Ege Akademik Bakış

Ege Academic Review

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Using Machine Learning Methods in Financial Distress Prediction: Sample of Small and Medium Sized Enterprises Operating in Turkey

Yusuf AKER[1], Alper KARAVARDAR[2]

ABSTRACT

Financial distress has become one of the main topics on which lots of research has been done in the recent finance literature. This paper aims to predict the financial distress of Turkish small and medium firms using Logistic Regression, Decision Tree, Random Forest, Support Vector Machines, K-Nearest Neighbor and Naive Bayes model. Empirical results indicate that decision tree model is the best classifier with overall accuracy of %90 and %97 respectively for 1 and 2 years prior to financial distress. Three years prior to financial distress, Naive Bayes outperform other models with an overall accuracy of 92.86%. Furthermore, this study finds that distressed firms have more bank loans and lower equity. In the Turkish economy, where cyclical fluctuations are high in the last decade, distressed firms grew rapidly with high bank loans and gained higher operating profits than non-distressed firms. After a while, distressed firms that cannot manage their financial expenses get into financial trouble and go bankrupt. This article can be useful for managers, investors and creditors as well as its contribution to academic research.

Keywords: Financial Distress Prediction, Decision Tree, Naive Bayes, Support Vector Machine, Random Forest, Logistic Regression.

JEL Classification Codes: G32, G33, C52

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INTRODUCTION

Financial distress prediction describes any situation where a company has certain kind of financial difficulties, especially loan payments due to creditors, making it unable to meet its financial obligations. If necessary measures are not taken on time, prolonged financial distress may eventually lead to bankruptcy. After the 2008 global financial crisis, this issue has never lost its importance due to 15 July 2016 coup attempt and the 2018-2021 currency and debt crisis in Turkey. Notwithstanding being financially supported by the government recently, company bankruptcies continued to increase. According to the report of the International Finance Institute (2021), Turkey ranks first in the world in the number of bankruptcies in 2020 and second in the increase in debt ratio among developing countries. Highly volatile flow of foreign exchange, increase in interest rates and soaring inflation caused a recession in Turkish economy, as a result of this, there has been a great increase in the number of companies going bankrupt recently. Additionally, according to the news that Bloomberg (2018) based on a consultancy company report, the fact that 80 percent of newly established companies in Turkey go bankrupt within the first five years shows us how important this issue can be for Turkey.

The main purpose of this study is to determine both which machine learning model has higher prediction accuracy and which financial ratios are more successful in distinguishing distressed and non-distressed firms. In the Turkish economy, where cyclical fluctuations are high, we wonder which financial ratios maximized the prediction accuracy that occurred 1, 2 and 3 years before the failure. Additionally, using selected ratios, this paper aims to make a comparison of forecast accuracy for six models, namely Logistic regression (LR), Decision Tree (DT), k-Nearest-Neighbours (kNN), Support Vector Machine (SVM), Naive Bayes (NB) and Random Forest (RF).

According to the report of the Banking Regulation and Supervision Agency (BDDK, 2019) the SME sector, which has a very important place in the Turkish economy, is the sector most affected by the negativities or crises that may occur in market conditions. The share of SME loans in all loans in Turkey is 24%, and these loans are more profitable loans for financiers due to the high spread. But we see that in the literature review conducted, it was

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seen that 88.5% of the studies on financial distress were conducted on commercial companies originating from Borsa Istanbul (BIST). 102 studies published on financial distress were analyzed and it was determined that only 2 of these studies examined SMEs. This study also aims to contribute to the literature on financial distress in SMEs in Turkey.

The second contribution of this article to the literature is related to the number of SMEs examined. In the literature review in the Turkish context, an average of 106 company data per survey was analyzed. In this study, the financial statements of 392 companies were examined and studied with much more data than other studies. According to Öğündür (2020), it is critical to work with enough data to avoid overfitting and underfitting in machine learning. The third and most important contribution of the article is related to the distress criteria of distressed firms. In the literature review conducted in the context of Turkey, it is seen that the distress criteria in most studies consist of make loss two years in a row, make loss three years in a row, 2/3 decrease in equity, Altman Z score ratio, previous year's loss exceeding 10% of the asset. These criteria are not definitive criteria for bankruptcy and companies with these characteristics can survive. In this study, the companies that were given bankruptcy or concordat decisions by the courts were deemed financially distressed, so the probability of making a mistake in this matter was reduced to zero. This issue is very important because error in the selection of distress criteria will make the research results controversial.

When examining the financial statements of companies in Turkey, two types of balance sheet structures are encountered. Inasmuch as analyzes should be made with similar types of financial statements, the research was continued with the financial statements of the companies that keep records on a calendar year basis. According to the official announcement website of the government, ilan.gov.tr, in 2018, 814 SMEs consisting of the same type of financial statements declared concordat or bankruptcy. Data on 219 SMEs, which constitute 27% of these unsuccessful SMEs, were reached.

This paper consists of 6 sections. Section 2 contains a brief review of the literature. In section 3, we present a study that demonstrates the working techniques of the machine learning models used in this study. Chapter 4 illustrates the samples and feature selection process. Section 5 presents the empirical results. In this section, a specific research methodology was applied while analyzing the data. Section 7 shows the results.

LITERATURE REVIEW

After Patrick (1931) who was one of the first to work in this field, discovered that there is a difference between distressed and non-distressed firms, many researchers (Beaver, 1966; Altman, 1968; Blum, 1972; Deakin, 1972; Libby, 1975; Springate, 1978; Fulmer, 1984) established new models or developed existing models to predict financial distress by means of financial ratios (Tuncay, 1998). Especially in the 2000s, financial markets developed, and with the increase in the software and hardware features of computers, the big data era was entered. Instead of theoretical and statistical models, machine learning models have started to be used more. Aziz & Dar (2006) analyzed 46 articles included 89 empirical studies. He ascertained that financial ratios were used as explanatory variables in more than 60% of the studies, and that machine learning models had a higher accuracy rate than statistical and theoretical models.

Table 1. Methodology of data analysis

Data pre-processing	
Process	Obtaining 2015-2016-2017 distressed and non-distressed SMEs data Missing data detection - Replacing missing values with median Outlier detection - Replacing outliers with Tukey method Data normalization Splitting the data for training and testing (%70 train - %30 test) Feature selection with Random Forest - Recursive feature elimination (RF-RFE) Correlation and multicollinearity (VIF) analysis of independent variables
Analysis methods	
Methods	LR DT kNN RF NB SVM

Both traditional statistical methods and machine learning methods were used in 13 studies (İçerli, 2005; Aksoy, 2018; Ural, 2020; Çelik, 2009; Torun, 2007; Ergin, 1999; Paket, 2014; Şengören, 2019; Civan & Dayı, 2014; Hesarı, 2018; Aktaş, Doğanay & Yıldız, 2003; Yazıcı, 2018; Yakut & Elmas, 2013) examined in the context of Turkey. While the predictive accuracy of these models is compared, it is noticed that machine learning models give 92% more successful result. It has been observed that the machine learning models used in our research are either not used at all or used very little in studies in Turkey. One of the 2 studies with the DT model was conducted by Hesarı (2018), and it was concluded that the DT model has higher prediction power than the artificial neural networks and discriminant model. Yakut & Elmas (2013), who conducted the other study, found that DT was more successful than discriminant analysis. Apart from Selcik (2019) in the RF model and Aksoy & Boztosun (2019) in the kNN model, no other financial distress studies used these models were found. One of the 2 studies with the SVM model was done by Ceran & Bülbül (2019) that mentioned the lack of studies with the SVM model in Turkey. Şengören (2019), who conducted the other study, used the LR and SVM models and found that the SVM model had higher prediction power than the LR model. No bankruptcy prediction studies have been conducted in Turkey with the NB method before, and this article is the first study in this field.

