



Understanding Ethanol Usage and Its Influences by Applying a Qualitative and Quantitative Research Design

Özerk Yavuz^{1*}

^{1*} Haliç University, Faculty of Management, Department of Management Information Systems, İstanbul, Turkey, (ORCID: 0000-0002-1371-688X), ozerkyavuz@halic.edu.tr; ozerk@alumni.bilkent.edu.tr; dr.ozerk@gmail.com

(International Conference on Design, Research and Development (RDCONF) 2021 – 15-18 December 2021)

(DOI: 10.31590/ejosat.1039621)

ATIF/REFERENCE: Yavuz, Ö. (2021). A 21st Century Approach in Analysing Health Precautions in London with Machine Learning Driven Data Mining. *European Journal of Science and Technology*, (32), 40-49.

Abstract

Human kind's interest on alcohol has been known for many decades. People used alcohol in different geographies, countries and cultures in parallel to the discovery and development of fermentation and distillation techniques. As seen in the analysis of many behavioural patterns it is believed to be several factors and antecedents that lead to engaging drinking alcohol and such behavior to occur. Today especially in 21st century alcohol usage became an important behavioral pattern in various contexts and settings and gained popularity in many social and cultural settings. With the help of transitions of the society and business landscape it found place in many organizational settings and landscapes in a more social and individualistic way. Interest of human to alcohol known for many decades and expected to remain. However different norms, traditions, values, approach of regulatory frameworks, environment, group influence have impact on alcohol consumption with several micro and macro level variables directly or indirectly in a moderating nature. Despite its popularity in many generations, life styles and preferences excessive levels of alcohol consumption constitutes several hazardous risks and dangerous to human health. There are several studies associated with alcohol consumption and its benefits, dangers and risks associated with its short term, long term and excessive usage in literature. In this study some of the factors associated with alcohol consumption is investigated with the triangulation approach of qualitative and quantitative research methodologies composed of in depth interviews, observation and supervised and supervised forms of data mining with the aim of having a comprehensive understanding of the phenomena and highlighting the risks and dangers associated with long term, excessive usage.

Keywords: Alcohol Consumption, French Paradox, Alcoholic Beverage Marketing, Alcohol Regulations, Alcoholism, Cirrhosis, Triangulation, Clustering, Classification, Data Mining, Machine Learning, Qualitative Research, Quantitative Analysis, Supervised Learning, Unsupervised Learning

Nitel ve Nicel Araştırma Tasarımı Uygulamasıyla Etanol Kullanımını ve Etkilerinin Anlaşılması

Öz

İnsan türünün alkole olan ilgisi uzun yıllardır bilinmektedir. Fermantasyon ve damıtma tekniklerinin keşfedilmesi ve geliştirilmesine paralel olarak insanlar, farklı coğrafyalar, ülkeler ve kültürlerde alkolü kullandılar. Birçok davranış kalıbının analizinde görüldüğü gibi, alkol içmeye ve bu tür davranışların ortaya çıkmasına yol açan çeşitli faktörlerin ve öncüllerin olduğuna inanılmaktadır. Günümüzde özellikle 21. yüzyılda alkol kullanımı, çeşitli şekillerde önemli bir davranış biçimi haline gelmiş, birçok sosyal ve kültürel ortamlarda popülerlik kazanmıştır. Toplum ve iş ortamındaki değişiklikler yardımıyla birçok organizasyonel ortamda sosyal ve bireysel formlarda yer buldu. İnsanoğlunun alkole olan ilgisi onlarca yıldır bilinmekte ve bunun devam etmesi beklenmektedir. Ancak farklı normlar, gelenekler, değerler, düzenleyici çerçeveler, çevre, grup etkisi, çeşitli mikro ve makro düzeydeki değişkenler doğrudan veya dolaylı olarak alkol tüketimini etkilemektedir. Birçok nesildeki ve yaşam tarzı tercihindeki popülaritesine rağmen, aşırı alkol tüketimi insan sağlığı için çeşitli riskler ve tehlikeler oluşturmaktadır. Literatürde alkol tüketiminin kısa vadeli, uzun vadeli ve aşırı tüketimi ile ilgili çeşitli çalışmalar vardır. Bunları bazı olası faydaları, riskleri ve tehlikeleri içermektedir. Bu çalışmada alkol tüketimi ile ilişkili bazı faktörler derinlemesine görüşmelerden oluşan nitel ve nicel araştırma metodolojilerinin üçgenleme (triangulation) yaklaşımıyla, derinlemesine mülakat, gözlemlene, güdümlü ve güdümsüz makine öğrenmesi gibi veri madenciliği yöntemleri yardımı ile kalitatif ve kantitatif araştırma yöntemleri kullanılarak ilgilili fenomenanın anlaşılması ve uzun vadede karşılaşılabilecek risklerin ve tehditlerin altının çizilmesi amacıyla uygulanmıştır.

* Corresponding Author: Asst. Prof. Dr. Özerk Yavuz, Haliç University İstanbul, Turkey, ORCID: 0000-0002-1371-688X, ozerkyavuz@halic.edu.tr, ozerk@alumni.bilkent.edu.tr, dr.ozerk@gmail.com

Anahtar Kelimeler: Alkol tüketimi, Fransız Paradoksu, Alkollü İçecek Pazarlaması, Alkol Düzenlemeleri, Alkolizm, Siroz, üçgenleme (Triangulation), Kümeleme, Sınıflandırma, Veri madenciliği, Makine öğrenme, Nitel araştırma, Kantitatif Analiz Denetimli Öğrenme, Denetimsiz Öğrenme

1. Introduction

“Science is the only true guide in life.” – **Atatürk**

“Wine is bottled poetry.” – **Robert Louis Stevenson**

“My only regret in life is that I didn't drink enough Champagne.” – **John Maynard Keynes**

“I have taken more out of alcohol than alcohol has taken out of me.” – **Winston Churchill**

Human kind's interest on alcohol has been known for many decades. People used alcohol in different geographies, countries and cultures in parallel to the discovery and development of fermentation and distillation techniques. As seen in the analysis of many behavioural patterns it is believed to be several factors and antecedents that lead to engaging drinking alcohol and such behavior to occur [1, 2, 7, 13, 59, 62].

Today especially in 21st century alcohol usage became an important behavioral pattern in various contexts and settings and gained popularity in many social and cultural settings. With the help of transitions of the society and business landscape it found place in many organizational settings and landscapes in a more social and individualistic way. Interest of human to alcohol known for many decades and expected to remain. However different norms, traditions, values, approach of regulatory frameworks, environment, group influence have impact on alcohol consumption with several micro and macro level variables directly or indirectly in a moderating nature. Despite its popularity in many generations, life styles and preferences excessive levels of alcohol consumption constitutes several hazardous risks and dangerous to human health. There are several studies associated with alcohol consumption and its benefits, dangers and risks associated with its short term, long term and excessive usage in literature. In this study some of the factors associated with alcohol consumption is investigated with the triangulation approach of qualitative and quantitative research methodologies composed of in depth interviews, observation and supervised and supervised forms of data mining with the aim of having a comprehensive understanding of the phenomena and highlighting the risks and dangers associated with long term, excessive usage [1, 2, 7, 13, 59, 62].

