

Role of Business Intelligence and Knowledge Management in Solving Business Problems

Eissa Mohammed Ali Qhal

Abstract: The term "Business intelligence" is described as a plan or a strategy where the operations like reporting, data analysis, data mining, event processing are performed to improve the production and growth of a business enterprise or a business entity. And on the other hand, the "Knowledge management" is explained as well-organized management of resources and information within a commercial organization it can be a business too. Almost all business will have limitations and challenges which can be also known as the business problems. One of the main business problem is demand, the business plans must work according to the demand of the consumers. Analyzing the demand would provide the solutions for queries like what is the business trend? What is the need of the users? What should be the improvement make in the production? Where is the current position of the enterprise? And who all will be the competitors? For the predictive analysis a dataset of bitcoin is taken. The major aim of the study is to implement the strategies to overcome the business problems mainly the demand prediction. And the objective is to find out the relevant issues and the remedies by using knowledge management and business intelligence to the common business problems. The dataset has columns called lowest price, highest price, open price, close price, trading volume and market capital. The research methodology used is predictive analysis using PCA and K-means clustering algorithm. By this dataset predictive plots are developed as achieved results for easy analysis by using research methodology. PCA and K-means are the algorithm used for accurate prediction. The importance of study is to predict the future sale, as it is very essential for a business enterprise to find future demand so that the organization can improve production.

Keywords: Business intelligence; knowledge management; business problems; PCA; K-means

1 INTRODUCTION

BI (Business intelligence) encompasses the technologies and approaches utilised by companies for the data analysis process and organization of business material. General purposes of business intelligence concepts comprises of numerous operations namely analytics, process mining, prescriptive analytics, predictive analytics, dashboard development, online analytical processing, benchmarking, data mining, complex event processing, text mining, business performance management and broadcasting[25]. Business intelligence concepts can operate on bulky quantities of organized and occasionally unorganized data to support, classify, create, and else develop innovative planned business openings. Which object to allow for the easy interpretation of these big data [14]. Identifying new opportunities and applying an operative approach built on perceptions can deliver productions with an enduring constancy and a modest marketplace benefit. Business intelligence (BI) can enhance worth to nearly number of business processes like developing a complete opinion and permitting squads to analyse their particular data to discover competences and style improved upcoming decisions [16].

The procedure of knowledge management is collective for most of the "enterprise business problems". Knowledge Management guarantees large number for its searchers. For an example, knowledge management has the capacity to keep the enterprise a complete of 6 trucks load a year. Inappropriately, corporations regularly flop to put in force on powerful Knowledge Management explanations. The major objective of knowledge management is to share the ideas, viewpoints, information and experiences with in the groups [5, 23]. This process helps to make informed decisions as well as it helps to progress the rate of efficiency by decreasing the requirement of revisit on obtained knowledge. To support the knowledge management process, the knowledge management technologies are used, the knowledge management technologies are nothing but

information technologies for knowledge management. There are mainly four components in knowledge management VIZ the strategy, information technology and content, people and the process. Knowledge management is used to make business decisions depending upon business analytics to acquire business objectives [9].

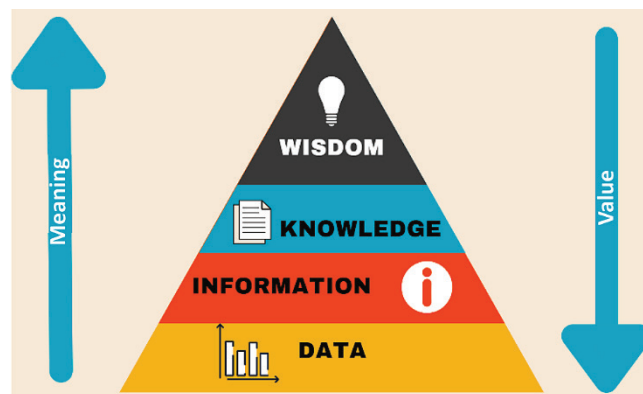


Figure 1 DIKW

As the process continues, there may come a problem in the operations and that can affect the performance of the organisation. These challenges and problems or the issues experienced by the business in a present period or in the long term are termed as business problems [20]. It is very important to identify the business problem, since the business problem might become an obstacle for the well fare of the business. To solve any problem one must find the root of the cause, similarly the main cause should be found out to resolve the business problem. There are many business problems faced by different entrepreneurs such as globalization, innovation, technology, demand, customers' experiences and relationships, complexity, finance, government policies, quality, promotion of the products etc. There are countless business problems, to solve such kind of problems the knowledge management and business

intelligence is used. Solving a complex problem manually is really very difficult task, but by applying business intelligence and knowledge management the task is fragmented and solutions are found easily [24].

The first and foremost procedure to solve a problem is to study the problem. The most valuable entity is data. From data the information is derived, from which the knowledge is acquired, that finally becomes the wisdom. To solve a problem, the problem must be studied properly, so that the root of the problem can be found and the problem can be rectified easily. In the process of problem solving the data is taken from the environment of problem. The data can be how the problem occurred? When did it happened? How many times did that happen? Who all are the sufferers? At which date it occurred? What is the type of the issue? What can be remedies? Which all are the prevention techniques? There arises number of queries when a problem occurs [17].