FINANCIAL DISTRESS PREDICTION MODELS

Beaver (1966), who made the first statistical study on the prediction of financial distress, examined the effect of accounting data on the prediction of bankruptcy. Beaver, with his univariate analysis, reached the end of that financial ratios have different trends in predicting bankruptcy. Afterwards, one of the most important studies in the bankruptcy literature was fulfilled by Altman (1968). Altman formed two groups with 33 successful and 33 unsuccesful firms and examined these firms using the multiple discriminant analysis method and then developed the Z score model consisting of 5 important financial ratios. The accuracies of this model were found that equal to 95%, and 72% for one and two years prior to bankruptcy, respectively (Mselmi, Lahiani & Hamza, 2017).

Deakin (1972), on the other hand, tried to bring together the good sides of both models by using the model developed by Beaver and Altman. Deakin matched 32 distressed firms that went bankrupt between 1964 and 1970 with 32 non-distressed firms, taking into account asset size and financial data periods. The findings obtained as a result of the study showed great similarities with the results obtained by Beaver in 1967. In both studies, it has been determined that the ratio of cash flow to total debt is the most effective method in estimating financial failure. In recent years, with the quickly progress of computer technology, machine learning algorithms and data mining have begun to be used successfully in estimating banktruptcy (Tuncay,1998).

In this paper, six different classification methods are used to predict bankruptcy of Turkish small and medium sized firms, namely LR, DT, RF, SVM, kNN, NB. In the context of Turkey, it has been observed that there are not enough financial distress prediction research with machine learning models except for LR and artificial neural networks (ANN). We only included the LR model in the study because we want to compare this model with other models.

Logistic Regression

The logistic regression model emerges as a model suitable for situations where the dependent variable is categorical or classified. It is a method used to determine the cause-effect relationship with explanatory variables in cases where the dependent variable is observed in binary, triple and multiple categories (Özdamar, 2002). In logistic regression analysis, predictions are made using equations. By drawing the linear line that best fits the relationship between the dependent and independent variables, it is tried to find the equation that will minimize the difference between the actual value of the dependent variable and the predicted value of the independent variable (Shannon & Davenport, 2001). In the logistic regression model, π represents probability, β1 represents the regression coefficient and Xi represents the independent variables. The β0 and β1s represents in the model are estimated using the maximum probability method. The logistic regression model is written as follows (Kalaycı, 2009);

$$\text{Log}\,\frac{\pi}{1-\pi} = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \ldots. \beta mXm$$

Since the main purpose here is to put the model in training or testing, a Z value is obtained after X1, X2 and all the following variables are multiplied by their weights.

$$Z = b\,(\text{bias}) + X1w1 + X2w2 + X3w3 + \ldots\ldots. + Xnwn$$

The resulting Z value is inserted into the Sigmoid function and equalized to a value between 0 and 1. Since the sigmoid function is a derivative function, the values and weights of X will be constantly updated as data is entered, and the Z value will take a new value each time (udemy.com).

Decision Tree

The decision tree model is a classification model in the tree structure consisting of decision nodes and leaf nodes. In this method, the data set is developed by dividing it into small pieces. In decision trees, which can consist of both categorical and numerical data, decision nodes can contain more than one branch. The first node is called the root node (Uzun, 2020).

The decision tree model can be defined as "the iterative model obtained by dividing n sets of statistical units into subgroups". The purpose of dividing the unit set into subsets is to increase the purity of the group by creating more subsets than the other group. The algorithm terminates when homogeneity is achieved in the subgroup and no more pure groups can be obtained (Soo & Upneja, 2014).

Random Forest

The random forest model, which is one of the types of supervised algorithms, is an algorithm that creates a random forest, as the name suggests, and is used in both classification and regression problems. Although there is no direct relationship between the number of trees and the result, the result is achieved as the number of trees increases. The difference with the decision tree algorithm is that the root nodes in the random forest algorithm are chosen randomly. The random forests algorithm is easy to understand and interpret. Its main advantages are that tree structures are visualizable and do not require extensive data preparation for analysis. However, if it produces overly complex trees that do not explain the data well, the probability of yielding positive results decreases. At the same time, in case of overfitting the system, the algorithm may lose its flexibility and give a result close to memorization and go into unnecessary details. Algorithm is more successful at classification than regression (Çebi, 2020).

k-Nearest Neighbor

The k-Nearest Neighbor algorithm is a type of algorithm that classifies the data to be classified according to the proximity relationship to the previous data. It is a simpler learning model compared to the complex structure in other algorithms. In this model, which does not have a training phase, training and testing mean almost the same thing. In this model, the closest points to the new point are sought. The closest points are represented by k. The k value represents the distance of the new data to the old data points to be measured. If we choose the k value as 3, the distance of 3 data points close to the new point is measured. The classification decision is made by looking at which class the 3 closest points belong to. The algorithm calculates these distances according to the Euclidean distance rule.

$$\sqrt{\sum_{i=1}^{n}(q1-p1)^2}$$

The kNN algorithm has some limitations. The choice of parameter k is critical to the success of the algorithm. Choosing the k parameter too small makes the algorithm sensitive to noisy data. The second important point is the selection of the appropriate distance criterion. Data need to be standardized without applying the distance criterion. It is known that the Euclidean distance criterion, which is suitable if the independent variables are continuous, cannot classify well in multivariate high-dimensional data. This algorithm, which needs high memory in high-dimensional data, is recommended to make classify with a small number of variables (Lantz, 2019).

Naive Bayes

Naive Bayes classifier is a model named after Thomas Bayes and based on Bayes Theorem. It determines the category of data with a set of calculation methods defined according to probability principles. Bayes' Theorem is a graphical model that shows the relationships between variables using conditional probabilities. In the model, variables are represented as nodes, while possible relationships are represented as lines between nodes. An unconnected node means that it is independent of variables. Bayes' theorem is expressed with the following equation (Haltaş & Alkan, 2013);

$$P(X|Y)=(\mathbf{P(Y\,|\,X)P(X)})/P(Y)$$

P(X|Y) represents the probability that event X will occur when event Y occurs. P(Y|X) represents the probability of event Y occurring when event X occurs, while P(X) and P(Y) are apriori probabilities of events X and Y. In the Naive Bayes algorithm, it is accepted that it performs well since each feature is considered independent from each other. With its simple and easy structure, very good works can be done with little data, and it can also give very positive results in high-dimensional data. It can be used with continuous and intermittent data as well as unbalanced data.

Support Vector Machine

Support vector machines are one of the supervised learning algorithms generally used in classification problems. SVM developed by Vapnik (1995) has attracted the attention of many researchers recently because it has produced remarkable results. The superiority of this method is due to its ability to generalize better than other models (Min, Lee, & Han, 2006). Tay & Cao (2002) used SVM for estimating the wholesale price index. Fan & Palaniswami (2000) also used this method for bankruptcy prediction. And then Huang et al. (2004) used this method for credit rating.

In the financial distress prediction literature, SVM is considered to be a very powerful and effective method due to its high prediction accuracy. SVM has different processes compared to other models. Its most important feature is its success in variable selection. Because while trying to comprehend the geometric structure of the sample space in the data subject to the research, unnecessary, irrelevant and unrelated data will be encountered. In such a case, more time will be spent and the fit rate of the model will decrease somewhat (Piramuthu, 2004).