Today alcohol usage became an important behavioral pattern in various contexts and settings and gained popularity in many social and cultural settings. As seen in the analysis of many behavioural patterns and traits it is believed to be several factors and antecedents that lead to engaging drinking alcohol [59, 62]. Interest of human to alcohol and alcohol consumption known for many decades [1, 2, 7]. When the world civilization is investigated it is seen that different forms of alcohol

found place in many civilizations, cultures and societies in many forms at different times. These have been mainly driven by the discovery of the fermentation, distillation and alcohol

production techniques and approaches in several civilizations by the human kind [13].

Ethanol (ethyl alcohol) which is considered to be the main ingredients of alcoholic beverages is a colorless, volatile, flammable liquid which has the chemical formula C_2H_5OH . Ethanol is an organic compound which is slightly basic which has a pH of 7.33. Ethanol is a polar solvent of lipid molecules, a sedative and a depressant for central nervous system which has a molecular weight of 46.07 with a pungent taste. [74, 75]. With the help of industrialization, changes in business landscape and approaches it found place in several markets under different names and brands for consumers [13]. Later as seen in many goods and services alcoholic beverages have been marketed to consumers with marketing approaches and efforts using several marketing mixes. As a result different brands used several segmentation, targeting and positioning approaches in succeeding to leave strong image in the minds of the consumers by leveraging brand associations [60,61].

As seen in many marketing campaigns and strategies satisfying the customer with products and services with high reliability and validity is important in building a long term relationship with the customer, which would provide a good customer lifetime value, a good market share and the chance to build profitable relationships with customer in the long run which means a good sales revenue which would lead to a successful growth of the organization in many cases [60, 61]. Therefore it can be said that a good marketing strategy can start with understanding the expectations and needs of the customer and providing successful brands and services to fulfill these needs. In building the strategy demographical, environmental, sociological, natural, technological, cultural and political-legal considerations should be assessed as well. This can be sustained with good products and services with reliability, a good price determined by the purchasing power of the consumer segment targeted, collaborating with right sales channels in reaching the customer and utilizing promotion activities composed of public relations and advertising policies to convey the right messages to the customer associated with the brands and services [60, 61]. In strengthening these messages opinion leaders, celebrity endorsement, sex appeals and different stimuli can be used based on the characteristics of communication medium and communication tools. Therefore while using conventional media strategies can require certain aspects, different forms of social media and communication tools may require other approaches [60, 61]. Additionally for more targeted marketing campaigns conveyed messages for the targeted audience can be strengthened with the results of qualitative and quantitative studies as well [62, 63, 64, 65].

With a good segmentation, targeting and positioning strategy brands can benefit more in the competitive market place while preserving their unique value proposition, core competitive edges and competitive advantages which make them distinct in the minds of the consumer. Also strengths, weaknesses, opportunities and threats should be assessed in market and product development activities [24, 25, 60, 61]. However for alcoholic beverage product categories, highlighting the risks, dangers of excessive and long term usage, hazardous effects of these products constitutes an ethical importance and should be a part of corporate

responsibility. On the other in the political framework, legislative and regulatory actions should be in parallel to all individual's expectations and the society at large in a way preserving their freedoms including alcoholic beverage consumption [1, 17, 18, 19].

While there are several studies highlighting the benefits of moderate alcohol consumption some highlight the risks, dangers and hazarding effects of alcohol consumption. The term French paradox is used to indicate the availability of low levels of heart diseases which is associated with wine drinking and the antioxidants taken by wine in comparison to other countries which have similar daily routines, habits and behavioral traits in daily life [1,2,3,4,5,6]. This may be a result of alcohol to be have a stimulis in solvation of lipids intravenous and widening effect of it on veins. However excessive and long term usage of it may provide several risks, dangers, hazarding effects and malfunctions in the abolism [7,8,9,11]. Alcohol metabolization is a process in which ethanol (ethyl alcohol - C₂H₅OH) which is considered to be the main indrigient of alcoholic beverages is transformed to acetaldehyde that is known to be one of the known carcinogens with alcohol dehydrogenase enyzeme (ADH) which is further later converted to acetate with aldehyde dehydrogenase (ALDH). Acetate then further is broken down to carbon dioxide and water. Wastes are removed from the metabolism with the help of excretory systems composed of several subsystems and organs including kidneys and bowels to preserve the homeostasis [1, 32]. This homeostasis can be broken down with organ or system failures that may be caused of excessive and long term alcohol consumption which can lead to organ or system failures and even death. Therefore drinking excessive, long term alcohol is never advised. However drinking moderate levels of alcohol may provide some benefits as indicated in literature [1,2,3,4,5,6,7,32].

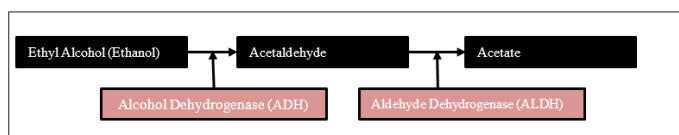


Figure 1. Alcohol Metabolism Process of a Healthy Liver with no Malfunction (Prepared by the Researcher)

As indicated in literature it is also worth noting that, there are several benefits and risks associated with alcohol consumption highlighted in literature. Therefore consumption of it is suggested to be moderate and responsibly for the consumers and associated market segements which should not be inferred as starting to drinking alcohol for nondrinkers. In literature while decreased risks of coronary heart disease, stroke, insulin sensivity boost, reduced risk of heart failure, reduced risk of gallstones and increased HDL cholesterol are cited as some of the benefits there are severe risks and dangers associated with alcohol consumption such as hypertension, severe types of alcohol caused liver diseases which can lead to death, risk of cardiovascular diseases, liver inflammation, scarring of the liver (cirrhosis), alcohol caused fatty liver disease, heart muscle damage (cardiomyopathy), stroke, organ with system failures in several forms and various cancer forms (mouth, pharynx, larynx, esophagus, breast, liver, colon, and rectum), can trigger weight gains if not balanced with a diet, societal problems, violent crimes and alcoholism [1,2,3,4,7]. According to a longevity study of Brandt, in literature consuming 15 g/day of alcohol leads to longevity whereas higher and lesser amounts of alcohol leads to a shorter life span for the sample of the study. However this amount can provide severe

risks for the people having liver malfunctions or other organ or system failures. Therefore it should be evaluated considering many parameters [1,2,3,4,5,6,7,8,9]. Despite some of the numerous benefits associated with alcohol consumption it is unfortunate to have the availability of a dense population combatting with alcohol addiction and its negative consequences. Therefore limiting or stopping alcohol intake, detoxification of the liver and metabolism with contemporary medical approaches, drinking moderate coffee, applying folate, curcumin, glutathione, vitamin c, vitamin b, sulphur, sistein, selenium cures are suggested for more sustainable liver functions in literature. Therefore these may be considered for more sustainable liver functions in consultation and suggested by the medical practioners. However preserving the health of the liver and metabolism by applying precautions, with life style changes may provide more benefits in the long run in comparison to treatment of anomalies in later stages [10, 11, 12, 13, 14, 15]. Individuals and metabolisms may react to the different doses of alcoholic beverages in several ways. Therefore metabolistic differences, several factors like age, sex, weight, height, metabolic rate other medical conditions associated with individuals should be considered and it should be drinken responsibly. In this context for the consumers who prefers to consume alcohol, it is suggested to consume in moderation with the right dose in consultation and suggested by their doctors.