By using knowledge management and business intelligence the entrepreneur can find out the solutions easily, knowledge management is also known as a process of managing or handling the set of information. The information can of any field here it is business. The data about business is a large entity, it impossible for a human to handle such a data, so the concept of business intelligence is applied.

1.1 Importance of Business Intelligence and Knowledge Management

Business intelligence and knowledge management plays an important role in solving business problems. It is really difficult to maintain the business and also to solve the business problem by a person. Because in the huge process of business solving, there are number of procedures which are difficult and complex for a human being [10].

So for the storage, analysis and control of the business enterprise, the organization needs a structure to handle this critical situation [26]. Here it explains the need of business intelligence and knowledge management. The business intelligence and knowledge management help to control, store, analyze and make a decision from the business problem [8].

There are various types of problems and challenges arise when the business environment possess distinct data sets. The business environment data is an essential source for the efficiency of the business performance. The business intelligence compromises the issues such as perfection in performance management, customs report development by technical teams, organization of day to day operations, limitation in accessing data, time consumption in creation of multiple systems and the future foundation from the actionable intuitions. These kind of data are managed in a business environment along with the collaboration of knowledge management.

1.2 Real Time Applications of Business Intelligence and Knowledge Management

- Hellofresh: It is a centralized reporting system for digital marketing for the progress of alterations. This enterprise had a problem in digital marketing reporting because the reporting was most commonly performed manually, and

inefficiently which was always leading to time intensity. This issue was resolved by implementing a "centralized business intelligence solution" which does automatic reporting of the process for each day which decreased the time of working from ten to twenty hours a day. These in turn reflected in improvement of "customer retention".

- REI: The business intelligence concept is applied to sort out the difficulty in chasing involvement system of measurement with 90 TB of data. They had a difficulty in tracking "membership metrics" with ninety terabytes of data. Here the business intelligence platform was utilized for the analysis of their "multi-work term agreement with one employer" and customer segmentation. These procedures resulted in betterment in customer satisfaction [1].
- Xerox: Xerox established their own Knowledge Management solution termed as Eureka. Which was a workwise attributed system of knowledge sharing in which the technologists would prepare the documents for the solutions. The organization permitted facility technologists to attribute their title to the articles, this resulted in enhanced reputation amongst the colleagues, and invigorated supplementary workforces to yield the time to stake their acquaintance [15].
- Chipotle: The "chipotle Mexican Grill" is a famous American restaurant chain. It has a wide range of locations worldwide. This enterprise possessed a problem for the teams to deal with the desperate sources of data by viewing the unified class of the restaurants. The chipotle updated their conventional business intelligence solution to a self-service business intelligence platform which gave them a centralized architecture of operations that supports tracking of restaurant operations.
- Toyota: This huge company implements knowledge management for the better enhancement of the organization. Toyota scrupulously encourages acquaintance transmission. The corporation directs two to three hundred novel workforces to labor in an already outstanding place of work. In attendance, they labor shoulder to shoulder with the additional knowledgeable workforces on the assemblage line, and training the manufacture system. Subsequently preliminary training on the work, the novel workforces are transported back to the innovative place of work. Then they go together with by one to two hundred exceedingly knowledgeable workforces who put their effort in combined with them, besides guarantee that Toyota's "finely-tuned" manufacture system is entrenched hooked on the novel site [13].
- Coca cola: It difficult to maintain reporting processes manually with limited admission to process data and real-time sales.
- Des Moines: Using business intelligence they solved the preservation of the Excel reporting destined managers could not audit data such as preventing timely attendance, intervention etc. They used manual excel sheet for reporting which was not an apt option for foresee of up to date data. And they started seeking advanced analytics for the improvisation.

- Geisinger medical group: By applying knowledge management they dropped costs, enhanced patient health care, and retained and recruited many healthcare providers for service [19].

1.2.1 What is the Business Problem?



Figure 2 The various business problems

- Customer experience: The customer experience plays a vital role in business, because the upcoming production and ideas always depends upon the customer experience.
- Technology: It occurs due to failure of IT infrastructure; the technical services might be costly for some business groups [21].
- Promotion: this issue arrives when the product or goods or services have no ability to generate demand among the market.
- Customer relationship: If the customer is not satisfied with the service, products or the goods, there is a huge chance of loss. Because the customer may leave this service and move to another production.
- Demand: This is one of major issues in business problem, because without demand there is no growth in the business.
- Quality: Quality of the production is important. For the existence of the business organization the enterprise must provide quality products for the customers [18].

1.3 The Business Problem - Demand

Demand prediction is the manner of the usage of predictive evaluation from existing historic facts to evaluate and are expecting customers' intention call for a service or a product. Demand prediction allows the analyst to support to the benefit perception into what their supporter desires by means of a lot of predicting strategies. These strategies has process like predictive evaluation, conjoined evaluation, customer reason studies. In this, the bitcoin dataset is used for predictive analyses by using k-means clustering algorithm along with PCA (Principal Component Analysis) and SOM (Self-Organising Map) [7].

2 LITERATURE REVIEW

Business Intelligence is a procedure which includes categorization of the obtained information and choose the relevant ones. Business intelligence delivers serious visions which support administrations for proper conclusions. Knowledge management is a main method to business problems [11]. One of the applications of knowledge management explains the usage of knowledge sharing scheme for business intelligence in varying transformations of tactic knowledge and explicit knowledge in e-business system. Innovatively four matrices and four indices were applied in the e-business, this supports the online stores to examine the data with web usage analysis [22].