SAMPLE AND DATA SELECTION

Data of this paper consists of annual financial statements of Turkish small and medium sized companies operating in Turkey from 2015 up to 2019. The firms in the study were selected from different sectors such as education, energy, furniture, transportation, mining, automotive, textile, tourism. However, construction and contracting companies were not included in the sample. Because it is quite possible that the works in the balance sheets of these firms are not annual or spread over more than one year. We continued to this sudy with companies in sectors whose financial statements have the same time (annual basis) period. All statistical analyzes were made using the python programming language.

Firms for which bankruptcy or concordat decisions were made by the commercial courts in the 2018-2019 period were accepted as distressed. The data collected for distressed firms includes annual data one (2017), two (2016) and three years (2015) before the the judgment date.

Our data consists of 173 non-distressed and 219 distressed firms. Data was randomly subsampled as 70% training set and 30% test set. The training set is used to train the prediction model. The model calculates the "prediction" values from the training result. The model is evaluated by comparing it with the test set, which consists of data that is not included in the training set.

In this study, 47 initial financial ratios were used and the selection of these ratios is based on previous studies (Mselmi, Lahiani & Hamza, 2017; Aksoy & Boztosun, 2018; Yürük & Ekşi, 2019; Kısakürek, Arslan & Bircan, 2018; Ertan & Ersan, 2018; Yazıcı, 2018). These ratios are selected from among the liquidity ratios, financial structure ratios, profitability ratios and turnover ratios.

Table 2 illustrates financial ratios before feature selection, also called initial ratios. From the primary financial ratios, the best subset that could represent the data set for each year before the failure was selected by the feature selection method. Feature selection is widely used in machine learning and statistics. Reducing the number of features has many benefits in data analysis. Reasons such as decreasing the size of the data, increasing the speed of the algorithm, eliminating the irrelevant and noisy data, making the data simpler and more visualizable, reducing the memory required for data storage are some of them. Random Forest - Recursive Feature Elimination (RF-RFE) method was used for feature selection in this research. RF-RFE method, one of the most popular feature selection approaches, is effective in reducing data size and increasing efficiency (Chen, Meng, Liu, Jin & Su, 2018). According to Voyle et al. (2016), RF-RFE has proven to be more effective compared to other methods and can use fewer features to achieve a higher classification accuracy. The RFE method can be also used with other classification algorithms (SVM, DT, etc.) other than RF. With RF-RFE, 8 financial ratios were selected for the first year prior to failure and 9 for the second and third years. The selected financial ratios are summed in table 3.

For one, two and three years before bankruptcy, the most important financial ratios selected by RF-RFE are Stock dependency ratio (R06), net tangible assets/long-term liabilities (R24) and financial expense/net sales (R32). R06 shows how dependent a firm is on inventories to pay for its short-term liabilities. It is seen that the stock dependency ratio of distressed firms is higher than that of non-distressed firms. In other words, this ratio shows that distressed firms are more dependent on stocks for the payment of short-term liabilities. The second most important ratio, R24, shows that the ratio of net tangible fixed assets to long-term debts of distressed firms is low, and it is two times higher in non-distressed firms than in unsuccessful firms. The third most important ratio, R32, shows the ratio of finance expense to net sales. It is seen that distressed firms have financing expenses of

approximately 4 percent of their net sales in all three years. In non-distressed firms, it is seen that this rate is between 5 per thousand and 7 per thousand. As expected, it is seen that distressed firms pay higher financial expenses as a result of using more foreign resources.

For one and two years before bankruptcy, the most important financial ratios selected by RF-RFE are long-term liabilities/constant capital (R18) and fixed asset turnover (R46). R18 shows that the ratio of long-term foreign resources to constant capital of successful firms is lower than that of distressed firms. It has been observed that non-distressed firms have stronger capital, while distressed firms use much more foreign resources than their own resources. For two and three years prior to failure, the most discriminant financial ratios selected by RF-RFE are Equities/Total foreign assets (R11) and (Financial expenses+İncome before tax)/Financial expenses (R35). R11 shows that distressed firms have 5 times more foreign resources compared to their own resources, while this rate is about 2 times higher in non-distressed firms. R35, on the other hand, shows that non-distressed firms operate with higher pre-tax profits and lower financing costs than distressed firms.

One year before bankruptcy, the most important financial ratios selected by RF-RFE are bank loans/total foreign assets (R15), operating profits/net sales (R30) and (financial expenses+profit after tax)/financial expenses (R34). R15 shows that the share of bank loans in foreign resources used by successful firms is lower than that of non-successful firms. When we analyze the R30 ratio, we encounter a different situation.

Contrary to what is known the results show that the operating profit margin of distressed firms is higher than that of non-distressed firms. However, in this case, the covering power of net financial debts should be considered. It has been observed that distressed companies grow rapidly with high bank debt, have high operating profits, but after a while they fail to manage their financing expenses. It has been observed that R34 gives similar results to the previously described and closely related R35.

Table 2. Selected initial financial ratios

Variable	Meaning
Liquidity	
R01	Current ratio
R02	Liquidity ratio
R03	Cash ratio
R04	Stocks/Current assets
R05	Stocks/Total assets
R06	Stock dependency ratio
R07	Short-term trade receivables/Current assets
R08	Short-term trade receivables/Total assets
Financial structure ratios	
R09	Total foreign assets
R10	Debt Ratio
R11	Equities/Total foreign assets
R12	Short term liabilities/Foreign assets
R13	Short term liabilities/Total liabilities
R14	Bank loans/Total assets
R15	Bank loans/Total foreign assets
R16	Short term bank loans/Short term liabilities
R17	Long-term liabilities/Total liabilities
R18	Long-term liabilities/Constant capital
R19	Current assets/Total assets
R20	Fixed assets/Equities
R21	Fixed assets/Total foreign assets
R22	Fixed assets/Constant capital
R23	Net tangible assets/Equities
R24	Net tangible assets/Long-term liabilities
R25	Net tangible assets/Total assets

Variable	Meaning
Profitability	
R26	Net income after tax/Net sales
R27	Cost of goods sold/Net sales
R28	Gross sales margin/Net sales
R29	Operational expenses/Net sales
R30	Operating profits/Net sales
R31	Oper. profits/(Total assets-Fin.tangible assets)
R32	Financial expense/Net sales
R33	(Finan. exp.+Netincome beforetax)/Total Liabilities
R34	(Financial exp.+Profit after tax)/Financial Expenses
R35	(Fin.expenses+İncome before tax)/Fin. Expenses
R36	Net profit after tax/Equities
R37	Profit before tax/Equities
R38	Net profit after tax/Total assets
R39	(Retained earn.+Reserves)/Tot.assets
Turnover Rates	
R40	Equity turnover
R41	Working capital turnover
R42	Net working capital Turnover
R43	Asset turnover
R44	Accounts receivable turnover
R45	Stock turnover
R46	Fixed asset turnover
R47	Net tangible asset Turnover

Note: This table illustrates the 41 financial variables. These variables represent the initial financial ratios applied to all firms.