With the help of transitions of the society and business landscape it found place in many organizational settings and landscapes in a more social and individualistic way. There are several studies associated with alcohol consumption and its benefits, dangers and risks associated with its short term, long term and excessive usage in literature. In this study some of the factors associated with alcohol consumption is investigated with the triangulation approach of qualitative and quantitative research methodologies composed of in depth interviews, observation and supervised and supervised forms of data ming with the aim of having an comprehensive understanding of the phenomena and highlighting the risks and dangers associated with long term, excessive usage [1].

2. Material and Method

2.1. Researh Method

In this study a phenomenological, single case study which is composed of a triangulation approach is being used. For this purpose qualitative and quantitative research paradigms with respective research methodologies used. In order to have an exploratory and confirmatory understanding an initial qualitative design composed of in-depth interviews and observation has been conducted. Later machine learning techniques in data mining have been applied in the quantitative part of the study following a literature review. Combining of qualitative and quantitative research approaches can be used in understanding the phenomeno in order to gain advantage and benefits cumulatively from the respective research methodologies and paradigms. There are numerous studies in literature applying triangulation technique for similar reasons [66,67,68,69,70,71,72,73,84].

Qualitative research here seeks to understand the phenomena including human behavior in a qualitative way, which is inductive in nature, applying interpretivism and constructivism for its epistemologic and ontological orientations whereas Quantitative research aims to understand the phenomena in a more deductive way, which has a positivistic and objectivist orientation of

epistemology and ontology. Qualitative data is semi or less structured, non-statistical, more flexible and mostly with a limited sample whereas quantitative data is more structured, can have more sample sizes based on the research design. For both cases several conventional and contemporary data collection methods and methodologies can be applied. Paper administered survey, online surveys, online or face to face focus groups, in depth interviews are some forms in this context [51. 62. 76. 77. 79. 84].

In addition to conventional statistical approaches in quantitative research, recent research methods and methodologies evolved over time. In this context data mining and machine learning with different techniques it utilizes as forward feeding or backpropagation found place in the research community. As indicated by Özerk in his notable work, unsupervised or supervised machine learning can be considered for several purposes as knowledge discovery, prediction or forecasting. It may provide an in-depth understanding of the topic of interest for the individuals, researchers, leaders, managers and stakeholder. [43. 48. 62. 63. 64. 65].

Data mining is a more structured and methodological approach in comparison to qualitative forms of research. In this context it can be said that data mining process is composed of some set of steps that together forms the data mining research process. These steps include understanding and analysis of the situation and business problem which is later followed with the examination and pre-processing of data. Later a conceptual framework or model is built following the literature review and analysis approaches. Following the model development, testing of the model with supervised and unsupervised versions of machine learning approaches takes place. In the last stage predicted analysis results are assessed [43. 48. 62. 63. 64. 65].

In general, in machine learning approaches, mainly those that employ a tree / graph structure, an entropy value is calculated based on different probabilities and combinations of the variables, and then the paths from major nodes to low secondary nodes. Entropy are tracked values. The paths with the minimum entropy value are chosen and respective boundary conditions are assigned to each node (decision nodes) in the tree / graph structures in order to reduce the perceived chaos due to unpredictability. This minimizes unpredictability, randomness of congestion or uncertainty with the selected routes. This form of mapping and tree / graph formations is handled as feed-forward and uses trigger or mapping / transform functions. Subsequently, with the backpropagation approach, an attempt is made to form most of the optimal paths and functions by customizing the functions and weights of the functions. This is called a form of gradient descent learning rule or delta rule that aims to calculate the most optimal weights for the input and output assignments in assignment / transform functions. . In this approach to rule learning, the weights that generate the most optimal solution are assigned as slopes in the function [85, 86, 87, 88, 89, 90, 91]. A gradient in this context shows the slope which is the derivative of the cost at the respective cost point. A gradient descent rule learner as in stochastic processes such as backpropagation, the shortest and steepest path indicating the local or global minimum with zero slope is calculated. The weights at this point which give the minimum cost are used as the slopes of the function. In this way, the total loss associated with the varying weights of the input layer is personalized and updated. As the gradient goes down, the total cost decreases and reaches the minimum at time t, which is the optimal weight for the minimum cost. In this process, the gradient descends iteratively and approaches the minimum cost with the

respected weight of the independent variable. The derivative of the cost finds its minimum at the minimum vertex of the inverse parabola (local minimum or global minimum) which gives the minimum cost and the associated weight which provides this minimum cost for the function. This point is reached iteratively by moving in the opposite direction of the gradient slope since it will approach the steepest and shortest point (descent). It is the point which gives the most optimal weight when the slope is zero at the local minimum or at the global minimum [85, 86, 87, 88, 89, 90, 91].

Among the rules formed lowest entropy value and the lowest cost, which is an indication of an optimal solution, is presented and listed as the association rule that maps input layers (spaces) to layers output (spaces). In each of these mappings, a cost or lost function is calculated that assigns an intuitive cost associated with the mapping function. The cost function is formulated as the average of the loss functions, while the loss function is involved in finding the error rate for a single training example. Find the difference between actual and expected values. The main aim of optimization approaches is to minimize this cost and to try to find the best adjustment parameters with techniques such as gradient descent, learning delta rule approach or backpropagation. On the other hand, an error function indicates the deviation of a real value from its prediction for the instance. Use of the combination of supervised and unsupervised machine learning techniques can be used as an influential approach in understanding some [85, 86, 87, 88, 89, 90, 91].