The external and internal environment monitoring is a complex process; hence it deals with huge amount of data and information. Knowledge management concepts are widely used to handle this complexity in various enterprise. The business intelligence is known as one of the most essential tool off knowledge management because it helps to support the organization's competitiveness [12]. In a study, in the year 2019, organization's competitiveness and business intelligence were quantitatively evaluated. In which it is determined the influencing components in business intelligence off multinational food processing company [28].

Knowledge management it's used to hide the complexity of the entire business process consumers please stop to improve the efficiency of knowledge management, knowledge discovery in database KDD process is being used indirectly. Business intelligence and knowledge management will definitely improve the company's overall performance that's having business intelligence and knowledge management as a combined structure is a huge benefit for an organization [6].

Knowledge management encourages the practice of knowledge and information accessible to the association. Thus, it can be expected that business intelligence and knowledge management perform a vibrant part in emerging the quantitative and qualitative information rate which is accessible to make decision [16]. They can assist each other, which is substantial that business intelligence has a widespread part to perform in knowledge management projects.

For example, business intelligence approaches are pragmatic in knowledge management for generating and storing knowledge. Business intelligence components are castoff globally for rationalization of the "Business Processes" [15]. It provisions the facts for all the business processes, which might be useful in making choices. It styles the "data processing" as mechanical and modified. It operates apt in analytical and financial field [27].

3 METHODOLOGY

The data mining tool called "orange" is applied here for the data visualization. The tool is an open source and is really easy to learn and use this tool. Orange facilitates the provision of drag and drop, the suitable algorithm can be chosen from the control panel and used as it is [3].

In this Fig. 3, the workflow is captured. Starting from the file import, then data table, PCA (Principal Component Analysis), k-means and finally SOM (Self-Organizing Map). This SOM is shown in another window with three clusters C1, C2 and C3.

The variance of the PCA (Fig. 4) must be always greater than 60%, if the variance is less than 35% then the data is meant as an unusable dataset. But if the variance is more than 60% then it means this has more complete original data [1].