Table 3. Financial ratios selected by Random Forest – Recursive Feature Elimination (RF-RFE)

Discriminant Ratios	1-year ahead	2-year ahead	3-year ahead
R6:Stock dependency ratio	✓	✓	✓
R11:Equities/Total foreign assets		✓	✓
R15:Bank loans/Total foreign assets	✓		
R16:Short term bank loans/Short term liabilities			✓
R17:Long-term liabilities/Total liabilities		✓	
R18:Long-term liabilities/Constant capital	✓	✓	
R20:Fixed assets/Equities			✓
R24:Net tangible assets/Long-term liabilities	✓	✓	✓
R30:Operating profits/Net sales	✓		
R32:Financial expense/Net sales	✓	✓	✓
R34:(Financial expenses+Profit after tax)/Financial expenses	✓		
R35:(Financial expenses+İncome before tax)/Financial expenses		✓	✓
R37:Profit before tax/Equities			✓
R42:Net working capital turnover			✓
R44:Accounts receivable turnover		✓	
R46:Fixed asset turnover	✓	✓	

Note: This table presents the financial variables selected by RF-RFE to be used in the prediction of financial distress.

Two years before bankruptcy, the most important financial ratios selected by RF-RFE are long-term liabilities/total liabilities (R17) and accounts receivable turnover (R44). R17 shows that the share of long-term liabilities of distressed firms in total liabilities is quite high. R44, on the other hand, is a financial ratio that shows how many times receivables are collected in an accounting period, and it has been observed that this ratio is high in non-distressed companies. Three years before bankruptcy, the most discriminant financial ratios selected by RF-RFE are fixed assets/equities (R20), profit before tax/equities (R37), net working capital turnover (R42) and short term bank loans/short term liabilities (R16). R20 shows that the fixed assets of the distressed firms are higher than the equities, while the non-distressed firms have fixed assets at the rate of about half of their equity. R37 financial ratio, on the other hand, shows that non-distressed firms have higher pre-tax profits than distressed firms compared to equity. The R42 financial ratio reflects the extent to which businesses achieve sales volume success with their Net Working Capital. As expected, successful companies have a better sales volume. Finally, R16 shows that distressed firms have much more short term bank loans than non-distressed firms.

EXPERIMENTAL RESULTS

Descriptive statistic

In this section, whether the data are normally distributed or not, the comparison of the variable means with the non-parametric (distribution-independent) Mann Whitney U test, the multicollinearity effect (VIF) and other descriptive statistics of the variables are examined. The normality assumption control of the data was done with the Shapiro-Wilk test. As it can be seen in table 4, for one, two and three *years prior* to the financial *distress,* since the p-value is less than 0.05 in all independent variables, it is understood that the distribution is not normal. It has been observed that the data are generally not normally distributed in studies conducted in the field of financial failure (Mselmi, Lahiana & Hamza, 2017; Selimoğlu & Orhan, 2015; Gör, 2016; Toraman & Karaca, 2016; Karadeniz & Öcek, 2019).

In the analysis performed with the Mann-Whitney U-test, which is a statistical comparison of the mean of independently selected variables, it was concluded that there was a statistically significant difference for all variables 1 and 2 years before the failure. 3 *years prior* to the financial *distress,* all independent variables except R37 and R42 are statistically significant.

The majority of correlations between independent variables are low. There is a high correlation (0.95) between R34 and R35. Therefore, R34 was excluded from the variables. Multicollinearity, with its simple definition, is the situation where there is a very high correlation between at least two variables that predict a variable. Our findings show that all independent variables have VIF values less than 10. Therefore, there is no multicollinearity problem between the variables.

Missing values and outliers

One year prior to failure, it has been determined that there are 280 missing values out of 7,990 data in non-distressed firms. The highest missing values were in the independent variables R34 with 41.76%, R35 with 41.76%, R24 with 41.18% and R44 with 25.88%, respectively. There is less missing value in distressed firms. Out of 9776 data, 152 are missing values. The highest loss is in the R24 variable with 13%. There is 2.43% missing data in total (distress and non-distress firms). The dataset was updated by filling in the missing data with the median values of the relevant variables.

Two years prior to failure, the data of distressed and non-distressed companies were examined and it was determined that there were 389 missing values out of 7,943 data in non-distressed companies (independent variables). The highest missing values were in the independent variables R24 with 48.52%, R34 with 44.37%, R35 with 44.37% and R44 with 26.04%. There is less missing value in distressed firms. Out of 9917 data, 127 are missing values. The highest loss is in the R24 variable with 18.48%. There is a total of 2.89% missing value in the data groups of companies that are distressed and non-distressed. The data set was updated by filling in the missing values with the median values of the relevant variables.

Three years before the failure, the data of successful and non-successful firms were examined and it was determined that there were 686 missing value out of 7,802 data in non-distressed firms. The highest missing value is in the independent variables R24 with 59.04%, R34 with 50%, R35 with 50%, R44 with 33% and R45 with 10.24%, respectively. There is less missing value in distressed firms. Of 10,293 data, 415 are missing value. The highest missing values are in R24 with 25.57%, R34 with 12.78% and R35 with 12.78%, respectively. In the data groups of distressed and non-distressed firms, there is a total of 6.08% missing data. The dataset was updated by filling in the missing data with the median values of the relevant variables.

After the missing value analysis, the outliers in the data were taken to their normal limits according to the Tukey method. In this method, when calculating outliers, the median value is found first. For this, the data is sorted from lowest to highest. The second step is to find the median of the data. Then the lower quartile (Q1) and upper quartile (Q3) values are found. In the following process, the values of Q1 and Q3 are multiplied by 1.5 to find the gap of quarters. Thus, the lower and upper bounds of the data are found. All values outside these limits are considered outliers.

MODEL PERFORMANCE COMPARISON AND DISCUSSION

When the models were evaluated according to their 2017 accuracy rates, the most successful prediction model was DT with 90%, RF with 89%, kNN with 87%, SVM and LR with 84%, and NB with 82%.When the models were evaluated according to their 2016 accuracy rates, the most successful prediction model was DT with 97%, RF with 96%, kNN and SVM with 89%, NB with 85%, and LR with 80%, respectively. When the models were evaluated according to their 2015 accuracy rates, the most successful prediction model was NB with 97%, DT and RF with 94%, kNN and SVM with 92%, and LR with 81%, respectively.

DT: We can say that the decision tree model is the most successful model in classification with a general average of 93.67. It is seen that the model with the best prediction in year t-1 and t-2 is the second model with the best prediction in year t-3. The model made its best prediction at t-2 and had a lower accuracy rate at t-1 than the others.

RF: With in overall average correct classification success, RF was the second best model with 93%. In this model, which has the advantages of processing with missing data and working with as many tree structures as desired, the success of correct classification in t-2 and t-3 years is higher. The model achieved the highest correct classification in t2.

SVM: It ranked third with 89.33% in overall classification success. He made the most successful classification in the year t-3. The rate of correct classification of model increased with the distance from the failed period. It showed the lowest performance in t-1 year. Successful companies have a higher rate of correct classification.

kNN: It is in the third rank with 89.33% correct classification success together with SVM in general classification. It has similar accuracy rates as SVM. It