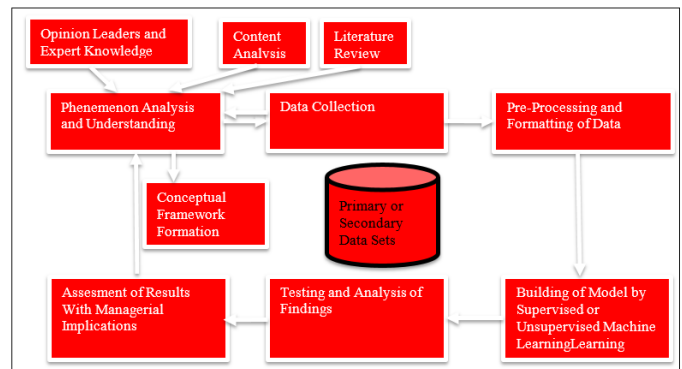


Figure 2. Data Mining Process in Data Analysis(Prepared by the Researcher)

In data analysis data mining process as in Figure 2 followed. Most frequently preferred supervised and unsupervised machine learning algorithms used consequently [43. 48. 62. 63. 64. 65]. In this context rules and insights gained with these algorithms. To name a few JRip, PART, OneR, Multilayer Perceptron, Bayesian Network, Kmeans have been used as the algorithmic choices. Unsupervised machine learning algorithms here assesses the instance values and assigns these independent values to the respective segment clusters whereas supervised machine learning algorithms mainly focused on mapping the multivariate variables in input layers to class labels in output layers with transformation and mapping functions, assesses the class based metrics and generates the associated rules in an reinforced fashion some applying forward feeding and backpropagation approaches based on the algorithmic designs and architectures they have [43. 48. 62. 63. 64. 65]. Also prediction focused machine learning functions are also involved in input-output transformation processes which generates the predicted values for the respective variables and attributes [43. 48. 62. 63. 64. 65]. Depending on the algorithmic

design. algorithmic architecture. complexity of the algorithms these algorithms can generate different results for similar. same or distinct problem sets [43. 48. 62. 63. 64. 65]. For the same data set with the same parameters performance indicators of the algorithms have been assessed and evaluated. The best performing algorithm for this problem domain with respective data set and parameters has been discovered with the analysis conducted. Knowledge patterns and rules found out have been interpreted and listed. Supervised and unsupervised machine learning processes followed is seen in Figure 3 and Figure 4.

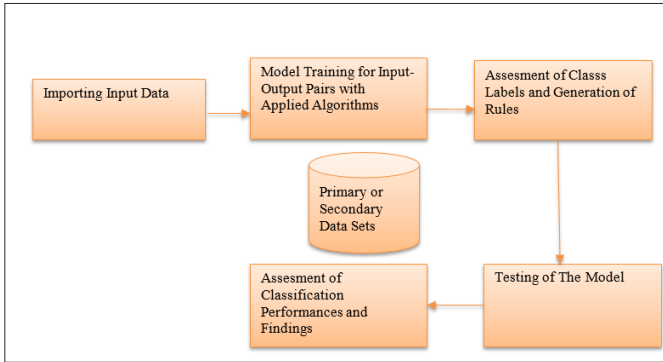


Figure 3. Supervised Machine Learning Algorithm Flow Composed of Model Building and Testing (Prepared by the Researcher)

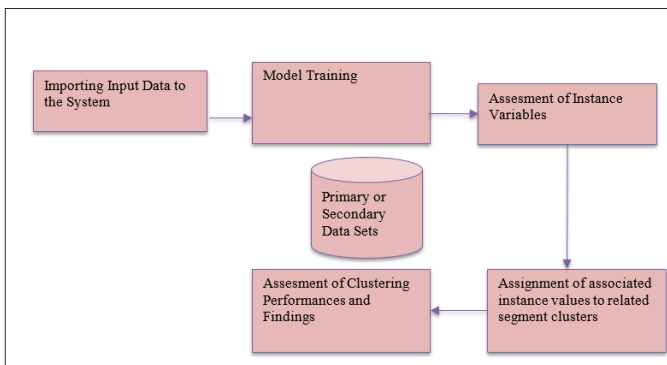


Figure 4. Unsupervised Machine Learning Algorithm Flow Composed of Model Building and Testing (Prepared by the Researcher)

2.1. Data Gathering and Processing

For data set, both qualitative and quantitative data gathering methodologies have been followed using in-depth interviews, observation, qualitative coding and surveys following a literature review associated with the topic. Primary data composed of Amount of Alcohol Consumed, Side Effect, Perceived Relaxation, Vilonce Tendency, Perceived Socialization, Alcoholic Status Indicator, Education Status Indicator, Weight Increase Indicator, Sklera and Skin Color Indicator, Waistline Increase Indicator, Alcohol Drinking Behavior Indicator have been used.

Table 1. List of Attributes

Name of Variable	Type of Variable
Amount of Alcohol Consumed	Numeric
Side Effect	Numeric
Perceived Relaxation	Numeric
Vilonce Tendency	Nominal
Perceived Socialization	Numeric
Alcoholic Status Indicator	Nominal
Education Status Indicator	Nominal
Weight Increase Indicator	Numeric
Sklera and Skin Color	Nominal
Waistline Increase Indicator	Nominal
Alcohol Drinking Behavior	Numeric

3. Findings

In the analysis section both qualitative and quantitative research methodologies have been followed. In the qualitative data analysis part of the triangulation it is revealed that the experimentee is drinking alcohol for relaxation purposes, socialization and having fun. It is understood that the experimentee does not have an alcoholic history, alcohol abuse or a usual binge drinking habit. It was seen that experimentee is health conscious and perceived risks associated with alcohol consumption such as liver malfunction or weight gain leads the experimentee to stop or drink alcohol in a more controlled and balanced way. The experimentee is in the age group of 30-40, having a university or above education status, working in a white collar position and pays attention to the brand equity and quality of the alcoholic beverages that is consumed. It was understood that factors like positive and negative anticipated emotions, cultural settings, local regulations, subjective norms, group norms, past behavior, perceived trust, alcohol consumption intention, value seeking activities, opinion leadership has an influence in consumer decision making and alcohol drinking and brand preference of the experimentee [43. 48. 60. 61. 62. 63. 64. 65]. It was also seen that product, price, place and promotion are some of the factors that leads to brand preference in alcoholic beverages category [60. 61]. It was discovered that the best perceived marketing mix composed of product, price, place and promotion dimension is an important determinant for the experimentee in brand preference. The experimentee is a healthy individual with healthy liver functions. With moderate levels of alcohol a relaxation with less side effects occurred in the observations and confirmed with the in-depth interviews. With the experiences with higher amounts of alcohol, more side effects like weight gains, waist line increase, headache, sweats, dehydration reported. A yellow sclera or yellow skin, an itchy skin which indicates a malfunction in liver functions have not been reported for the amounts in the range of 20 gr-120 gr ethanol levels for the sample of the study in the qualitative research part of the study [43. 48. 62. 63. 64. 65. 79. 80. 81. 82 .83].

Initial qualitative part is followed with a data mining process composed of classification and clustering algorithms applying supervised and unsupervised forms of machine learning. As Özerk states. today many data mining processes apply a technical approach where independent or multivariate indicators and variables with the help of mapping functions are assigned to output class labels. In this process rules that would enhance the exploratory and confirmatory understanding of the phenameno is generated [25. 30. 57]. In this context a data mining research methodology formed with an aristotle logic can be preffered and considered in many disciplines as finance. medical. operations research. information technology. marketing. public relations. political science and sociology [43. 48. 62. 63. 64. 65].

