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THE IMPACT OF IMPLEMENTING DATA MINING IN BUSINESS INTELLIGENCE

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ABSTRACT

In today's world data became the new gold & extracting these golds created a new opportunity to business, this will allow the business to generate a valuable data which can be used to analyze the customer patterns. This re-search will study the data mining, the research question will be what business intelligence will benefit out of data mining implementation. To answer the research question & reach the result and conclusion in this research, information from different trustworthy books & articles were collected, After the data was collected, we analyze these data, after the analysis it has been found that data mining is very helpful for the businesses, it gives the business a better understanding of the customers, market condition, & many others. In this study, & based on the results, it is highly recommended for the business to use the data mining, for a better knowledge & higher profits.

Keywords: Data Mining, Business Intelligence, Knowledge Discovery of Database

INTRODUCTION

Data is a major thing in today's world, the success of the businesses today is very much depending on the information the business has, & the data analyzed by the organizations. The businesses today must be updated in order to compete in the market. To stay updated, the businesses needs to have data & analyze the data, to know their customers, their needs, study the competitors …. etc. Traditionally the way of analysis used to be by analyzing a structured data, which is an organized number collected to be analyzed to convert them into a useful information. However, approximately 80% of the data are unstructured data, which were not analyzed in the traditional way (Bavota, 2016). Data mining will allow the analysis of the un-structured data, so this will open a big source of information for the businesses nowadays, to help them compete and survive in the current highly competitive market. The businesses today has to make decisions that are very important to their survival, yet to make these decisions correctly, they must have a data to predict, know the market trend, & know their customers, so to do that they must do business intelligence. Business need to minimize the mistakes in decision making, as such mistakes might be catastrophic (Dam, Le Dinh, & Menvielle, 2019). This paper will study the benefits of implementing data mining and business intelligence in the business sector.

Business Intelligence and Data Mining

Business intelligent is a modern approach to analyze the raw data by transforming them into the information to have a making decision it include different methodology, process & technologies. Business intelligent is important for better decision making, avoiding threat and funding new business insight and opportunities. Business intelligent is important to be used for many organizations working in different industries. Business intelligent can use structured data for analysis however no unstructured data can be used to gather information this can make the decision based on incomplete information which will affect the correctness of the decisions (Llave, 2018). Data mining is analysis method where structured & unstructured data will be an-alyze this method go beyond only analyzing numbers &

reports, using this method we can analyze image, video, text, email, social media and many more, this method can predict outcomes by find the patterns & correlations in database. Data mining is more complete method then business intelligent, data upon gathering are mostly unstructured & difficult to be analyze, Data mining will help to analyze the raw datasets & provide the business intelligence team with the information to make a conclusion (Shmueli, Bruce & Patel, 2016; Kassner, GrKger, Mitschang & WestkЏmper, 2015)

Knowledge Discovery

The customers and businesses are having a dramatically different relationship than in the old days. The companies today have to create new strategies, & ways to adopt to the new changes in their relationship with their customers, in order to make profit. The mass production & marketing where the companies used to make a mass production of their products then try to market their products which considering the customers taste and & has to be first in any of the business strategies in order to succeed. Data mining, data warehousing also the customer relationship management techniques can help the companies to act upon the customer's needs and wants as the new market dictates & requires. In the modern market, knowledge is a main key to survive in the business world, so the companies need to do knowledge discovery (Bathinda, 2012). Knowledge discovery: it is to convert the raw data into a useful and meaningful information, it's a key part of business intelligence & data mining. The data is stored in a database, then these data after some steps will be transferred to a meaningful information, these steps are KDD known as knowledge discover in database (Figure 1) (Sindhu & Sangwan, 2017).