Table 4. Summary statistics

	Variables	R6	R15	R18	R24	R30	R32	R34	R46
One year priot to distress	Panel A: Entire data set								
	Number of firms	378	378	378	378	378	378	378	378
	Mean	1.849.557	0,604377	0,372624	0,918207	0,046092	0,027699	2.500.073	12.164.229
	Std. Deviation	1.714.372	0,701298	0,324820	0,736784	0,050256	0,034877	1.733.570	14.300.647
	Min	-1.968.473	0,000000	-0,567549	-1.232.655	-0,072043	0,000000	-0,975730	0,000000
	Max	6.390.963	2.724.057	1.081.260	2.638.308	0,177656	0,141963	6.542.847	55.452.146
	Shapiro-Wilk (p value)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	Mann-Whitney U (p-value)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	Panel B:Distressed firms								
	Number of firms	208	208	208	208	208	208	208	208
	Mean	2.332.664	0,860544	0,511647	0,713795	0,060167	0,044018	1.764.553	7.918.617
	Std. Deviation	2.052.956	0,793298	0,296164	0,777527	0,055165	0,038967	1.252.516	7.746.015
	Min	-1.968.473	0,000000	-0,181926	-1.232.655	-0,072043	0,000000	-0,975730	0,000000
	Max	6.390.963	2.724.057	1.081.260	2.638.308	0,177656	0,141963	4.626.431	23.645.576
	Panel C: Non-distressed firms								
	Number of firms	170	170	170	170	170	170	170	170
	Mean	1.258.461	0,290949	0,202524	1.168.313	0,028871	0,007731	3.400.003	17.358.861
	Std. Deviation	0,869124	0,383047	0,273927	0,596777	0,036940	0,011171	1.817.144	18.258.983
	Min	-0,529976	0	-0,567549	0,166867	-0,050417	0	0,086331	0,32531
	Max	2.904.297	1.100.631	0,894771	2.060.690	0,102070	0,032298	6.542.847	55.452.146

	Variables	R6	R15	R17	R18	R24	R32	R35	R44	R46
Two years priot to distress	Panel A: Entire data set									
	Number of firms	380	380	380	380	380	380	380	380	380
	Mean	1.902.626	0,460397	0,146860	0,319295	0,797053	0,026858	1.891.485	8.305.613	13.586.545
	Std. Deviation	1.811.481	0,503204	0,185932	0,340008	0,514782	0,034739	0,958350	7.628.059	16.158.007
	Min	-2.418.927	0,000000	0,000000	-0,831633	-0,621116	0,000000	-0,530658	0,000000	0
	Max	6.792.352	1.933.519	0,780676	1.610.463	1.867.806	0,146562	3.757.784	27.898.704	65.860.889
	Shapiro-Wilk (p value)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	Mann-Whitney U (p-value)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	Panel B:Distressed firms									
	Number of firms	211	211	211	211	211	211	211	211	211
	Mean	2.392.867	0,631280	0,210324	0,438052	0,739323	0,042394	1.624.414	6.065.722	8.469.488
	Std. Deviation	2.072.580	0,546349	0,212740	0,353286	0,659067	0,039259	1.120.664	5.547.003	8.366.145
	Min	-2.418.927	0,000000	0,000000	-0,831633	-0,621116	0,000000	-0,530658	0,000000	0,000000
	Max	6.792.352	1.933.519	0,780676	1.610.463	1.867.806	0,146562	3.757.784	17.833.136	25.022.325
	Panel C: Non-distressed firms									
	Number of firms	169	169	169	169	169	169	169	169	169
	Mean	1.290.549	0,247046	0,067623	0,171024	0,869130	0,007462	2.224.928	11.102.164	19.975.297
	Std. Deviation	1.163.882	0,340077	0,100213	0,254871	0,213203	0,010688	0,548321	8.867.789	20.677.305
	Min	-1.089.725	0,000000	0,000000	-0,253363	0,532658	0,000000	1.398.079	0,830515	0,206249
	Max	3.540.690	1.063.317	0,283595	0,775582	1.156.743	0,031778	3.072.351	27.898.704	65.860.889

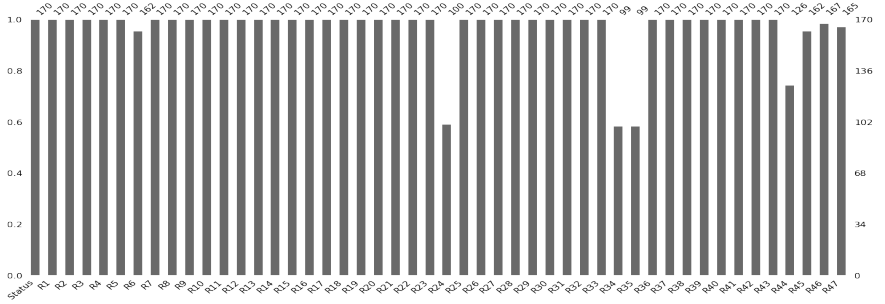
	Variables	R6	R11	R16	R20	R24	R32	R35	R37	R42
Three years priot to distress	Panel A: Entire data set									
	Number of firms	385	385	385	385	385	385	385	385	385
	Mean	1.664.436	0,377779	0,217862	1.069.187	0,903652	0,024855	2.152.028	0,110036	4.369.192
	Std. Deviation	1.434.573	0,408893	0,258234	1.288.109	0,513968	0,033625	1.143.455	0,152928	9.371.304
	Min	-1.719.263	-0,701137	0,000000	-2.077.135	-0,717077	0,000000	-1.080.795	-0,195678	-1.330.962
	Max	5.377.166	1.673.011	0,963857	4.565.448	2.067.443	0,131258	4.886.129	0,406570	22.859.310
	Shapiro-Wilk (p value)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	Mann-Whitney U (p-value)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,877	0,527
	Panel B:Distressed firms									
	Number of firms	219	219	219	219	219	219	219	219	219
	Mean	2.075.591	0,232468	0,306650	1.404.374	0,834385	0,039280	1.775.682	0,106594	4.147.905
	Std. Deviation	1.621.150	0,196115	0,284628	1.494.190	0,673897	0,038166	1.404.670	0,163007	9.809.513
	Min	-1.719.263	-0,231713	0,000000	-2.077.135	-0,717077	0,000000	-1.080.795	-0,195678	-13.309.623
	Max	5.377.166	0,649309	0,963857	4.565.448	2.067.443	0,131258	4.886.129	0,406570	22.859.310
	Panel C: Non-distressed firms									
	Number of firms	166	166	166	166	166	166	166	166	166
	Mean	1.122.009	0,569485	0,100725	0,626982	9,950347	0,005824	2.648.532	0,114578	4.661.132
	Std. Deviation	0,892650	0,522771	0,154568	0,752247	0,000000	0,008138	0,000000	0,138871	8.780.536
	Min	-0,793944	-0,701137	0,000000	-1.102.812	9,950347	0,000000	2.648.532	-0,177186	-11.446.018
	Max	2.964.440	1.673.011	0,417816	2.265.504	9,950347	0,021405	2.648.532	0,393072	21.303.075

Note: This table illustrates descriptive statistics of the 16 selected variables.