Table 2. Performance Estimations of machine learning algorithms

Machine Learning Method	Key Performance Indicators			
	Correctly Classified	Misclassified	RMSE	Precision
Multilayer Perceptron	100	0	0.03	1
JRip	33.33	66.67	0.54	N/A
OneR Method	33.33	100	0.81	N/A
Part	66.66	66.67	0.47	N/A
J48	66.66	100	0.47	N/A
Bayesian Networks	33.33	33.34	0.56	N/A

In the data mining analysis. for the same problem domain. same input with the same parameters have been run using machine learning algorithms. Later classification and clustering performances have been assessed and evaluated. In the analysis. 67 percent of the data has been used to train the model which is later tested with the test data set for the same variables. Considering some of the performance indicators frequently cited in literature performances of these algorithms compared. Generated root mean square error. precision. correct classification rate. incorrect classification rate values have been used for this purpose [43. 48. 62. 63. 64. 65]. Analysis revealed the performance indicators and rules as in Table 3 and Table 4.

Table 3. Discovered Rules by Machine Learning

If weight increases than it indicates an waistline increase whereas if the weight does not increase it in indicates a no waistline increase

If there is waistline increase then it points a waistline increase as well on the other hand if there is no waistline increase it is estimated that there is no weight increase as well

If there is no side effect and no weight gain than there is no perceived relaxation associated with alcohol consumption. if there is no side effect and weight increase then it points to a perceived relaxation with a score of 3

If there is side effect that it indicates a perceived relaxation with a score of 5

Perceived relaxation is less for alcohol consumption with lower quantities whereas perceived relaxation is higher for alcohol consumption with higher quantities

If perceived relaxation is with the score of 0 or 3 then it there is no side effect as headache. sweetining and nausea whereas if the perceived relaxation has the scores of 4 or 5 in a 5 point likert scale then it points to a side effect as headache

In one cluster with a alcoholic beverage with a 10gr of ethanol. no side effect. no violence tendency, perceived socialization with a score of 1.5, no alcoholism history. university or above university degree, a no value of weight increase indicator, a score of 2.4 for perceived relaxation, no yellow value of skin or eye color indicator with a alcohol drinker status of value yes and waistline increase value of no on the other hand 46.6 gr of ethanol. Some side effects as headache and nausea, no violence tendency, perceived socialization with a score of 3, no alcoholism history, university or above university degree, a yes value of weight increase indicator, a score of 3.33 for perceived relaxation, no yellow value of skin or eye color indicator with a alcohol drinker status of value yes and waistline increase value of yes

If alcohol consumed contains ethanol less than 60 gr then there is no major side effect as headache, nausea and sweetining whereas if alcohol consumed contains ethanol greater than 60 gr then headache. sweetining and nausea type of side effects occur

If the amount of alcohol consumed is less than 0 then the instance is classified under no drink status label whereas if the amount of alcohol consumed greater than 0 then the respective rule is classified under drink status yes.

If perceived relaxation is less than 1.5 than it indicates a no drink status whereas if perceived relaxation is greater than or equal to 1.5 then it indicates a yes drink status

If alcoholic beverage consumed contains less than 60 gr of ethyl alcohol then it indicates a perceived relaxation that has a value of 1.5 whereas if it consumes ethyl alcohol greater than or equal to 60 gr than it indicates a perceived relaxation that has a value of 4.75

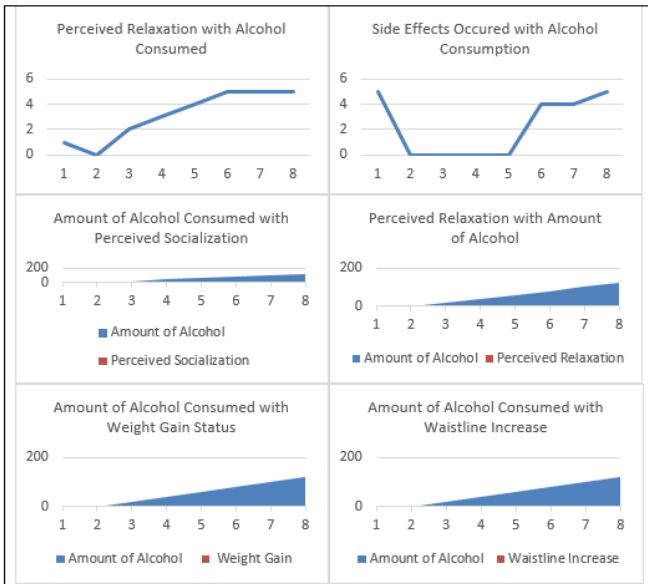


Figure 5. A Chart View of Changes in Variables

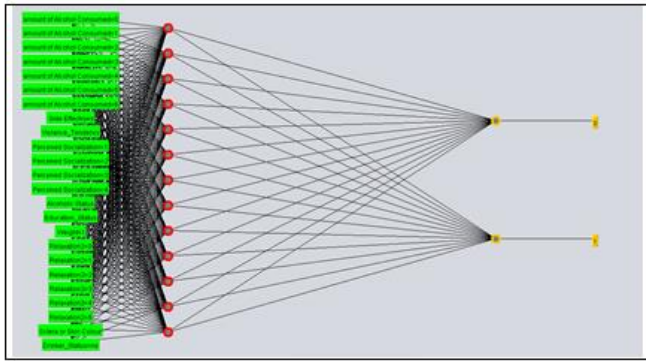


Figure 6. A view of Neural Network Analysis conducted (Multi-Layer Perceptron)

4. Conclusions and Recommendations

Human kind’s interest on alcohol has been known for many decades. People used alcohol in different geographies, countries and cultures in parallel to the discovery and development of fermentation and distillation techniques. As seen in the analysis of many behavioural patterns it is believed to be several factors and antecedents that lead to engaging drinking alcohol and such behavior to occur [1, 2, 7, 13, 59, 62].

Today especially in 21st century alcohol usage became an important behavioral pattern in various contexts and settings and gained popularity in many social and cultural settings. With the help of transitions of the society and business landscape it found place in many organizational settings and landscapes in a more social and individualistic way. Interest of human to alcohol known for many decades and expected to remain. However different norms, traditions, values, approach of regulatory frameworks, environment, group influence have impact on alcohol consumption with several micro and macro level variables directly or indirectly in a moderating nature. Despite its popularity in many generations, life styles and preferences excessive levels of alcohol consumption constitutes several hazardous risks and dangerous to human health. There are several studies associated with alcohol consumption and its benefits.

dangers and risks associated with its short term, long term and excessive usage in literature. In this study some of the factors associated with alcohol consumption is investigated with the triangulation approach of qualitative and quantitative research methodologies composed of in depth interviews, observation and supervised and supervised forms of data mining with the aim of having an comprehensive understanding of the phenomena and highlighting the risks and dangers associated with long term, excessive usage [1, 2, 7, 13, 59, 62].

Usage of alcohol became an important behavioral pattern in various contexts and settings and gained popularity in many social and cultural settings. As seen in the analysis of many behavioural patterns and traits it is believed to be several factors and antecedents that lead to engaging drinking alcohol. Interest of human to alcohol and alcohol consumption known for many decades. Therefore several marketing strategies, plans and programs are being used and formulated to attract consumer in the marketplace. As seen in the success of many marketed goods and services good marketing and brand management strategies composed of right price, place, place and promotion mixes, with the approaches putting the consumer in the center of the value chain succeeds.