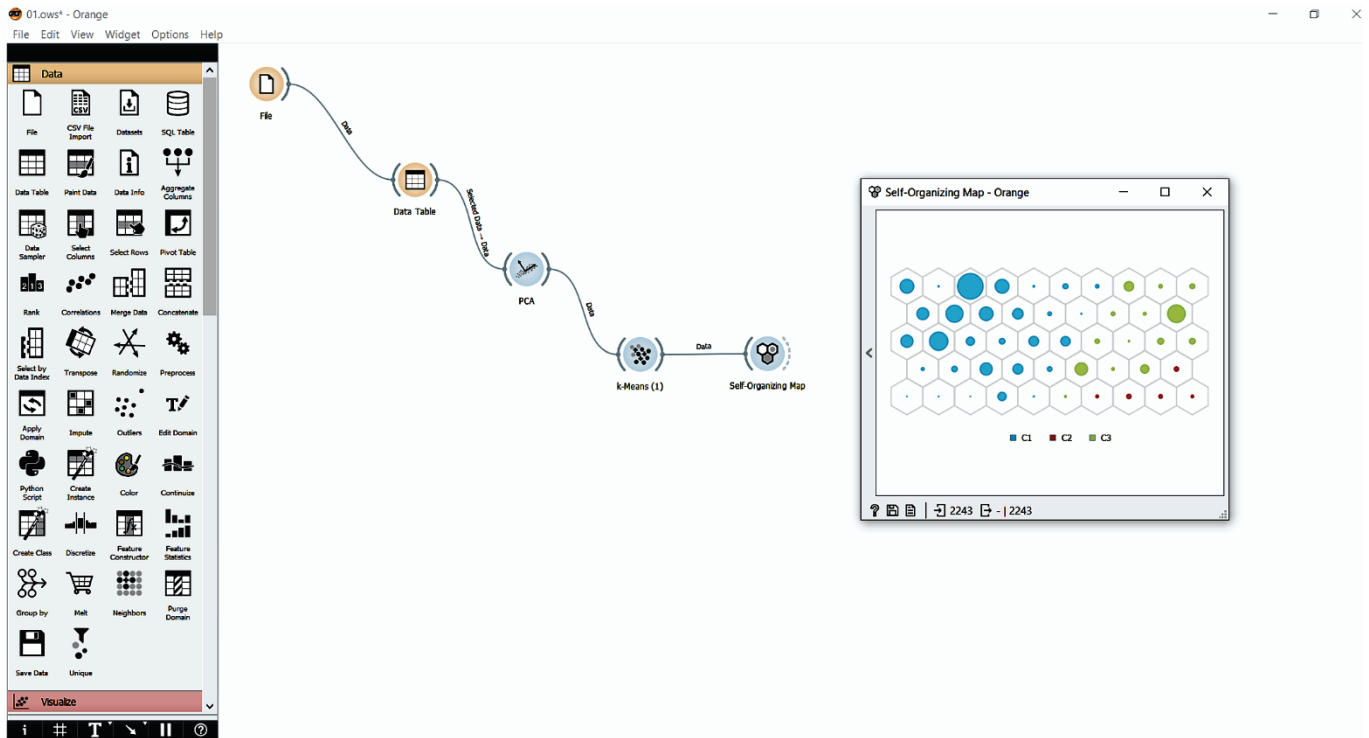


Figure 3 A sample workflow in the orange tool

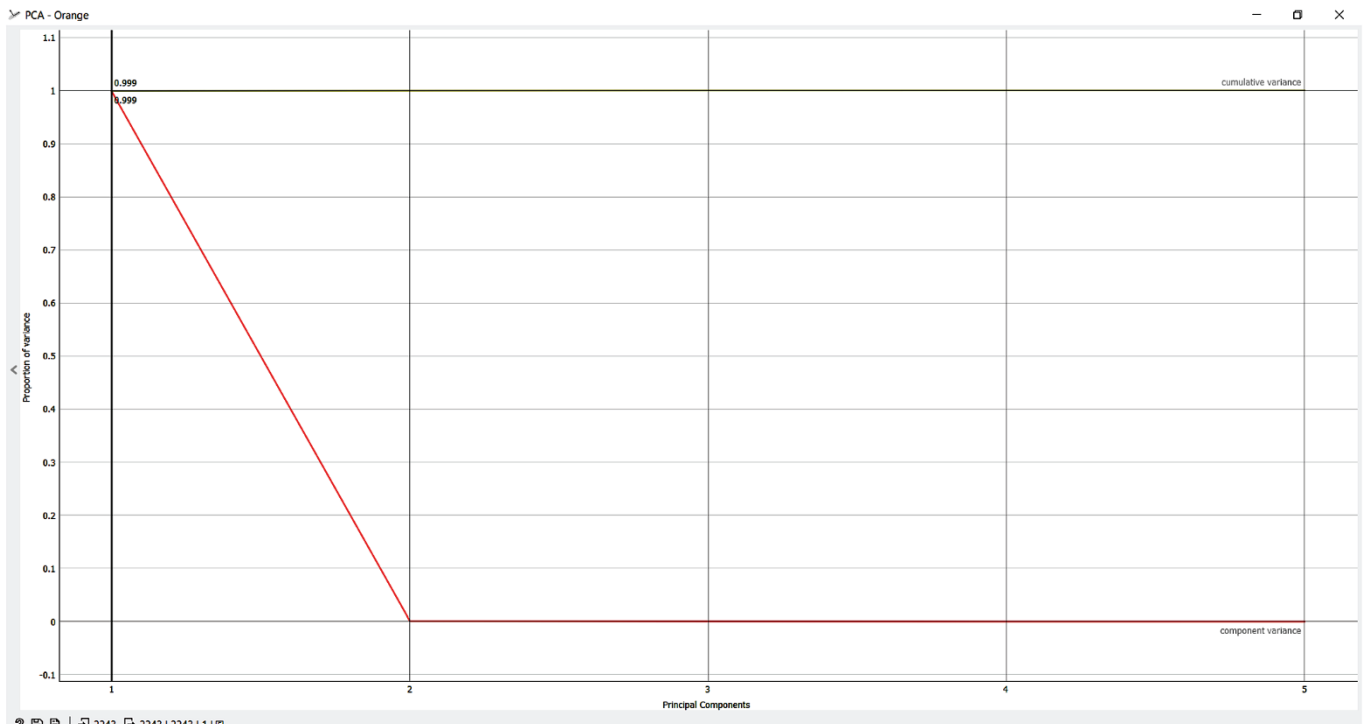


Figure 4 An initial step – PCA (Variance of PCA)

These two figure are sample illustration of the obtained results. Fig. 5 has clusters C1, C2, and C3 and Fig. 6 is self-organizing map of silhouette.

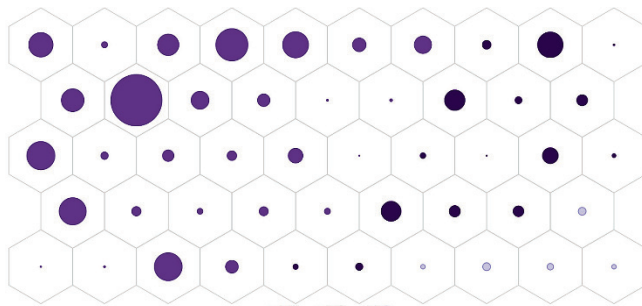


Figure 5 K-means followed by PCA

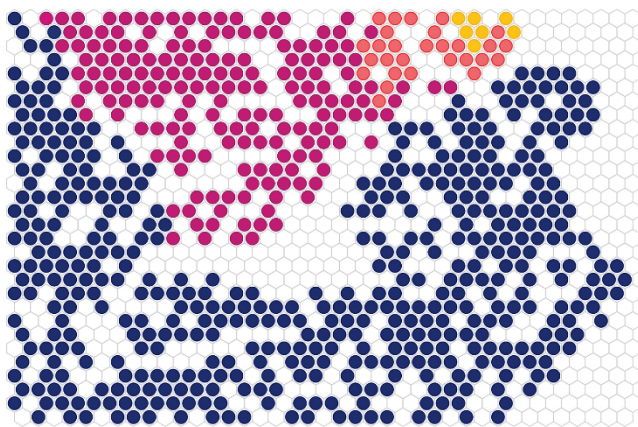


Figure 6 SOM using k-means

3.1 Implementation

To demystify the purpose of prediction and analyses, here it is applied a trend analysis using a dataset of bitcoin. The business intelligence and knowledge management concepts are applied in the example of bitcoin. These concepts are used to find out the current trend of the bitcoin in the business environment using an attribute called "demand" [29]. This involves the following steps:

- **Requirements Reporting** – the recipient would prefer to conduct an examination on the development of Bitcoin business, with the help of numerous particulars as conceivable [9].
- **Requirements are Broken Down** – this is the second step in the business analysis this has different sections for the process such as the findings of yearly transactions, the volume of transaction, the globalization of industry and the vital information on current posters about the industry [18].
- **Prioritization** – The most relevant attributes are to be considered for the analysis. In this case it is suggested as: High price, low price, open price, close price and transaction volume. These attributes are important for the upcoming steps.
- **Data Gathering and Validation** – this procedure will include the training of all obtainable basis for statistics,

be they authorized foundations, or on open-sources that give statistics about the Bitcoin usage.

- **Analysis** – the entire results will be utilized completely in this step. The data will be cleaned and organized to put together for an accurate result. These results will be used to improve the annual production as well as supports to take proper business decisions. Separately from the "data analysis preparation", specialists might spread over numerical proprieties so that they have statistics appropriate info and have suitable pictorial constituents to represent to the consumer. This might effect in polls, trends, explanations for the change in price and all the associated illustrations [12].
- **Results Presentation** – this is the concluding phase that characterizes the tendering of the consequences to the end client. This analysis will help the entrepreneurs to have an improved picture of the current Bitcoin marketing, its expansions and conceivable forthcoming progresses [24].

3.1.1 Dataset

Table 1 Sample rows of the taken dataset

Date	Open	High	Low	Close	Volume
Jun 18 2019	9335.47	9348.37	9004.9	9081.76	15848210536
Jun 17 2019	8988.92	9416.41	8988.92	9320.35	15562951919
Jun 16 2019	8841.44	9335.87	8814.56	8994.49	23348550311
Jun 15 2019	8689.75	8859.13	8618.4	8838.38	18371033227
Jun 14 2019	8230.9	8710.64	8183.39	8693.83	19831162906
Jun 13 2019	8145.55	8311.57	8087.06	8230.92	18669407147
Jun 12 2019	7925.43	8196.65	7862.36	8145.86	19034432883
Jun 11 2019	8004.24	8026.39	7772.8	7927.71	17107279932
Jun 10 2019	7692.28	8031.91	7586.73	8000.33	18689275118

The dataset (Tab. 1) is taken from the website <https://www.kaggle.com/>. The dataset contains different columns such as date, Open Price, Highest trading price of the day, Lowest trading price of the day, Close price of the day, Trading volume and Market cap of bitcoin.

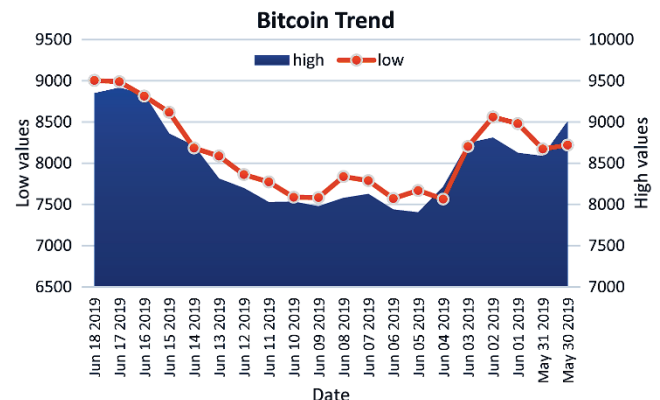


Figure 7 Sample plot of bitcoin trend

Fig. 7 explains the highest trading price of specific dates which is given in the right side of the graph and lowest trading price on the left side. The first twenty values are taken from the dataset to plot this graph. From the plotting one can easily understand the difference between the lowest price and the highest price in a date [17].

Table 2 The first twenty values of the dataset (column: date, high and low)

Date	High	Low
Jun 18 2019	9348.37	9004.9
Jun 17 2019	9416.41	8988.92
Jun 16 2019	9335.87	8814.56
Jun 15 2019	8859.13	8618.4
Jun 14 2019	8710.64	8183.39
Jun 13 2019	8311.57	8087.06
Jun 12 2019	8196.65	7862.36
Jun 11 2019	8026.39	7772.8
Jun 10 2019	8031.91	7586.73
Jun 09 2019	7975.97	7583.22
Jun 08 2019	8076.89	7837.61
Jun 07 2019	8126.15	7788.37
Jun 06 2019	7937.34	7571.47
Jun 05 2019	7901.85	7668.67
Jun 04 2019	8210.99	7564.49
Jun 03 2019	8743.5	8204.19
Jun 02 2019	8809.3	8561.24
Jun 01 2019	8625.6	8481.58
May 31 2019	8586.66	8172.55
May 30 2019	9008.31	8221.27

This is a part of the dataset where this contains only three columns such as date, high and low. Tab. 2 have the highest price of the bitcoin per date. From this table the analyst can have a clear picture on the value of bitcoin [2].

4 RESULTS AND DISCUSSIONS

The study model of the system is appropriate for this paper since it increases the accuracy and efficiency of the results. The section contains the plots and figures obtained from the analysis. Initially the data is processed from the

PCA and then after filtering the noisy data it is applied with the k-means. And finally for the representation SOM (Self-Organizing Map) is used.