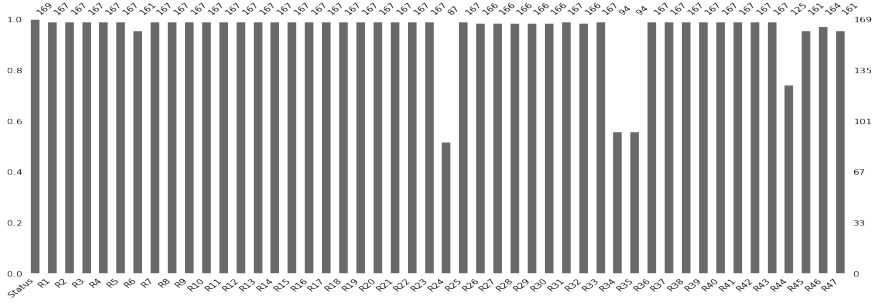
Graph 1. Visualizing Missing Values

Non- financially distressed firms

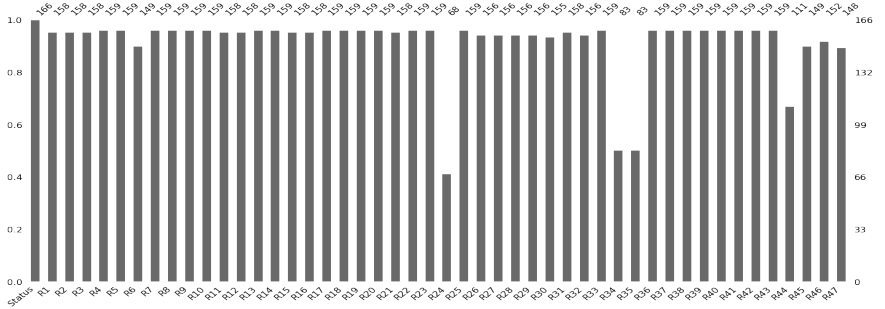
One year prior to failure



Two years prior to failure

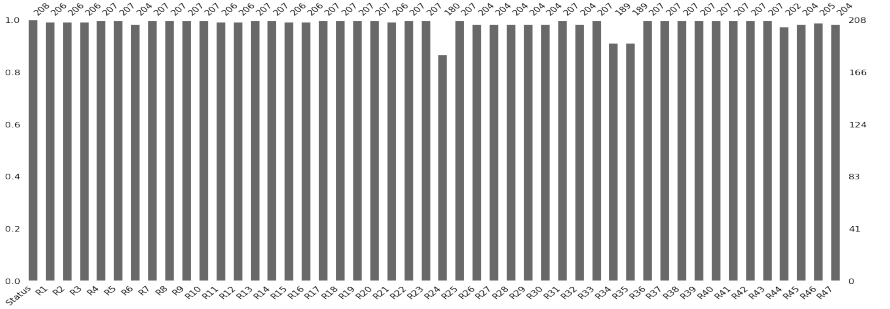


Two years prior to failure

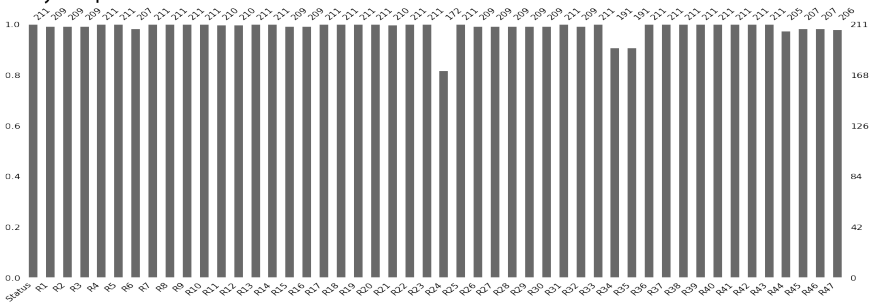


Financially Distressed firms

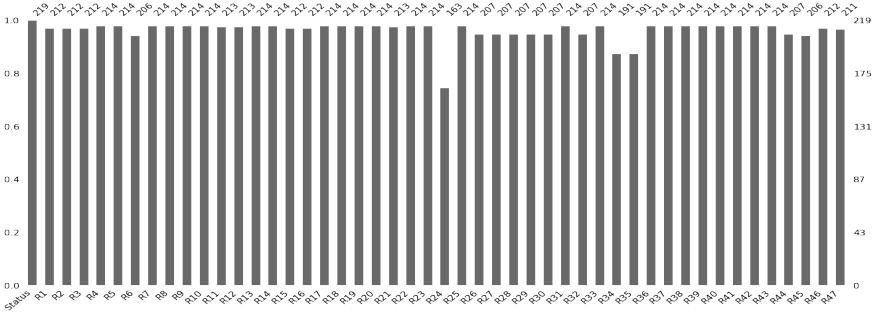
One year prior to failure



Two years prior to failure



Three years prior to failure



Note: The missing values in this graph are visualized with using the missingno library. Missingno is a Python library that provides the ability to understand the distribution of missing values.

Table 5. Classification performance

	LR			RF			DT			SVM			NB			kNN		
	T-1	T-2	T-3	T-1	T-2	T-3	T-1	T-2	T-3	T-1	T-2	T-3	T-1	T-2	T-3	T-1	T-2	T-3
Accuracy	87	80	81	89	96	94	90	97	94	84	89	92	82	85	97	87	89	92
Precision	87	80	82	89	96	94	91	97	94	84	90	92	82	85	96	87	89	89
Sensitivity	87	79	81	88	97	94	90	97	94	84	89	92	82	85	97	87	89	88
F-measure	87	80	81	89	96	94	90	97	94	84	89	92	82	85	97	87	89	87

Note: This table illustrates the prediction accuracy of LR, RF, DT, SVM, NB and kNN.

reached the highest accuracy at t-3 and the lowest accuracy at t-1. Successful companies have a higher rate of correct classification.

LR: It was the model with the lowest accuracy rate with 81.67% in overall performance. It reached the highest accuracy rate in t-1 year with 84%. It achieved 81% correct classification success in t-3 and 80% in t-2 year.

While the highest correct classification success was achieved in t-3 with 91.67%, this rate was 89.33% in t-2 year and 86% in t-1 year. The models in the t-2 and t-3 have higher accuracy. Although the t-1 year is the closest period to failure, its lower accuracy has pushed us to investigate the dynamics of the Turkish economy in which businesses operate in more detail. It is observed that interest, inflation and dollar/tl exchange rates did not change much in t-2 and t-3 years in Turkey. However, in the year t-1, despite the Central Bank interest rates remaining the same, it is observed that there is a serious movement in inflation and dollar/tl rate. In 2018, the year of failure, these three variables increased dramatically.

In t-1, it is seen that the idle capacity increased more than the other two years (R46), and the share of bank loans in liabilities increased (R15). According to Güngen (2018), reasons such as the 20.5% depreciation of the Turkish Lira from 15 July 2016 to the end of 2017 and the financing of the current account deficit with hot money adversely affected the economic dynamics of the country.

According to Çetin (1996) & Erez (1994), the most important problem of SMEs is financing. The increasing inflation since 2017, the dollar/TL exchange rate and the dramatically increasing interest rates in mid-2018 made it difficult for SMEs to access credit and increased the cost of the credit they used. Compared to 2015 and 2016, SME sector bank loans increased in 2017 (R15). SMEs were most affected by this situation and the NPL ratio of SME loans increased rapidly compared to retail and commercial loans.According to the results of this study, it is understood that cyclical fluctuations have an effect on financial failure. The rapid increase in interest rates, exchange rates and inflation in 2017 and 2018, which had a stable trend in 2015 and 2016, led to a rapid increase in bank loans in distressed firms and reduced their capacity utilization. Contrary to the commercial and consumer customer segments of these businesses, which use loans with weak collateral and high rates, it is observed that NPL ratios have increased rapidly since mid-2017. We believe that it would be more appropriate to consider macroeconomic dynamics when making evaluations about this differentiated group.

CONCLUSION

The financial failure of the enterprises negatively affects the groups related to the enterprise, especially the environment of the enterprise, and the general economic structure. Predicting financial failure has become one of the important issues in the field of finance. The purpose of financial failure forecasting is to develop a forecasting model that will enable to predict the financial condition of a business by using various econometric indicators. Knowing the possibility of financial failure of a business for the creditors and investors of the business has become a very important issue before the decisions to be taken.

Since the 1960s, models that predict financial failure have been tried to be developed using different methods. Especially today, with the dizzyingly developing technological innovations, hardware and software developments of computers, larger and more complex data masses, big data have begun to emerge. With this increasing volumetric growth, traditional statistical estimation models measuring financial failure began to fail to meet the need, and modern methods were needed.