In literature there a several studies highlighting the benefits associated with moderate and low levels of alcohol consumption whereas their dangers, risks, hazardous effects to human health in many contexts especially when consumed in large and excessive long term use of alcohol. Alcoholic beverages which contain fermented or distilled ethyl alcohol as their ingredients therefore constitutes health risks and dangers to human health which can lead to organ failures and even death therefore they should be consumed responsibly in consultation and as suggested by a medical practitioner.

In the study conducted which is a triangulation research design is followed composed of qualitative and quantitative research approaches. In this context observation, in-depth interviews and supervised and unsupervised machine learning approaches have been applied with the aim of discovering some knowledge and insights associated with the subject matter.

Later performances of machine learning algorithms have been assessed and evaluated for such problem domains and sets. Some of the rules and insights discovered are as follow. in the low levels of alcohol consumption a perceived relaxation, perceived socialization occurs and a side effect as headache, nausea, sweating is not reported. When the amount of alcohol is increased marginal utility of the alcohol from perceived relaxation, having fun and perceived socialization indicated whereas side effects increased as headache, nausea and sweating including the following day. Additionally with the large alcohol consumption in large quantities led to weight gain and waistline increases. Neither amounts of the alcohol consumed led to violence tendency or similar behavioral traits. When the sample is analyzed it was understood that there are several factors that have influence in alcohol drinking behavior to occur and brand preference. These factors are positive and negative anticipated emotions, cultural settings, local regulations, subjective norms, group norms, past behavior, perceived trust, alcohol consumption intention, value seeking activities, opinion leadership.

As part of the classification and clustering algorithms driven machine learning approach, following rules have been discovered. If alcohol consumed contains ethanol less than 60 gr then there is no major side effect as headache, nausea and

sweetening whereas if alcohol consumed contains ethanol greater than 60 gr then headache, sweetening and nausea type of side effects occur. If the amount of alcohol consumed is less than 0 then the instance is classified under no drink status label whereas if the amount of alcohol consumed greater than 0 then the respective rule is classified under drink status yes. If perceived relaxation is less than 1.5 then it indicates a no drink status whereas if perceived relaxation is greater than or equal to 1.5 then it indicates a yes drink status. If alcoholic beverage consumed contains less than 60 gr of ethyl alcohol then it indicates a perceived relaxation that has a value of 1.5 whereas if it consumes ethyl alcohol greater than or equal to 60 gr then it indicates a perceived relaxation that has a value of 4.75. If weight increases then it indicates a waistline increase whereas if the weight does not increase it indicates a no waistline increase

If there is waistline increase then it points a waistline increase as well on the other hand if there is no waistline increase it is estimated that there is no weight increase as well. If there is no side effect and no weight gain then there is no perceived relaxation associated with alcohol consumption, if there is no side effect and weight increase then it points to a perceived relaxation with a score of 3. If there is side effect that it indicates a perceived relaxation with a score of 5

Perceived relaxation is less for alcohol consumption with lower quantities whereas perceived relaxation is higher for alcohol consumption with higher quantities. If perceived relaxation is with the score of 0 or 3 then there is no side effect as headache, sweetening and nausea whereas if the perceived relaxation has the scores of 4 or 5 in a 5 point likert scale then it points to a side effect as headache. In one cluster with a alcoholic beverage with a 10gr of ethanol, no side effect, no violence tendency, perceived socialization with a score of 1.5, no alcoholism history, university or above university degree, a no value of weight increase indicator, a score of 2.4 for perceived relaxation, no yellow value of skin or eye color indicator with a alcohol drinker status of value yes and waistline increase value of 0 on the other hand 46.6 gr of ethanol, some side effects as headache and nausea, no violence tendency, perceived socialization with a score of 3, no alcoholism history, university or above university degree, a yes value of weight increase indicator, a score of 3.33 for perceived relaxation, no yellow value of skin or eye color indicator with a alcohol drinker status of value yes and waistline increase value of yes on the other hand

In the qualitative data analysis part of the triangulation it is revealed that the experimentee is drinking alcohol for relaxation purposes, socialization and having fun. It is understood that the experimentee does not have an alcoholic history, alcohol abuse or a usual binge drinking habit. It was seen that experimentee is health conscious and perceived risks associated with alcohol consumption such as liver malfunction or weight gain leads the experimentee to stop or drink alcohol in a more controlled and balanced way. The experimentee is in the age group of 30-40, having a university or above education status, working in a white collar position and pays attention to the brand equity and quality of the alcoholic beverages that is consumed. It was understood that factors like positive and negative anticipated emotions, cultural settings, local regulations, subjective norms, group norms, past behavior, perceived trust, alcohol consumption intention, value seeking activities, opinion leadership has an influence in consumer decision making and alcohol drinking and brand preference of the experimentee [43, 48, 60, 61, 62, 63, 64, 65]. It was also seen that product, price, place and promotion are

some of the factors that leads to brand preference in alcoholic beverages category [60, 61]. It was discovered that the best perceived marketing mix composed of product, price, place and promotion dimension is an important determinant for the experimentee in brand preference. The experimentee is a healthy individual with healthy liver functions. With moderate levels of alcohol a relaxation with less side effects occurred in the observations and confirmed with the in-depth interviews. With the experiences with higher amounts of alcohol, more side effects like weight gains, waist line increase, headache, sweats, dehydration reported. A yellow sclera or yellow skin, an itchy skin which indicates a malfunction in liver functions have not been reported for the amounts in the range of 20 gr-120 gr ethanol levels for the sample of the study in the qualitative research part of the study [43, 48, 62, 63, 64, 65, 79, 80, 81, 82, 83]. In the data mining analysis, multiplayer perceptron has been the top scorer among other algorithms that have been used in supervised machine learning approaches. It had the 100 percentage of correct classification rate, with 0.03 root mean square error and a precision value of 1.

Alcohol constitutes many risks, dangers and hazarding effects to human health therefore consumers who prefers to consume alcohol, it is suggested to consume in moderation with the right dose in consultation and suggested by their medical practioners. Individuals and metabolisms may react to the different doses of alcoholic beverages in several ways. Therefore metabolic differences, several factors like age, sex, weight, height, metabolic rate other medical conditions associated with individuals should be considered and it should be drincken responsibly.

To sum up, in this study a research design in the form of triangulation with the aim of discovering insights and knowledge from the qualitative and quantitative methodologies that provide used. In this context some of benefits when consumed in low-moderate doses, risks and dangers of alcohol consumption analysed. Some of the benefits and risk factors associated with alcohol consumption and factors that has influence in alcohol drinking behavior and consumer decision making with brand preference is examined. This may provide a complimentary perspective in understanding the phenomena with its managerial implications to governmental leaders, business leaders and the society at large. Also various versions of emprical studies of this type, employing data mining methodologies alike can be considered in different settings, for similar scenarious and problem domains in exploratory and confirmatory understanding for future researchers of the topic.