The over-all variance here is 99% which is the totality of variances of all independent principal components (Fig. 8). This figure has three components thus the line lies on the component three on the x-axis and that line is parallel to y-axis.

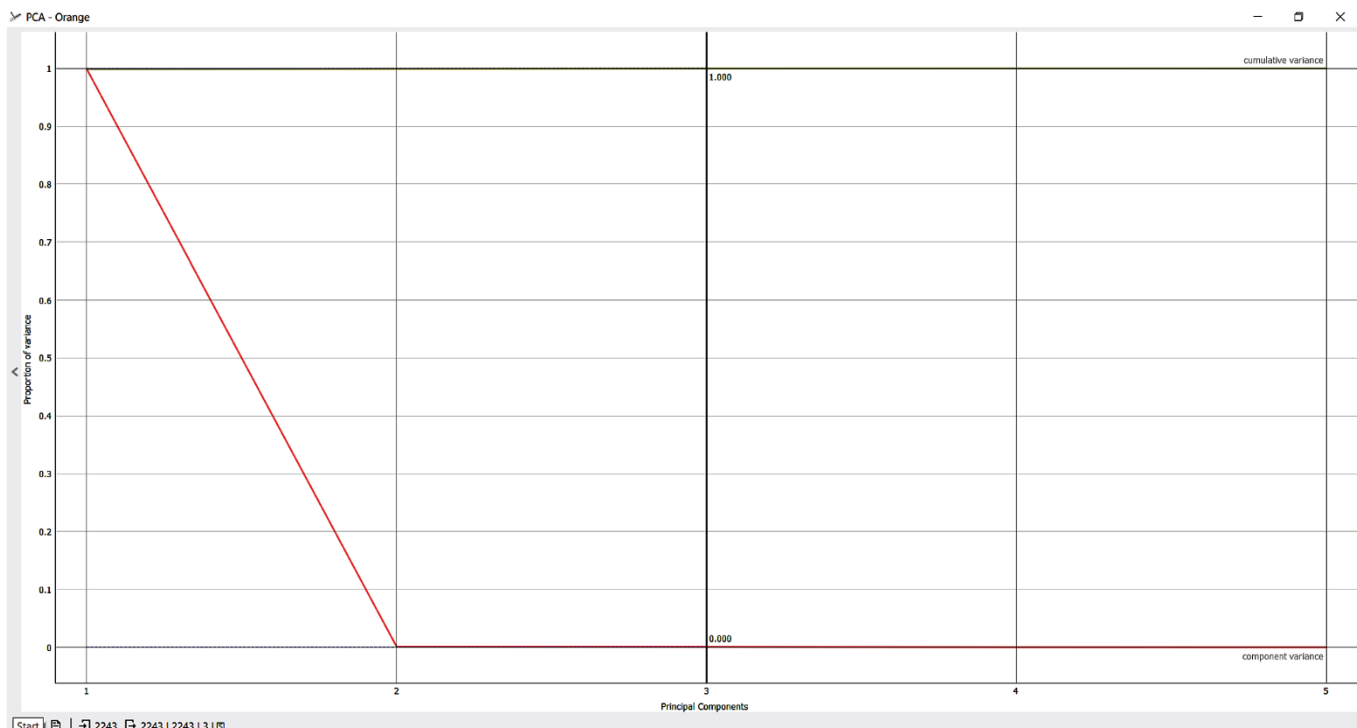
The k-means is a clustering algorithm which is commonly used for various predictive analysis (Fig. 9). Here three clusters are illustrated with three distinct colors as pista green (C1), cyan (C2), and blue (C3). Cluster 1 i.e., C1 is having large number of data points.

This type of size variance is obtained by choosing, size by number of instance. These feature will enable the diagram to have a clear understanding picture of the analysis. In this, the large circles denote the greater values in the close price of the bitcoin (Fig. 10).

The PC2 denotes the second most important direction along with the samples (Fig. 11). PC2 is also known as second principal component which is focused in such a way that it reproduces the second largest cause of variation in the data while being immaterial to the PC1.

This is the silhouette representation in the Self Organized Map (Fig. 12), silhouette is defined as one of the mechanism in machine learning for understanding and justifying of constancy inside the clusters of the data.

The silhouette can have multicolor for catchy looks, in the SOM there exists an option to choose the initialization (Fig. 13). This structure was obtained by initializing with PCA. As the PCA is the root of this predictive analysis.

**Figure 8** PCA with 99% of variance

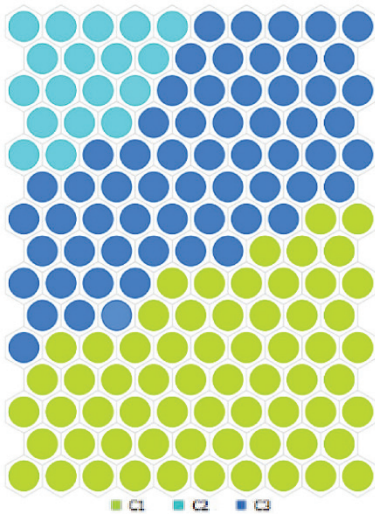


Figure 9 K-means using SOM (Self-Organizing Map)