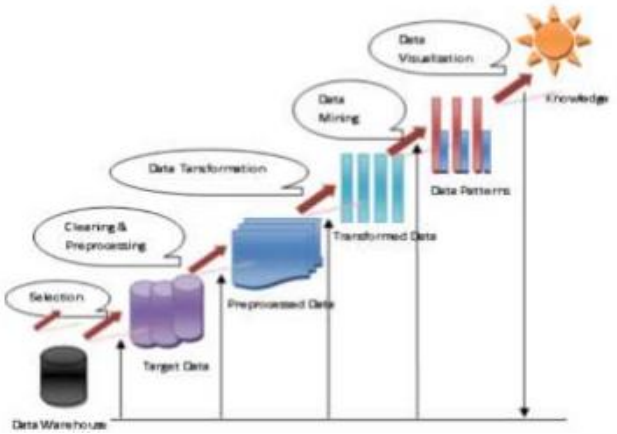

FIGURE 1
THE STEP OF KNOWLEDGE DISCOVERY IN DATABASES (Sindhu & Sangwan, 2017)

Data selection- the data warehouse contains a lot of data in it, so we need to select part of the data which match the business problem or what business wants to study. In other words, data selection is not sampling it choosing which point, and pieces of data are important to the issue you are solving. (Sindhu & Sangwan, 2017).

Data cleaning & preprocessing- After we targeted the data the next step would be to substituting missing values, smoothing noisy data, find outliers and fixing inaccurate information in database (Sindhu & Sangwan, 2017).

Data Transformation- The pre-processed data is mapping and convert data from one structure to another structure in order to perform the mining (Sindhu & Sangwan, 2017).

Data mining-in this stage the data mining will generate some patterns us-ing data mining techniques (Sindhu & Sangwan, 2017).

Data visualization -display findings that can be readable and graphically represented like bar chart, in this stage the knowledge is displayed as a chart. The business can make a decision based on the finding (Sindhu & Sangwan, 2017).

DATA MINING TECHNIQUE

Classification

Data attribute transferred into classes which can help to forecast consumer behavior like based on the customer purchase in supermarket we can identify the customer class (Bayer, Aksogan, Celik & Kondilogluc, 2017).

Association

Is used to find the connection between the variables, for example if the customer buys certain item then they are going to buy another X item (Bayer, Aksogan, Celik & Kondilogluc, 2017).

Clustering

The objects that are similar in database can be grouped by used the algorithm, for example it can be used for customer profiling and segment (Bayer, Aksogan, Celik & Kondilogluc, 2017).

Regression

Is one the data mining techniques which is used to identify the connection between two or more variables (Bayer, Aksogan, Celik & Kondilogluc, 2017).

Prediction

similar to classification method but instead of finding the classes we are predicting value for a numerical value by using the past data (Dam, Le Dinh & Menvielle, 2019). Each of the techniques mentions has advantages and also disadvantage. How useful is the methods depends on some factors like dataset size, pattern type in the data whether the data comply with the assumptions in the methods, noisiness of the data and analysis goal (Shmueli, Bruce & Patel, 2016). The result of the methods and their performance can vary according to the meth-od. In data mining it is regular process to apply multiple methods to see the best method for the goal and accordingly the best method will be chosen. (Shmueli, Bruce & Patel, 2016).

Applications Of Data Mining In Business Sector

Data mining in business Intelligence have increases in popularity over the past decade. The data mining provides more techniques which can be used to extract customer pattern, this can help the business in understanding the customer preference, amount spent, product preference & the customer satisfaction.

Retails

The transaction information which are done by the consumer is stored in data warehouses & never accessed again for cleaning or research purpose in past 20 years but with the help of data mining this data can be useful to predict potential sales and make it easier for business owners to monitor purchases by their customers (Maksood & Achuthan , 2016). Walmart which is one of the biggest retails in USA, failed to in e-commerce and marketing online so it began using digital interfaces to obtain the customers information and link them with their personal accounts, also they will try to find some information about consumer in online, these data where based in a new data mining technique to find consumer behavior. Consumer behavior can predict their next purchase, when they will visit the store, disease prediction, comparison with global consumption strategies & other biological effects. The

digitized world where we log a record into a database every move we take, & the precise manipulation of these records is the reason why Walmart achieves great success (Maksood & Achuthan , 2016). Target is another popular retail in USA, implements data mining to predict pregnancy in their customers based on their previous purchase and when they found she will be pregnant they sent her a promotion for baby stuff (Maksood & Achuthan , 2016).

