

Research Article

Data Mining and Soft Computing in Business Model for Decision Support System

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Several studies were taken to effectively determine the importance of data mining in business model development for decision support system. It was later discovered that most businesses have invested heavily in the data mining process which enables them to easily study and analyse the market environment and improve their domination in the market. Data mining is a process used by most firms to effectively collect information about certain topic. One factor that business model development usually focuses more on is the value of measurable performance and increased innovation in the market. The aim of the current research is to investigate the values and key roles played by data mining prospects in the business model development. It also revolves around current techniques used within business model development that are crucial in enhancing the position and competitiveness of a firm in the market. Although the data mining prowess varies in regards to the firm and effort used, the main concept remains on how to fully have the firm understand the effects and role played by data mining techniques in their overall business flow. In methodology, secondary sources are categorically used to enhance the overall flow of the study question by comparing them and analyzing them using the techniques provided. The results and analysis reveal that the effects of using data mining techniques are huge towards achieving success for various businesses. Moreover, the practical implications have categorically increased the notion of how influential the prospects of data mining can be when applied in businesses.

1. Introduction

The value of measurable performance and increasing market innovation is one area that business model development normally focuses on. Data mining has been one of the most influential prospects that have enabled firms to effectively increase their output in the market. This prowess gives the firms a complete control of managing how their clients perceive their overall business functions making it easy for them to fully take over all controls that affect the clients. There is also a huge difference that gives each firm applying this prospect to fully become adaptive in various schemes. Hence, when the market changes to reflect on other prospects that affects the society, it becomes easy to fully remain competitive without facing or undergoing any challenges of a breakdown or a fall in the business activities. Therefore,

through data mining, the firm can easily incorporate specific client goals and specifications.

2. Business Model Development

A data mining is a process used by most firms to effectively collect information about certain topic. In most cases, these topics help firms to visualize about their position in the market. Business models, according to the literature, can be regarded as “cognitive” gadgets, and their use necessitates the acquisition of extensive knowledge about customers, suppliers, and competitors. Recent experimental investigations have shown that the use of data-mining technologies has a favorable impact on business models, boosting strategic performance skills that drive competitive advantage. In research by [1], the purpose was to strengthen studies on the

interaction between data-mining tools and business model design by examining whether organizational heterogeneity related to data-mining technologies might help or impede data-mining adoption in a real-world setting [1]. In another study, Lee and Jung [2] established prospects in which they tried to understand the relationship that exists between new big data of ships and the demand from clients. It was discovered that the presence of a new business model in the ship manufacturer industry established prospects that enhanced the growth of the business across the globe. The essence of the business model in this stage has also enabled various stakeholders to effectively increase their production process. One factor that business model development usually focuses more on is the value of measurable performance and increased innovation in the market [3].

Business model development requires creativity and innovation to be a regular aspect. It also involves understanding all the prospects about clients and how their behavior is crucial in enhancing the overall business activities of any firm. In their study, Breuer et al. [4] discovered that the society lacks a shared knowledge that enhances sustainability in a modelled business. Through this sustainability, enterprises can effectively understand the values bestowed towards data mining at their firms. In the current regime, the prospects of the changing market have forced researchers to embark on a study mission of trying to evaluate the effects of data mining on a broader market. A research conducted on the Indian market by Suma and Hills [5] tried to find reasons why data mining is efficient in understanding the demand for refurbished electronics. Through this business model setup, it becomes efficient for an individual to effectively focus more on the data accumulation and validation as a tool of creating new models of business opportunities. Data mining can also be used to predict the demand from clients and their likelihood to consume certain manufactured products. It can also be used to effectively shed light on all nonlinear factors that determine and describe online market [6].

2.1. Current Techniques Used within Business Model Development. The concept of business model development has evolved since ancient time. Traditionally, the techniques which were commonly used involved aspects such as brick and motor stores, advertising-based, direct sales, and franchising [7]. Despite their prowess in increasing the values of various industries, their efficiency has slowly been overpowered by the emerging techniques being introduced across the globe. A study by Sullivan et al. [8] conducted research on understanding the use of AI techniques as an alternative of boosting the business model in law firms. Through this approach, it was evident that the future is geared towards having AI services replace the roles being handled by humans. There are various techniques that are used in the business world today. According to Täuscher and Laudien [9], techniques such as subscription model, commission model, and advertising model are mostly preferred. Subscription model involves having clients to fully pay a recurring amount on a regular basis for particular services

[10]. Brands which have fully implemented these services are movie and video streaming companies such as Netflix. Also, TV providers are also using this approach as the best option of conducting business. The advantages of this model are enabling the firms to retain the clients as well as simplifying the business process.