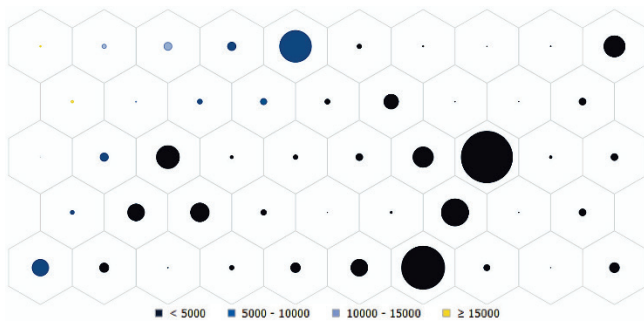


Figure 10 SOM of close price of the day

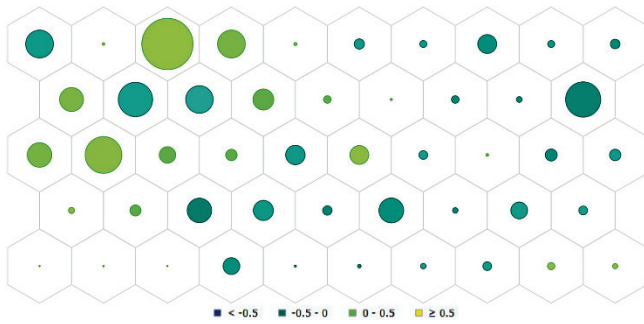


Figure 11 SOM of PC2 component

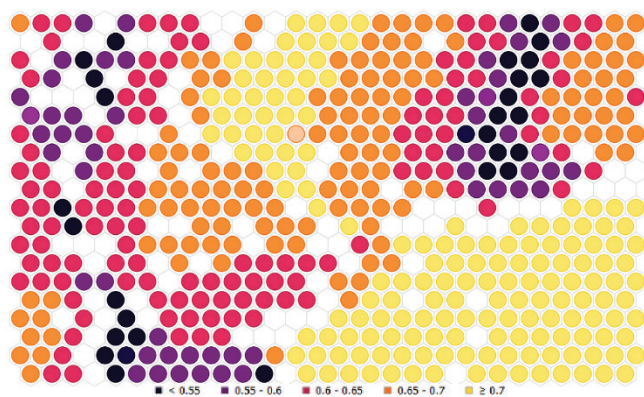


Figure 12 SOM of silhouette

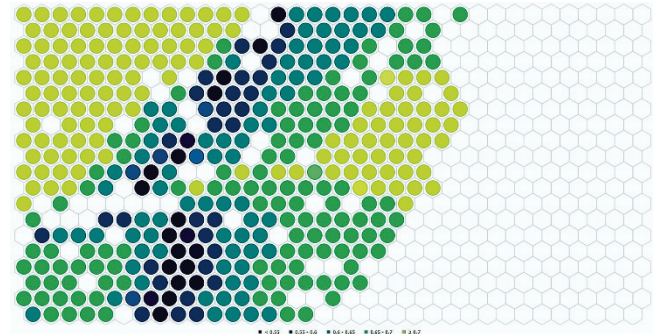


Figure 13 SOM of silhouette in different shade

5 CONCLUSION

As a conclusion, there are a number of challenges in the business field. But even those challenges solving or finding the demand can provide many major solutions for the business problems [30]. If an enterprise analyzes the demand of the customers the future sale of the production is secured. Demand of the product is the only key off the product for an example the progression of bitcoins is used for analysis, the people use their bitcoins extremely. Bitcoin is also known as one of the volatile investment. Bitcoins do have challenges still it can be prevented by the analysis [5].

Similarly, any production can be secured from falling by performing proper analysis by using accurate information. For the analysis, PCA (principal component analysis) is applied initially for handling an analysis problem termed as high dimensionality [4]. "Dimensionality reduction" includes depleting the count of columns or input variables in data modelling. PCA is a procedure as of linear algebra which could be applied to execute dimensionality lessening automatically [29]. PCA also helps to reduce noisy data from the pre-processed data. PCA is calculated by discovering the components that clarify the highest count of variance, it records the signal from the data and neglects the noise [7].

After applying PCA, the clustering algorithm called k-means is implemented to improve the accuracy of the analysis. The k-means clustering algorithm is best suitable with large dataset. The efficiency of k-means generally based on the silhouette of the obtained clusters. Thus k-mean has an efficient result. For the illustration of k-means, SOM (Self Organizing Map) is used which has a capability to characterize clustering perception by joining the same kind of data together. Finally, the knowledge management supports the business environment to evade the redundant work. Business intelligence and knowledge management helps to set richer goal for the employees by managing the organization info, spreading the opportunity of employee learning, betterment in "intra-company communications".

