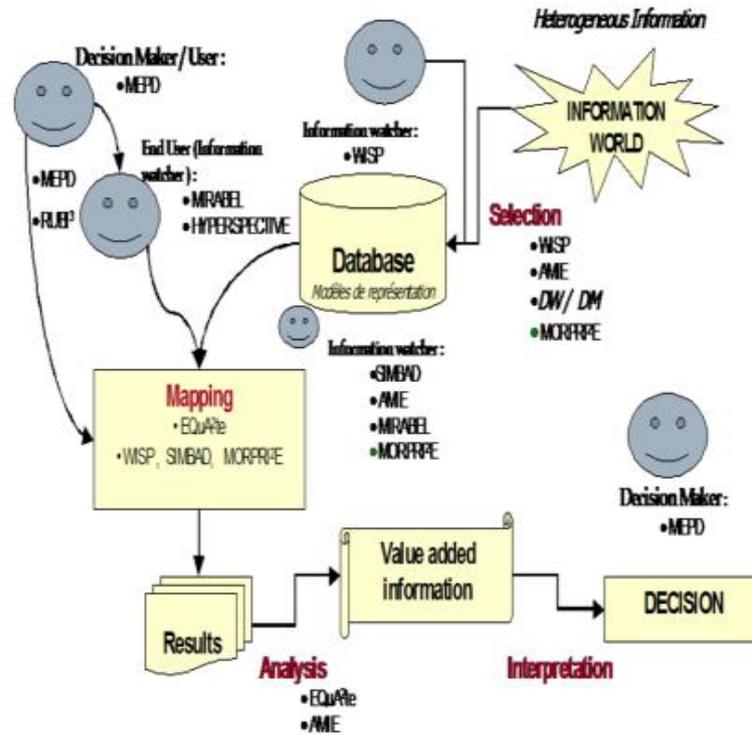- Interpretation
- Decision

Figure1: Architecture of EI system

3.1. Examples of predictive analytics in Decision- making processes

In 2012, Ulanoff (2014) stated that Amazon filed for a patent, officially known as "method and system for anticipatory package shipping," According to the patent, this forecasting model uses data from prior Amazon activity, including time on site, duration of views, links clicked and hovered over, shopping cart activity and wish lists. When possible, the algorithm also sprinkles in real-world information gleaned from customer telephone inquiries and responses to marketing materials, among other factors. This can offer "decision support for speculative shipping of items," per the patent. Similarly Siegel (2013) stated that Microsoft helped develop technology which, based on GPS data, it accurately predicts one's location up to multiple years beforehand. According to *Kalakota (2014)* Target predicts customer

pregnancy from shopping behaviour, thus identifying prospects to contact with offers related to the needs of a new born's parents. Tesco (UK) annually issues 100 million personalized coupons at grocery cash registers across 13 countries. Predictive analytics increased redemption rates by a factor of 3.6.

3.2. Benefits of Predictive Analytics

It is possible to use predictive analytics across various aspects of the day to day operation of an organization to enhance decision making. It can be used in key areas such as: product launch, marketing and many more. Predictive analytics offers key decision makers decision making tools to better many areas of an organisation, for instance, sales, marketing and profit projections, product reengineering, and product development.

3.3. Drawbacks and Criticism of Predictive Analytics

Organisations hoping to use data to guide decisions need to understand what decisions are to be made, what data is required for analysis, they also need to understand how to get relevant data from a series of events, and occasionally big data sets are difficult to get. Even though an organization may have adequate data, sceptics dispute that when considering human behaviour computers fail to factor changing variables such as seasons, state of mind, associations and much more which have the ability to influence the outcome of events.

4. Conclusion

The evaluation of Diagnostic analysis and predictive analysis has revealed that most organizations decision support processes are largely diagnostic, providing insights after the event or interference happens. Using diagnostic analysis only should no longer be an option most organizations accept. Organizations truly excelling will be those who have uninterrupted, responsive, reliable access to the systems and information they require for decision making whether they are trying to understand what happened? Or trying to forecast what may happen. However the aim of predictive analytics is not to predict with certainty

future events, it is to forecast what may occur futuristically because predictive analytics are generally probabilistic. It is therefore difficult to say one is superior to the other when evaluating diagnostic analysis and predictive analysis both can be used equally at various points in an organization to enhance decision making.

However more work needs to be done to analyse case studies of organizations using diagnostic data analysis and predictive data analysis to enhance decision making.

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