However, according to [11], the challenges of this model include management of subscribed clients. It becomes a difficult task for the firms to effectively manage the huge traffic that they experience simultaneously. Another huge challenge is the security of the payment done by the clients [12]. Another technique being used in the business world is the bundling model. Through this approach, a firm easily sells two products as a single unit [13]. Some of the firms that have specialized in this type of business include Adobe Creative Suite and AT&T. Besides, fast food firms also use this model to attract more clients to their business [14]. However, the main challenge that this model has is reduction in the profit model which makes the business to face losses in the long term [8]. Another common business model that companies have resorted to use is the freemium approach. In this model, a company offers its services for free but has a limit on services that the client can access [14]. Hence, after reaching the freemium limit, the client will be required to subscribe to more content in order to enjoy the services on board. The main challenge of this approach is that clients would easily opt for other services from competing companies [15].

2.2. Data Mining (Definition and Concept). Data mining is a concrete process that most firms use to effectively convert raw data into meaningful information. These firms target to achieve a certain range of competitiveness in the market by being directional and unique [16]. Therefore, they effectively engage their services in prospects that utilize most of their raw data to their benefits. In the long run, the firms end up having a robust system that gives them the power to effectively understand the needs of the clients. According to [17], data mining is a crucial process that firms use to effectively make lasting decisions for their activities. Through this process, the management fully understands the values and perceptions of all clients. It also accounts to how the products of the firm are received across the market. In different firms, the usage of data mining involves concepts such as forecasting, grouping, finding sequences, risk, and probability. When forecasting, a company estimates its sales while predicting server loads or down time. Grouping involves putting clients in clusters while predicting their affinities. In the risk and probability, most firms would easily use it to select the clients who can be used for targeted features such as mailings [18]. Since collected data seem to be made out of various sources, having a robust system that groups them would easily enhance the flow of business. In most cases, the firms use the space and values of data mining to make decisions that affect the values of the group. It is through such steps that people end up becoming effective and resourceful in their respective firms. In addition, the concepts and techniques used in data mining are useful

prospects that guide the company to fully understand their position in the market by analyzing how their clients respond to their products and goods. Another key factor of data mining is based on aspects such as integration, subject orientation, and time variant. These aspects help the firms to effectively understand their market and focus more on producing products that align with the requirements of the clients. Despite being a broad concept, the values demonstrated by the concepts in data mining are unidirectional and effective in enhancing all the activities conducted by the firm. Therefore, implementing data mining in any business is a key factor that helps firms to achieve success faster and grow while understanding the basic values that mean so much to their clients.

2.3. Data Mining Techniques and Application. There are many data mining techniques that can be used to effectively help boost the firm's performance in the market. These techniques are strategically set up to enable the firms to be successful in the market. The important factor when dealing with these big data is the essence of understanding how to use them for the good of the company. In most cases, the data mining techniques have become the ideal stopovers that have helped firms to remain competitive. In research by Majumdar et al. [19], data mining techniques were found to be an important element of accomplishing solutions to such a problem. An example of this is where big data is used in agriculture, where there is a large number of factors such as soil differences, environmental influences, and commodity pricing. This is why it is vital that farmers use data methods when deciding. Examples of data mining techniques used in agriculture data include PAM, CLARA, DBSCAN, and Multiple Linear Regression. In another research, Alahmar [20] used data mining techniques to determine the length of hospital stay for patients. It was later discovered that using the stacked ensemble was an effective approach that was crucial in predicting short and long LOS for patients with both diabetic I and II. Hence, through the use of the stacked ensemble technique, the results automatically validated this approach and ensured that it can be applicable in various situations. Other important techniques that can be used in the world today include clustering, regression, classification, sequential patterns, and prediction. The application of these techniques in various institutions is one of the important factors behind the usage of data mining. Clustering ensures that the data recorded are sorted in a manner that enables the firm to understand how their clients value their services. Clustering also plays an important role in helping sort the available data into small groups that are easy to assess [21]. For instance, when dealing with records of people living in a certain region who uses a specific brand of petroleum jelly for their daily activities, using a cluster will ensure that those who prefer brand A and those who prefer brand B are categorically sorted and their needs are fully implemented. In this example, the clustered approach will allow the firm to put the clients in a certain category that will help in identifying more needs that are vital for the progress of the firm. In their study, Saxena et al. [21] used clustering techniques to

effectively determine the similarity complex of customers in any business environment.