6 REFERENCES

- [1] Supakkul, S., Ahn, R., Junior, R. G., Villarreal, D., Zhao, L., Hill, T., & Chung, L. (2020). Validating goal-oriented hypotheses of business problems using machine learning: An exploratory study of customer churn. *International Conference on Big Data* (pp. 144-158). Springer, Cham. https://doi.org/10.1007/978-3-030-59612-5_11

- [2] Yang, M. S., Chang-Chien, S. J., & Nataliani, Y. (2018). A fully-unsupervised possibilistic c-means clustering algorithm. *IEEE Access*, 6, 78308-78320. <https://doi.org/10.1109/ACCESS.2018.2884956>
- [3] Chennubhotla, C. & Jepson, A. (2001). Sparse PCA. Extracting multi-scale structure from data. *Proceedings of the 8th IEEE International Conference on Computer Vision (ICCV 2001)*, 1, 641-647.
- [4] Chen, W., Er, M. J., & Wu, S. (2005). PCA and LDA in DCT domain. *Pattern Recognition Letters*, 26(15), 2474-2482. <https://doi.org/10.1016/j.patrec.2005.05.004>
- [5] Yu, J., Chaomurilge, C., & Yang, M. S. (2018). On convergence and parameter selection of the EM and DA-EM algorithms for Gaussian mixtures. *Pattern Recognition*, 77, 188-203. <https://doi.org/10.1016/j.patcog.2017.12.014>
- [6] Levinson, W. A. (2010). *Statistical process control for real-world applications*. CRC Press. <https://doi.org/10.1201/b10467>
- [7] Stojanovic, B. & Neskovic, A. (2012, November). Impact of PCA based fingerprint compression on matching performance. *The 20th Telecommunications Forum (TELFOR 2012)*, 693-696. <https://doi.org/10.1109/TELFOR.2012.6419304>
- [8] Alhawarat, M. & Hegazi, M. (2018). Revisiting K-means and topic modeling, a comparison study to cluster Arabic documents. *IEEE Access*, 6, 42740-42749. <https://doi.org/10.1109/ACCESS.2018.2852648>
- [9] Castellanos, M., Umeshwar, D., & Miller, R. (2010). *Enabling real-time business intelligence*. Heidelberg: Springer. <https://doi.org/10.1007/978-3-642-14559-9>
- [10] Fahland, D. & van Der Aalst, W. M. (2015). Model repair—aligning process models to reality. *Information Systems*, 47, 220-243. <https://doi.org/10.1016/j.is.2013.12.007>
- [11] Chen, R. S. & Hsiang, C. H. (2007). A study on the critical success factors for corporations embarking on knowledge community-based e-learning. *Information Sciences*, 177(2), 570-586. <https://doi.org/10.1016/j.ins.2006.06.005>
- [12] Alavi, M. & Leidner, D. E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS quarterly*, 107-136. <https://doi.org/10.2307/3250961>
- [13] Asay, M. (2017). 85% of big data projects fail, but your developers can help yours succeed. *Big Data Tech. Republic*, 11, 1-5.
- [14] Binkhonain, M. & Zhao, L. (2019). A review of machine learning algorithms for identification and classification of non-functional requirements. *Expert Systems with Applications: X*, 1, 100001. <https://doi.org/10.1016/j.eswax.2019.100001>
- [15] Pedregosa, F. et al. (2011). Scikit-learn: Machine learning in Python. *The Journal of Machine Learning Research*, 12, 2825-2830.
- [16] Lundberg, S. M. et al. (2020). From local explanations to global understanding with explainable AI for trees. *Nature machine intelligence*, 2(1), 56-67. <https://doi.org/10.1038/s42256-019-0138-9>
- [17] Arianthi, D. E. & Sampurna, D. S. Analysis of the Influence of Brand Image Service Quality and Electronic Word of Mouth on Purchase Decisions (Case Study on Shopee's Consumers), 1-22, 2020.
- [18] El-Ebiary, Y. A. B., Almandeel, S., Ghanem, W. A. H. M., Abu-Ulbeh, W., Al-Dubai, M. M. M., & Bamansoor, S. (2020). Security Issues and Threats Facing the Electronic Enterprise Leadership. *International Conference on Informatics Multimedia Cyber and Information System (ICIMCIS 2020)*, 24-28. <https://doi.org/10.1109/ICIMCIS51567.2020.9354330>
- [19] Meraj, S. T. et al. (2021). A Diamond Shaped Multilevel Inverter with Dual Mode of Operation. *IEEE Access*, 9, 59873-59887. <https://doi.org/10.1109/ACCESS.2021.3067139>
- [20] Bouaoula, W., Belgoum, F., Shaikh, A., Taleb-Berrouane, M., & Bazan, C. (2019). The impact of business intelligence through knowledge management. *Business Information Review*, 36(3), 130-140. <https://doi.org/10.1177/0266382119868082>
- [21] El-Ebiary, Y. A. B., Abu-Ulbeh, W., Al-Sammarraie, N. A., Yusoff, M. H., & Hamzah, W. A. F. W. (2020). The Role of ICT in Special Educational Needs—A Case Study of Malaysia. *IJETT*, 68, 90-93. <https://doi.org/10.14445/22315381/CATI1P216>
- [22] Hamzah, W. A. F. W., Abu-Ulbeh, W., Al-Sammarraie, N. A., El-Ebiary, Y. A. B., & Yusoff, M. H. (2020). The Integration of Learning Management Systems with PLE—a Review Paper. *IJETT*, 68, 94-96. <https://doi.org/10.14445/22315381/CATI1P217>
- [23] Turban, E., King, D., Lee, J., & Viehland, D. (2004). *Electronic Commerce: a managerial perspective 2004*. Pearson Education.

Author's contacts:

Eissa Mohammed Ali Qhal
Administration Department, Applied College,
Jazan University,
Jizan, Saudi Arabia
<https://orcid.org/0000-0002-9243-3174>
E-mail: egohal@jazanu.edu.sa