References

- [1] <https://www.hsph.harvard.edu/nutritionsource/healthy-drinks/drinks-to-consume-in-moderation/alcohol-full-story/>
- [2] Renaud S, de Lorgeril M. Wine, alcohol, platelets, and the French paradox for coronary heart disease. *Lancet*. 1992 Jun 20;339(8808):1523-6.
- [3] Burr ML. Explaining the French paradox. *J R Soc Health*. 1995 Aug;115(4):217-9.
- [4] Constant J. Alcohol, ischemic heart disease, and the French paradox. *Coron Artery Dis*. 1997 Oct;8(10):645-9.
- [5] Isabela Maria MONTEIRO VIEIRA. Alcohol and Health: Standards of Consumption, Benefits and Harm – a Review. *Czech J. Food Sci.* 36. 2018 (6): 427–440

- [6] Haseeb S. Alexander B. Baranchuk A. Wine and Cardiovascular Health: A Comprehensive Review. *Circulation*. 2017 Oct 10;136(15)
- [7] Carvalho AF. Heilig M. Perez A. Probst C. Rehm J. Alcohol use disorders. *Lancet*. 2019 Aug 31;394(10200):781-792.
- [8] Mathurin P. Lucey MR. Liver transplantation in patients with alcohol-related liver disease: current status and future directions. *Lancet Gastroenterol Hepatol*. 2020 May;5(5):507-514.
- [9] Rehm J. Taylor B. Mohapatra S. Irving H. Baliunas D. Patra J. Roerecke M. Alcohol as a risk factor for liver cirrhosis: a systematic review and meta-analysis. *Drug Alcohol Rev*. 2010 Jul;29(4):437-45.
- [10]<https://www.hopkinsmedicine.org/health/wellness-and-prevention/detoxing-your-liver-fact-versus-fiction>
- [11]<https://www.health.harvard.edu/blog/sorting-out-the-health-effects-of-alcohol-2018080614427>
- [12]<https://www.archivesofmedicalscience.com/The-role-of-curcumin-in-liver-diseases.78816.0.2.html>
- [13]https://en.wikipedia.org/wiki/History_of_alcoholic_drinks
- [14]<https://medipol.com.tr/kurumsal/haberler/medyada-medipol/karacigeriniz-icin-detokstan-medet-ummayin>
- [15]<https://www.sommerwhitemd.com/eat-these-foods-to-increase-glutathione/>
- [16]https://www.hpa.org.nz/sites/default/files/documents/Health_Effects.pdf
- [17]Blais E. Maurice P. Toward improved evaluations of laws against drink-driving. *Lancet*. 2019 Jan 26;393(10169):297-298.
- [18]<https://www.cdc.gov/alcohol/fact-sheets/alcohol-use.htm>
- [19]White A. Hingson R. The burden of alcohol use: excessive alcohol consumption and related consequences among college students.
- [20]Antonio Riccardo Buonomo . The role of curcumin in liver diseases. *Arch Med Sci* 2019; 15 (6): 1608–1620
- [21]<https://www.encyclopedia.com/education/applied-and-social-sciences-magazines/alcohol-history-drinking>
- [22]<https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-10991-7>
- [23]<https://health.clevelandclinic.org/is-coffee-good-for-your-liver/>
- [24]SWOT Analysis: Discover New Opportunities. Manage and Eliminate Threats". www.mindtools.com. 2016. Retrieved 24 February 2018.
- [25]Sammut-Bonnici. Tanya & Galea. David. (2015). SWOT Analysis. 10.1002/9781118785317.weom120103.
- [26]Satoshi Nakamoto. Bitcoin: A Peer-to-Peer Electronic Cash System.2008
- [27]Águila. R.D.M.. Ramírez. G.A.. 2013. Series: basic statistics for busy clinicians. *Allergol Immunopathol*. 42 (5). pp. 485-492.
- [28]Blackmore. K.. Bossomaier. T.. 2002. Comparison of See5 and J48.PART algorithms for missing persons profiling. *International Conference on Information Technology and Applications*
- [29]Frank E. and Witten I.H. (1998). Generating Accurate Rule Sets Without Global Optimization. In Shavlik. J.. ed.. *Machine Learning: Proceedings of the Fifteenth International Conference*. Morgan Kaufmann Publishers.
- [30]Frank E. and Witten I.H. (2000). *Data Mining: Practical Machine Learning Tools and Techniques with Java Implementations*. Morgan Kaufmann Publishers: San Francisco. CA.
- [31]Lemeshow S., Hosmer D.W., Klar J. & Lwanga S.K.. 1990. Adequacy of sample size in health studies. Chichester: John Wiley and Sons.
- [32]<https://pubs.niaaa.nih.gov/publications/aa72/aa72.htm>
- [33]Ramchoun. H. r.. Idrissi. M. m.. Ghanou. Y. y.. & Ettaouil. M. m. (2017). New Modeling of Multilayer Perceptron Architecture Optimization with Regularization: An Application to Pattern Classification. *IAENG International Journal of Computer Science*. 44(3). 261-269.
- [34]Rosenblatt. F.. & Cornell Aeronautical Laboratory. (1958). *The perceptron: A theory of statistical separability in cognitive systems (Project Para)*. Buffalo. N.Y: Cornell Aeronautical Laboratory.
- [35]Shearer. C.. 2000 The CRISP-DM model: the new blueprint for data mining. *Journal of Data Warehousing*. 5. 13-22.
- [36]Simoudis. E. (1996). Reality Check for Data Mining. *IEEE EXPERT*. 11(5). pp.26-33
- [37]Cohen. W. (1995). Fast effective rule induction. In A. Prieditis and S. Russell (eds.). *Proceedings of the 12th International Conference on Machine Learning*. Lake Tahoe. CA. pp.115-123.
- [38]Saravanan. N.. Gayathri V.. 2018. Performance and classification evaluation of J48 algorithm and Kendall's based J48 algorithm (KNJ48). *International Journal of Computer Trends and Technology*
- [39]Sasaki M.. Kita K.. 1998. Rule based text categorization using hierarchical categories. *IEEE*
- [40]Edmondson. Amy C.. and Tiona Zuzul. "Quantitative and Qualitative Methods in Organizational Research." In *The Palgrave Encyclopedia of Strategic Management*. Continuously updated edition. edited by Mie Augier and David J. Teece. Palgrave Macmillan. 2017. Electronic. (Pre-published. October 2013.)
- [41]Taniguchi M.. Haft M.. Hollm'en J.. and Tresp V. (1998). Fraud detection in communications networks using neural and probabilistic methods. In *Proceedings of the 1998 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP'98)*. Volume II. pp. 1241-1244.
- [42]Venkatesan. E. V.. 2015. Performance Analysis of Decision Tree Algorithms for Breast Cancer Classification. *Indian Journal of Science and Technology*.
- [43]Yavuz Ö.. 2019. A data mining approach for desire and intention to participate in virtual communities. *International Journal of Electrical and Computer Engineering*. 9(5).
- [44]Ławrynowicz. A.. Tresp. V.. 2014. *Introducing Machine Learning. Perspectives on Ontology Learning*. AKA Heidelberg /IOS Press.
- [45]Thomas. M.. 2012. Root Mean Square Error Compared to. and Contrasted with. Standard Deviation. *Surveying and Land Information Science*. 72.
- [46]Ławrynowicz. A.. Tresp. V.. 2014. *Introducing Machine Learning. Perspectives on Ontology Learning*. AKA Heidelberg /IOS Press.
- [47]Thomas. M.. 2012. Root Mean Square Error Compared to. and Contrasted with. Standard Deviation. *Surveying and Land Information Science*. 72.
- [48]Karahoca D.. Karahoca A.. Yavuz Ö.. 2013. An early warning system approach for the identification of currency crises with data mining techniques. *Neural Computing and Applications*. 23(7-8)
- [49]Rasmussen. C. E.; Williams. C. K. I. *Gaussian Processes for Machine Learning (Adaptive Computation and Machine Learning)*; The MIT Press: 2005.