2.4. Potential of Data Mining to Support Business Model Development and Who Can Benefit from It. Data mining is employed by companies to discover connections in data to make improved business decisions. It can also be used to help investigate the patterns in sales, to predict customer loyalty, and to develop marketing methods. The following are some examples of data mining applications: market segmentation, fraud detection, interactive marketing, trend analysis, customer churn, direct marketing, and market basket analysis [22]. Market segmentation is the process through which businesses determine the common features of customers who purchase the same items from them. Through customer churn, the firms can easily predict which clients are most likely to abandon your firm for a competition [22]. In the essence of fraud detection, data mining is used to determine which transactions have the highest likelihood of being fraudulent. Moreover, trend analysis helps firms to determine clients and their probability of shopping with the firm [23].

Therefore, these prospects prove that the firms which deploy the data mining techniques benefit as compared to those that no longer use this approach. For instance, a bank may want to effectively determine if the use of its credit cards can be effective if the prices charged are reduced to halves. If this approach uses data mining, the firm would end up determining that their clients prefer services that are likely viable for their specific income [24]. Hence, in this example, the values of data mining remain to be high and would forever be the ideal approach used by firms in that region. In another study, Härting et al. [25] determined that business models and procedures have altered dramatically as a result of new advancements in digitization technologies such as Big Data and Data Science, and new business models have emerged in unprecedented numbers. Their research involved four potential prospects that aimed at improving the businesses by evaluating the weakest points while determining the best approaches that can be used to help them be more competitive in the market. A study by Sarkar et al. [26] used data mining techniques to effectively understand the occurrences of accidents at the workplace. It was later discovered that the values and prospects of the data mining technique were based on the availability of this drive from the management [27]. Hence, if the management has fully embraced the data mining technique, it becomes easy for the firms to grow and realize a huge potential in the market [23, 28].

3. Methodology

The data collected for this research study is secondary data. Secondary data is derived from second-hand sources or published sources. The data are collected from various sources such as journals, books, and scholarly articles. The reason for using secondary data in this research is because it supports the analysis of the data of this study for a long

period of time, and in addition to that, the researcher(s) can find additional data from the primary data that contribute to supporting the results of the current business models on the previous studies. As well, it would help with the use of this study outcomes to involve more results. Answering the research question will largely be done through analyzing the work which has been done on this topic so as to understand how businesses have been made use of data mining. The inclusion criteria for this review include papers on businesses which have employed data mining techniques. The research question will be answered through conducting a literature review including articles derived from different search engines, such as Google Scholar, DBLP, and IEEE Xplore. The findings are displayed in Table 1, which compares the article use of data mining techniques.

In Table 1, we see that there are various articles which categorically reflect and value the usage of data mining techniques. For instance, research papers usually involve peer reviewed papers and would entail GIS spatial analysis. In the essence of raw data, the data mining tasks involved are data preprocessing. There is also the use of previous studies which focus on clustering and DBSCAN.

Research Question: What is the impact of data mining application in product/business model development?

4. Findings

The research question was answered using business papers that focused more on data mining techniques. Analysis of these samples was based on the approaches used which effectively increased the chances of collecting credible information about the research question. From the collected samples, it is evident that all infrastructures bestowed towards achieving a long-lasting goal would easily be influential in determining the analysis of the research question. Most of the studies used previous research that had focused on analyzing the data mining techniques. Hence, it becomes easy to effectively come up with joint analysis that helps businesses to effectively analyse their position in the market. Data mining has proved to be an important factor that businesses use to collect more information about their position in the market. It is clear that businesses which opt for any of the data mining approaches end up having and recording a mileage of success factors that effectively push them to be more successful. In business model development, data mining is also an important factor that can determine various prospects for the firm. Data mining techniques can also be utilised when inputting data to find the most effective performance strategy. A study by Majumdar [19] uses the PAM, CLARA, and DBSCAN data techniques to explore the best range of temperatures and wheat climate requirements to optimise crop productivity. Quality metrics are used to compare clustering algorithms. It was found that DBSCAN provided better clustering qualities than the PAM and CLARA techniques. Therefore, the importance of the current paper findings is to easily analyse how data mining techniques are important in enhancing the business prowess of any firm. Besides, businesses which employ the

use of this approach would easily record improvements in their activities.