Table 6. Correlation matrix of selected independent variables

2017	*R6*	*R15*	*R18*	*R24*	*R30*	*R32*	*R34*	*R46*
R6	1							
R15	-0,04713	1						
R18	0,023742	0,561236	1					
R24	0,077526	-0,25591	-0,51959	1				
R30	-0,10478	0,21522	0,197285	-0,08493	1			
R32	-0,02582	0,446509	0,407102	-0,1501	0,694608	1		
R34	-0,08637	-0,29287	-0,40681	0,20231	-0,1226	-0,46496	1	
R46	-0,15284	-0,2829	-0,28045	-0,00095	-0,185	-0,31208	0,250055	1
VIF	2,049434	2,847239	3,447713	2,606682	4,050813	4,899684	3,408806	1,737293

2016	*R6*	*R15*	*R17*	*R18*	*R24*	*R32*	*R35*	*R44*	*R46*
R6	1								
R15	-0,0699	1							
R17	-0,10277	0,727466	1						
R18	-0,04129	0,533566	0,794596	1					
R24	0,01099	-0,04646	-0,32634	-0,32257	1				
R32	0,145187	0,502446	0,414569	0,373735	-0,11977	1			
R35	-0,11874	-0,30743	-0,30065	-0,31493	0,113634	-0,48274	1		
R44	-0,3053	-0,09051	-0,07302	-0,11357	0,116626	-0,23219	0,111954	1	
R46	-0,13269	-0,33351	-0,30983	-0,25432	0,008867	-0,32956	0,182065	0,18696	1
VIF	2,061043	4,91414	7,42647	5,08798	3,59912	2,39152	3,79763	2,32642	1,8558

2015	R6	R11	R16	R20	R24	R32	R35	R37	R42
R6	1								
R11	-0,325	1							
R16	0,142	-0,1177	1						
R20	0,0135	-0,2674	0,1102	1					
R24	0,0565	0,1027	0,0147	-0,0559	1				
R32	0,1366	-0,2663	0,3735	0,2213	-0,2251	1			
R35	-0,0648	0,28	-0,2191	-0,2624	0,0922	-0,5298	1		
R37	0,1325	-0,1097	-0,0968	-0,0615	-0,0147	-0,1712	0,3492	1	
R42	-0,1218	-0,0035	-0,0379	-0,1558	-0,013	-0,0821	0,0802	0,0425	1
VIF	2,5499	2,2643	2,0261	1,7035	3,5718	1,9551	4,9539	1,8521	1,2282

Note: This table shows the correlation matrix of the selected independent financial ratios.

Table 7. Confusion Matrix of DT, RF, kNN, SVM, NB and LR

	1 year prior to distress						2 years prior to distress						3 years prior to distress					
	Training sample			Test sample			Training sample			Test sample			Training sample			Test sample		
	0	**1**	**Sum**	**0**	**1**	**Sum**	**0**	**1**	**Sum**	**0**	**1**	**Sum**	**0**	**1**	**Sum**	**0**	**1**	**Sum**
	Random Forest																	
0	100	0	100	90,48	9,52	100	100	0	100	95,08	4,92	100	100	0	100	95,31	4,69	100
	(145/145)	(0/145)		(57/63)	(6/63)		(150/150)	(0/150)		(58/61)	(3/61)		(155/155)	(0/155)		(61/64)	(3/64)	
1	0	100	100	13,73	86,27	100	0	100	100	1,89	98,11	100	2,63	97,37	100	7,69	92,31	100
	(0/119)	(119/119)		(7/51)	(44/51)		(0/116)	(116/116)		(1/53)	(52/53)		(3/114)	(111/114)		(4/52)	(48/52)	
	Decision Tree																	
0	94,48	5,52	100	87,30	12,70	100	100	0	100	98,36	1,64	100	100	0	100	95,31	4,69	100
	(137/145)	(8/145)		(55/63)	(8/63)		(150/150)	(0/150)		(60/61)	(1/61)		(155/155)	(0/155)		(61/64)	(3/64)	
	0	100	100	5,88	94,12		0	100	100	3,77	96,23	100	2,63	97,37	100	7,69	92,31	100
1	(0/119)	(119/119)		(3/51)	(48/51)	100	(0/116)	(116/116)		(2/53)	(51/53)		(3/114)	(111/114)		(4/52)	(48/52)	
	LR																	
0	88,29	11,71	100	87,30	12,70	100	81,33	18,67	100	85,25	14,75	100	84,52	15,48	100	90,63	9,37	100
	(128/145)	(17/145)		(55/63)	(8/63)		(122/150)	(28/150)		(52/61)	(9/61)		(131/155)	(24/155)		(58/64)	(6/64)	
	15,13	84,87	100	19,60	80,40		25,86	74,14	100	26,42	73,58	100	23,68	76,32	100	30,77	69,23	100
1	(18/119)	(101/119)		(10/51)	(41/51)	100	(30/116)	(86/116)		(14/53)	(39/53)		(27/114)	(87/114)		(16/52)	(36/52)	
	Naive Bayes																	
0	85,52	14,48	100	85,71	14,29	100	89,33	10,67	100	85,25	14,75	100	90,97	9,03	100	93,75	6,25	100
	(124/145)	(21/145)		(54/63)	(9/63)		(134/150)	(16/150)		(52/61)	(9/61)		(141/155)	(14/155)		(60/64)	(4/64)	
1	15,13	84,87	100	21,57	78,43	100	18,10	81,90	100	15,09	84,91	100	0	100	100	0	100	100
	(18/119)	(101/119)		(11/51)	(40/51)		(21/116)	(95/116)		(8/53)	(45/53)		(0/114)	(114/114)		(0/52)	(52/52)	
	DVM																	
0	88,28	11,72	100	84,13	15,87	100	89,33	10,67	100	86,89	13,11	100	86,45	13,55	100	90,63	9,37	100
	(128/145)	(17/145)		(53/63)	(10/63)		(134/150)	(16/150)		(53/61)	(8/61)		(134/155)	(21/155)		(58/64)	(6/64)	
1	10,92	89,08	100	15,69	84,31	100	2,59	97,41	100	7,55	92,45	100	0	100	100	5,77	94,23	100
	(13/119)	(106/119)		(8/51)	(43/51)		(3/116)	(113/116)		(4/53)	(49/53)		(0/114)	(114/114)		(3/52)	(49/52)	
	kNN																	
0	86,90	13,10	100	87,30	12,70	100	90,66	9,34	100	88,52	11,48	100	78,06	21,94	100	85,94	14,06	100
	(126/145)	(19/145)		(55/63)	(8/63)		(136/150)	(14/150)		(54/61)	(7/61)		(121/155)	(34/155)		(55/64)	(9/64)	
1	10,92	89,08	100	13,73	86,27	100	3,45	96,55	100	11,32	88,68	100	1,75	98,25	100	0	100	100
	(13/119)	(106/119)		(7/51)	(44/51)		(4/116)	(112/116)		(6/53)	(47/53)		(2/114)	(112/114)		(0/52)	(52/52)	

Note: This table illustrates confusion matrix of LR, DT, RF, SVM, kNN, and NB method. The numbers in brackets represent the number of companies. The results are given in the form of training and testing. 0 illustrates non-successful firms and 1 illustrates successful firms.

Financial distress estimations have always been important in economies such as Turkey, where periodic cyclical fluctuations are high, and it has turned into a field on which intensive studies are conducted. Mistakes that can be made in this area may cause the creditors to incur losses. This will adversely affect the shareholders, depositors, employees, the public and the general economic structure in financial institutions.