Insurance

In many business activities, data mining is used, such as carrying out complex classifications & correlations, gathering new clients when referring to current ones, developing & choosing policies. The technique which can be used are: (Mishra, Hazra, Tarannum & Kumar, 2016).

Detection of fraud: It is possible to examine the variables that indicate a high possibility of an allegation or a fraud taking place and its numerous trends. (Mishra, Hazra, Tarannum & Kumar, 2016).

Consumer retention & segmentation: Identify packages and promotions that could improve customer satisfaction and include each new customer in suitable categories (Mishra, Hazra, Tarannum & Kumar, 2016).

Telecommunication

Telecommunication has now evolved from local & long-distance voice communication to modern pager, fax, email, & mobile phone strategies. They are now incorporated with numerous networking systems such as the Telephone, networks, & computers. The data mining which can be used are: (Mishra, Hazra, Tarannum & Kumar, 2016).

Cluster analysis: In the telecommunications sector, fraudulent activities face a significant danger. Network efficiency is influenced by these events. Clustering can help to identify these deceptive trends & increase the efficacy of the different contact services. (Mishra, Hazra, Tarannum & Kumar, 2016).

Banking

The banking system contains a lot of data where data mining can be used to help the bank make a better decision making. In their decision-making, banks who implement data mining strategies tremendously profit & hold an advantage on those that don't. Some of the fields where decision can improve banks are risk management, detection of fraud, marketing, identify money laundering & customer relationship management (Raj, 2015).

Marketing

The bank can analyze the past data, along with the present data to determine the customer behavior of different services and goods in order to achieve more market prospects. The data mining can be used to identify the good and profitable customer (Miyan, 2017).

Risk management

A certain level of risk is involved in each lending decision a bank makes. Defining this risk will simplify the process of risk management & limit the bank's risk of financial loss. Knowing the ability for the customer to repay can significantly improve the decision of credit management. Data mining can help the bank to identify which customer will repay on time and which will delay this can help the bank to take the right decision to prevent any losses. Data mining can analyze old data to predict some future patterns; also can improve credit rating (value which reflect the credit worthiness of a borrower) & forecast probability of default. Behavioral ratings are collected to predict their possible actions in diverse circumstances using probability models of consumer behavior. Data mining may use the

borrower's previous debt reduction habits to extract this rating by evaluating the credit history available (Mi-yan, 2017; Raj, 2015).

Fraud Detection

Banks lose millions of dollars in fraud annually so detecting a fraud in a transaction can help the bank & reduce the possibility of fraud occurring.one of the areas where fraud detection can be used is credit card product where we can apply data mining to analyze the history of the customer transaction & the risk of new behavior can be estimated to determine if it's a fraud. Customer transaction trends can be found, and warnings can be produced if any detectable anomalies are observed. Another area for fraud detection is in financial statement. These statements can contain overstated income, revenue, & income, so this may contribute to money laundering. To identify money laundering in such programs usually consider custom-er risk evaluation data, transaction risk measurement data, & activity patterns. Based on their similarity contained in these selected characteristics, transactions can be identified if it's a money laundering (Miyan, 2017; Matthew, Yunusa, Gumel & Abdullahi, 2019).

Social Media

Millions of users are nowadays using the social media. For businesses, any post or tweet on a social media platform can be of useful data in order to analyze the customer patterns & also to keep in touch with their customers. The social media especially important for small business as they are lacking some resource compare to the competitors so with the help of data mining they can analyze social media to maximize the efficiency of the business and keep ahead of competition and consumer expectations. By analyzing social media the businesses will know more about their customer's needs ,taste and preference and how to satisfy their customers, so form this knowledge they will be able to target the customer in their advertisement , tailor their product as per the customer preference and satisfy their customers (Balan & Rege, 2017).

Other Applications

Manufacturing- The manufacturers needs to predict the customer preference in order to customize the product that best meet the customer's taste (Bathinda, 2012). Warranties- The manufacturing need to identify the number of consumers who are willing to claim their warranty and expense of those claims (Bathinda, 2012). Frequent flier incentives- the airline can identify the customer segment who can be offer opportunities to travel more (Bathinda, 2012).