5. Discussion

5.1. Impact of Data Mining Techniques on Business Model Development. Business model development is a process that needs the combined input of all parties in a firm. Through this, it is easy for the firm to record their progress from one stage to another. Data mining could be used by a department store to aid in its target marketing mail campaign. Another way in which data mining techniques can be utilised is to determine which customers are likely to purchase more products based on the purchases they have made, through mined strong association rules [21]. This allows the organisation to send marketing and promotions to specific consumers who are likely to purchase items and improving sales. On the other hand, simplistic statistical analysis is incapable of handling vast amounts of data. There are various data techniques used in the research. A healthcare organisation, for example, can employ data mining to help with adjudication, claims, COB, and acceptance and rejection processes. Data mining functions including association, classification, and clustering are used. Organisation datasets can leverage the association to identify certain groups of claims that are likely to be submitted electronically, on paper, or through a web portal. The system may use this data to create numerous BI dashboards and analyses about the intake process [28]. In claim processing, data processing is also utilised to recover and uncover additional patterns. In another research, tenfold cross validation, two decision tree classifiers, classification and regression tree (CART), and C5.0 were implemented. Additionally, adaptive boosting, an ensemble technique, has been used to improve classification accuracy. The results reveal that for the prediction task, enhanced C5.0 produces more accuracy than the others. In addition, the rules derived provide insight into the situations. Another study focused on gradient boosting data technique. Multiple additive trees (MATs), or gradient boosting, is a novel improvement in data mining introduced by Friedman at Stanford University. It uses stochastic gradient boosting to extend and improve the decision tree (DT) model [28]. Boosting is a broad strategy for attempting to “boost” the efficiency of any given classification model by fitting a series of limited models and then combining them.

These techniques imply that the validity of the process used is essential in improving the outcome received. Therefore, when the new models are put in place, firms can easily meet the needs of their clients while maintaining their validity in the market. The outcome received proved how influential the process of data mining is and how it can effectively be used to transform the performance of a product from zero to greatness. Marketing firms use data mining to create data models and forecasts based on past data [29]. Promotions, marketing strategies, and pivots are all run by them. This leads to rapid growth and success. The retail business and marketing firms are on the same page. They believe in prediction models for their goods and services as a result of data mining. Better production and

TABLE 1: The current articles that use data mining techniques.

Article	Business resources	Database types	DM tasks	DM techniques/applications
[23]	Research papers	Peer-reviewed research papers	Inverse distance weighted (IDW)	GIS spatial analysis
[26]	Tenfold cross validation	Tenfold cross validation	Reactive and proactive data technique	Adaptive boosting
[27]	Raw data	Raw data	Data preprocessing	Data preprocessing
[21]	Previous studies	Previous studies	Clustering	Clustering
[19]	Previous studies	Previous studies	Data analysis	PAM, CLARA, DBSCAN, and multiple linear regression
[29]	Previous studies	Previous studies	Clustering	DBSCAN
[24]	Previous studies	Previous studies	Clustering	Clustering
[30]	Previous studies	Previous studies	Data analysis	CLARA
[28]	Previous studies	Previous studies	Data analysis	Association

TABLE 2: Advantages and disadvantages of current tool.

Tool	Advantage	Disadvantage
GIS spatial analysis	Helps in reading the characteristic of various places	It is costly to install.
Adaptive boosting	It effectively classifies text and images.	Conducting binary classification is difficult.
Data preprocessing	Eliminates redundancy of data	It is prone to bugs
Clustering	Contains greater scalability	It is difficult to recover in case the database fails

customer insights are possible in retail stores [3]. Historical data is used to calculate discounts and redemption coupons. Banks profit from data mining in terms of financial rewards and upgrades. They create a model based on consumer information and then examine the lending process, which is genuinely data driven. Manufacturers get their products. Table 2 shows the advantages and disadvantages of the tools used in data mining.

5.2. Future of Data Mining Techniques on Business Model Development. The outcomes have become a talking point that most enterprises use to define their prowess. The effective approaches used to collect insights help the firms to defend their worth and predict their position in the market. For all future prospects, using data mining techniques has proved to be effective because it allows the firms to fully predict how the behaviour of their product would impact competition from other entities [26]. Data mining techniques are especially useful over prior methods as they are more reliable and accurate in estimating future outcomes. Future inventory needs, shipments, and shop layouts can be managed through data mining techniques to increase sales [30]. This is useful for corporations as it aids with planning and using less resources. For instance, this technology is used to maximize occupancy and income of hotels, restaurants, and other hospitality settings through estimating the number of guests expected at a particular time period and planning accordingly.

6. Conclusions

The results show that improved C5.0 is more accurate than the others in the prediction task. The rules that are derived also provide insight into the situations. Another study looked into the technique of gradient enhancing data. Friedman at Stanford University presented multiple additive

trees (MAT), also known as gradient boosting, as a new breakthrough in data mining. Data mining models have become important dynamics that are also being used in predictive aspects. It is now easy to predict the future and determine how the firm would perform if certain measures are put in place. The limitation of the current work is on the concept of using various studies that use different techniques. Besides, the future of data mining is intact, and there is a slight hope of having increased efficiency.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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