- [50]<http://old.opentox.org/dev/documentation/components/gaussianregressions>
- [51]Malhotra. Naresh K. Marketing Research: An Applied Orientation. Upper Saddle River. NJ: Pearson/Prentice Hall. 2007.
- [52]Anil Rajput. 2011 J48 and JRIP Rules for E-Governance Data. International Journal of Computer Science and Security (IJCSS). 5(2)
- [53]<https://plato.stanford.edu/entries/aristotle-logic/>
- [54]<https://www.health.harvard.edu/blog/get-smart-about-your-goals-this-strategy-can-help-you-stay-focused-and-on-track-at-any-age-2017090112113#:~:text=A%20good%20way%20to%20establish.clearly%20and%20can%20attain%20them.&text=Specific%3A%20Goals%20need%20to%20be.connected%20to%20a%20meaningful%20outcome.>
- [55]<https://hbr.org/2000/01/the-brand-report-card>
- [56]<https://hbsp.harvard.edu/product/BEP224-PDF-ENG>
- [57]Conkright. Todd. (2015). Using the Four Functions of Management for Sustainable Employee Engagement. Performance Improvement. 54. 10.1002/pfi.21506.
- [58]<https://www.aiuniv.edu/degrees/business/articles/functions-of-management>
- [59]Ajzen. I. & Fishbein. M.. 1980. Understanding attitudes and predicting social behaviour. Englewood Cliffs. NJ: Prentice Hall.
- [60]Kotler. Philip. Principles of Marketing. Englewood Cliffs. N.J. :Prentice Hall. 1991.
- [61]Kotler. Philip. Marketing Management. Upper Saddle River. N.J. :Prentice Hall. 2000.
- [62]Yavuz. Ö.. 2018. Marketing Implications Of Participative Behavior In Virtual Communities. Bahcesehir University Graduate School of Social Sciences. Management-Marketing Program. Istanbul
- [63]Yavuz. Ö.. 2009. An early warning system approach for the identification of currency crises. Bahcesehir University Graduate School of Sciences. Computer Engineering Graduate Program. Istanbul
- [64]Yavuz. Ö. (2021). A Public Perceptions Analysis With Data Mining Algorithms. 2. International “Başkent” Congress On Physical, Social and Health Sciences. Ankara
- [65]Yavuz. Ö. (2021). A Data Mining Analysis of Coronavirus Cases and Vaccinations in The City of London. Astana. Ankara.
- [66]Halldórsdóttir. S. (2000). The Vancouver School of doing Phenomenology. In: Fridlund. B. and Hildingh. C. (eds.) Qualitative research methods in the service of health. Lund: Studentlitteratur. pp. 47-84.
- [67]Smith. J.D.. (2012). Single-Case Experimental Designs: A Systematic Review of Published Research and Current Standards. Psychological Methods. 10.1037/a0029312.
- [68]Tate. Robyn & Perdices. Michael. (2020). Research Note: Single-case experimental designs. Journal of Physiotherapy. 66. 10.1016/j.jphys.2020.06.004.
- [69]Khan. Shahid. (2014). Qualitative Research Method - Phenomenology. Asian Social Science. 10. 298-310. 10.5539/ass.v10n21p298.
- [70]Neubauer. B.E.. Witkop. C.T. & Varpio. L. How phenomenology can help us learn from the experiences of others. Perspect Med Educ 8. 90–97 (2019).
- [71]Olsen. Wendy. (2004). Triangulation in social research: Qualitative and quantitative methods can really be mixed. Developments in sociology. 20. 103–118.
- [72]Kelle. Udo & Kühberger. Christoph & Bernhard. Roland. (2019). How to Use Mixed-methods and Triangulation Designs: an Introduction to History Education Research. History Education Research Journal. 16. 5-23. 10.18546/HERJ.16.1.02.
- [73]Todd D. Jick. 1979. Mixing Qualitative and Quantitative Methods: Triangulation in Action. Administrative Science Quarterly
- [74]<https://pubchem.ncbi.nlm.nih.gov/compound/Ethanol>
- [75]<https://www.calstatela.edu/sites/default/files/dept/chem/08summer/158/25-words-ethanol.pdf>
- [76]Cropley. Arthur. (2015). Introduction to Qualitative Research Methods. 10.13140/RG.2.1.3095.6888/1.
- [77]Kuluchumila. Revocatus. (2018). Researching Education leadership in Tanzanian Secondary Schools.
- [78]van den Brandt PA. Brandts L. Alcohol consumption in later life and reaching longevity: the Netherlands Cohort Study. Age Ageing. 2020 Apr 27;49(3)
- [79]<https://www.webmd.com/a-to-z-guides/causes-of-yellow-eyes>
- [80]Joseph A. Samant H. Jaundice. [Updated 2021 Aug 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing;
- [81]<https://my.clevelandclinic.org/health/diseases/15572-cirrhosis-of-the-liver>
- [82]Brandt. Piet & Brandts. Lloyd. (2020). Alcohol consumption in later life and reaching longevity: the Netherlands Cohort Study. Age and ageing. 49. 10.1093/ageing/afaa003.
- [83]<https://www.mayoclinic.org/diseases-conditions/cirrhosis/symptoms-causes/syc-20351487>
- [84]Bryman. A. (2008). Social Research Methods. New York: Oxford University Press.
- [85]<https://towardsdatascience.com/entropy-how-decision-trees-make-decisions-2946b9c18c8>
- [86]https://en.wikipedia.org/wiki/Feedforward_neural_network
- [87]<https://en.wikipedia.org/wiki/Backpropagation>
- [88]<https://brilliant.org/wiki/backpropagation/>
- [89]https://en.wikipedia.org/wiki/Loss_function
- [90]https://en.wikipedia.org/wiki/Error_function
- [91]https://en.wikipedia.org/wiki/Gradient_descent