Compare Traditional Business Intelligence without Data Mining and Business Intelligence with Data Mining

A research paper conducted a questionnaire comparing BI with and without data mining using 10 performance metrics (Kumar, 2020)

Timely Information (TI)
Ease of Use (EU)
Data Analysis Capability (AC)
Strategic Information (SI)
Future Prediction (FP)
True Enterprise Wide Decision Support (DSS)
Improved Sales Measurement (IS)
Improved CRM (CRM)
Detecting Early Warning Sign (EWS)
Streamline Business Process (SBP)

Business intelligent without the data mining -analysis data and present it in such a way that its easier for the person to understand it and make a business decision

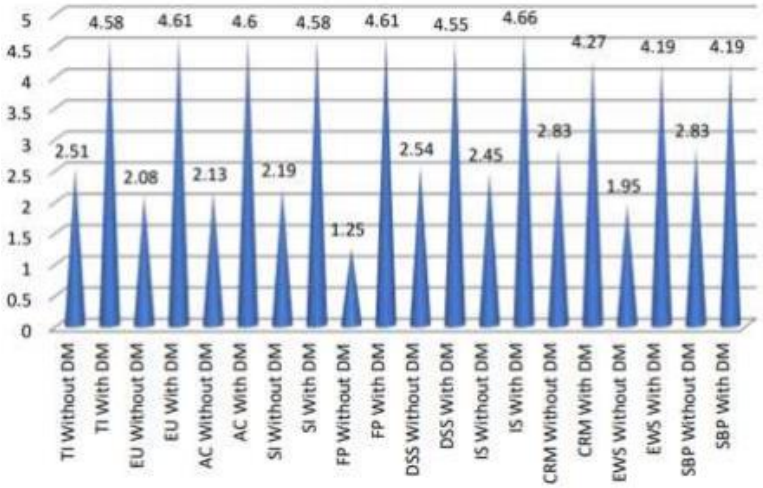

FIGURE 2
COMPARE BUSINESS INTELLIGENCE WITH/WITHOUT DATA MINING QUESTIONNAIRE RESULT (Kumar, 2020)

RESULTS

In this study, we found out that data mining can improve the business intelligence and enhance the profits of the business, such that the data the business can gain more understanding about the customer pattern and based on these patterns the business companies can react so this will boost the business profits and will decrease the risk when making a decision. Furthermore, because data mining can help business to know their customers, and the market trend, it will dramatically improve the marketing, and the way business do marketing. By gathering the data of the custom-er in the internet along with data available in the warehouse, data mining can be implemented to analyze data to find a much better understanding of the customers, as a result, business can know the customer history and based on that they can predict the customer next purchase, so this will reduce the level of risk. In addition, data mining is not only helpful for the big business, yet it can also help the small business-es, small business can benefit from data mining to analyze the customer preference for their good using the social media platform. In the banking sector, data mining can be used to identify money laundering, reduce fraud transaction, and find customer trends.

CONCLUSION AND FUTURE WORK

To conclude the business intelligence, need to implement the data mining techniques as it significantly improves the way business deals with data. The data mining techniques allows the business to get a better understand of their data as it allows business to have much more understand about their customer pattern and this can lead to an improvement in marketing .Furthermore the data mining can be used to analyze both structured and unstructured data, also it helps to identify any fraud within the system and also data mining can analyze the social media data. There are a lot of data mining techniques to be implemented in the business field but it's important to choose the right techniques to get the best result out of your data. Since we have seen some benefits in implementing the data mining to the business intelligent. The future work would be what are the risks in implementing data mining, in order to benefit from the data mining and reduce the risks that might happen from implementing the data mining.

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REFERENCES

Abazeed, A., & Khder, M. (2017). A classification and prediction model for student's performance in university level. *Journal of Computer Science, 13*, 228–233.

Ali, B.J., Bakar, R., & Omar, W.A.W. (2016). The critical success factors of Accounting Information System (AIS) and it's impact on organisational performance of jordanian commercial banks. *International Journal of Economics, Commerce and Management, 4*(4), 658-677.

Ali, B. J., Omar, W.A.W., & Bakar, R. (2016). Accounting Information System (AIS) and organizational performance: Moderating effect of organizational culture. *International Journal of Economics, Commerce and Management, 4*(4), 138-158.

Ali, B., & Omar, W. (2016). Relationship between e-banking service quality and customer satisfaction in commercial banks in Jordan. *American Based Research Journal, 5*(12), 34-42.

Balan, S., & Rege, J. (2017). Mining for social media: Usage patterns of small businesses. *Business Systems Research, 8(*1).

Bathinda, T.S. (2012). *Implementation benefit to business intelligence using data mining techniques*.

Bavota, G. (2016). Mining unstructured data in software repositories: Current and future trends. *In 2016 IEEE 23rd International Conference on Software Analysis, Evolution, and Reengineering (SANER,) 5, 1-12).*

Bayer, H., Aksogan, M., Celik, E., & Kondilogluc, A. (2017). *Big data mining and business intelligence trends*.

Dam, N., Le Dinh, T., & Menvielle, W. (2019). *Marketing intelligence from data mining perspective – A literature review.*

Hasan, H., Oudat, M.S., Alsmadi, A.A., Nurfahasdi, M., & Ali, B.J. (2021). Investigating the causal relationship between financial development and carbon emission in the emerging country. *Journal of Governance and Regulation, 10*(2).

Jalamneh, A.A, & Khder, M.A. (2021). Challenges of implementing cloud computing in the arab libraries environment. *Information Sciences Letters, 10*(1), 10.

Kassner, L., GrKger, C., Mitschang, B., & WestkЏmper, E. (2015). Product life cycle analytics–Next generation data analytics on structured and unstructured data. *Procedia CIRP, 33*, 35-40.

Khder, M.A., Fujo, S.W., & Sayfi, M.A. (2021). A roadmap to data science: background, future, and trends. *International Journal of Intelligent Information and Database Systems, 14*(3), 277-293.

Khder, M.A, & Abu-AlSondos, I.A. (2021). Business intelligence and data mining: Opportunities and future. *European Journal of Business and Management, 13*(11).

Kumar, P. (2020). *Business intelligence with and without data mining - A comparative study*.

Llave, M. (2018). Data lakes in business intelligence: Reporting from the trenches. *Procedia Computer Science, 138*, 516-524.

Maksood , F.Z., & Achuthan , G. (2016). Analysis of data mining techniques and its applications. *International Journal of Computer Applications, 140*, 6-14.

Matthew, U.O., Yunusa, M.M., Gumel, A.A., & Abdullahi, A.B. (2019). *Data mining applications in banking sector for effective service delivery.*

Mishra, B.K., Hazra, D., Tarannum, K., & Kumar, M. (2016). *Business intelligence using data mining techniques and business analytics*. 84-89.

Miyan, M. (2017). Applications of data mining in banking sector. *International Journal of Advanced Research in Computer Science, 8*(1).

Oudat, M.S., & Ali, B.J. (2021). The underlying effect of risk management on banks' financial performance: An analytical study on commercial and investment banking in Bahrain. *Ilkogretim Online, 20*(5).

Oudat, M.S., Ali, B.J., & Qeshta, M.H. (2021). Financial performance and audit committee characteristics: An empirical study on Bahrain services sector. *Journal of Contemporary Issues in Business and Government, 27*(2), 4279.

Raj, S. (2015). A review of data mining applications in banking. *International Conference on Recent Advances in Electronics, Computer Science and Information Technology.*

Salameh, A.A., Abu-AlSondos, I.A., Ali, B.J., & Alsahali, A.F. (2020). From citizens overview: Which antecedents' can assist to increase their satisfaction towards the ubiquity of mobile commerce applications? *International Journal of Interactive Mobile Technologies, 14*(17).

Shmueli, G., Bruce, P.C., & Patel, N.R. (2016). *Data mining for business analytics: concepts, techniques, and applications with XLMiner (3rd edition).* New Jersey, United States of America: Jogn Wiley & Sons.

Sindhu, D., & Sangwan, A. (2017). Optimization of business intelligence using data digi-talization and various data mining techniques. *International Journal of Computational Intelligence Research, 13(8).*