In this study, the financial statements of 392 SMEs operating in Turkey, 173 of which are non-distressed and 219 of which are distressed, between the years 2015-2019 were examined. It is aimed to find the model with the highest correct prediction power that can be valid 1, 2 and 3 years before the failure by using logistic regression, decision tree, random forests, support vector machines and k nearest neighbor methods to predict failure. SMEs for which bankruptcy or concordat decisions were made by the competent courts in 2018 were deemed unsuccessful.

Based on the annual Income and Corporate Tax returns approved by the Ministry of Finance, 47 financial ratios for all businesses were calculated separately for each year. The study was continued with the data pre-processing step and missing data analysis was performed. A total of 2.43%, 2.89% and 6.08% missing data were encountered for the years 2017, 2016 and 2015, respectively. Missing data are filled in with the median value of each independent variable. Afterwards, the extreme value analysis of each independent variable was made using the box-plot method, and the negative effect of the extreme data on the analysis was tried to be reduced.

As a result of the study, the highest percentage of correct classification 1 and 2 years before the failure belonged to the decision tree model with an average of 90% and 97%, respectively. Three years before the failure, the Naive Bayes has the highest level of average accuracy of 97%. It has been observed that the models categorize distressed firms better than non-distressed firms in every 3 years examined.

When the accuracies of all models were examined, the highest correct prediction were obtained in the year t-3, which is the year farthest from the failure year. Although the t-1 year was the closest to failure, its lower accuracy prompted us to further investigate the dynamics of the Turkish economy in which businesses operate. Macroeconomic indicators (interest, inflation, exchange rate), which acted similarly in 2015 and 2016, increased dramatically in 2017 and 2018. In 2017, it is seen that the share of bank loans in foreign resources (R15) and idle capacities of distressed firms increased (R46). It has been observed that the loan repayment capacity of SMEs, which have unique disadvantages such as weak collateral structures and high rate of borrowing, is not as durable as commercial firms and individual consumers.

To summarize, it was observed that there was no problem in the dynamics of the general economic structure of Turkey in 2015 and 2016. The deterioration that started in 2017 reached its peak in 2018. Distressed firms grew rapidly with high bank loans and gained high operating profits. However, these firms with low equity could not manage their financial expenses after a while. Distressed firms, which could not make a profit with high bank indebtedness and high financing expenses, failed in 2018 because they could not financially translate themselves.

In this study, it was tried to predict failure by considering only financial ratios. However, management skills in businesses, education and age of business owners or shareholders, business management information systems, short and long-term strategies, business efficiency, concentration on customers, supplier reliability, relations with banks, customers' check and promissory notes, credit occupancy, credit record Many variables such as bureau scores, external economic environment, unemployment rates, political and economic stability of the country, increasing the sample size used, country interest, exchange rate and inflation rates, sector return averages, exchange rates and growth rates also have an effect on failure. It is thought that including these variables in the model can be beneficial in terms of obtaining more precise and reliable results.

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Relativity Approach to the Strategic Cyber Conflict Management In Businesses

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ABSTRACT

The study aims to form a theoretical basis for the development of strategies needed by businesses and establish strategic principles. The starting point of this research is that cyber conflict is an operational, managerial, relational, and strategic problem of businesses rather than a cross-country administrative problem. This research was carried out by adopting grounded theory, known as theorizing-based theory. The study was carried out with 593 limited liability and joint-stock companies operating in Turkey. The research results revealed a new theory named "relativity of strategic cyber conflict management". According to the research findings, the five orbital forces (negotiation, managerial, infrastructure, defense, competition) were determined in cyber conflict management. Four principles were determined as a business within the system (location in space), the business within cyber cosmos (relativity of time), warping spacetime due to cyber conflict (Curvature of strategy), and illusions due to cyber conflict (Gravitational lenses).This study introduces a new theory of the cyber conflict management with the inspiration of the principles of relativity theory.

Keywords: Cyber conflict, management, strategy, relativity theory, grounded theory.

JEL Classification Codes: M10, M15, M16, M19

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INTRODUCTION

Internationalization and cyber developments continue to increase their influence on organizations, country economies, and societies (Barrinha & Renard, 2017). The positive contributions of digital innovations to business life support the strategic developments of the manufacturing and service sectors (Barrett et al., 2015). Innovations such as automation, nanotechnology, 3D printing, robotic applications, industrial internet of things (IIoT), cloud computing, big data, augmented reality, 5G, artificial intelligence, cybersecurity, and smart factory technologies have created a revolution in production and planning (Campbell & Ivanova, 2013; Zollo et al., 2007; Carmigniani et al., 2011). This revolution has brought technologies such as autonomous vehicles, real-time supply chain visibility, verified carbon standard technology, blockchain, artificial and augmented intelligence, digital twins, advanced analytics to businesses in the field of logistics (Kato et al., 2015; Caridi et al., 2014; Sharma et al., 2012; Li et al., 2020).

Technological, digital, and cyber innovations emerging in the manufacturing sector have revealed important developments in the service sector. Smartphones, the internet of things (IoT), virtual reality, quantum computing, AI-boosted and predictive cyber protection, runtime application self-protection, biometric verification, identity-as-a-service, distributed artificial intelligence, edge computing, 5G cellular such innovations facilitate the functions of businesses (Emig et al., 2007; Li et al., 2017). The multidimensional positive effects of cyber developments on businesses such as productivity, performance, profitability, customer satisfaction, functional speed, ease of access, virtual access have brought risks and threats (Monostori, 2014; Lee et al., 2015).

The rapid development of cyber innovations has revealed security risks (Andrijcic, & Horowitz, 2006; Alhayani et al., 2021). Hidden competition between countries and organizations has triggered the malicious use of cyber innovations. Cyberwarfare serves this purpose (Dipert, 2010). Cyber attacks aimed at attacking the political, military, economic, and cultural values of countries often target international companies and organizations (Li et

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al., 2012). This situation reveals cyber conflicts (Danyk, Maliarchuk, & Briggs, 2017). Businesses that are important actors in realizing economic goals, contributing to the global economy, opening the way for the implementation of entrepreneurial ideas, and creating new angel investors are under the threat of cyber conflicts.

Cyber conflicts damage the relationships of businesses with their stakeholders, environment, and employees (Gandhi et al., 2011). Conflicts can negatively affect many processes related to company mergers, negotiations, intra-organizational relations, operations, production and planning, and business (Shackelford, 2014). Businesses need a strategy that they can implement against these conflicts. Studies on cyber conflict deal with limited issues such as cyber-attacks and cyber warfare (Junio, 2013; Karatzogianni, 2008; Shi et al., 2007; Heckman et al., 2013; Denning, 2014; Xu, Lu, & Li, 2015). In conflict management, it is necessary to develop a new theory and strategy principles on issues such as the relations of businesses with their stakeholders, the perceptions of employees, the relativity of the changing conditions and experiences over time, and the fight against the obstacles that arise in the elimination of cyber conflicts. Elimination of this important deficiency can strengthen businesses in the context of struggling with cyber conflicts.

In the context of cyber conflict management, structuring the theoretical basis for the development of strategies needed by businesses and establishing strategic principles are the objectives of this study. It is among the other aims of the study to provide practical and theoretical inferences to practitioners, policymakers, and academics, based on the issue that cyber conflict is an operational, managerial, relational, and strategic problem of businesses rather than a cross-country administrative problem.

THEORETICAL FRAMEWORK

General View of Cyber Conflict Management

The virtual movement that emerged with the internet and digital developments has increased the freedom of action of organizations, countries, and individuals in cyberspace. Cyber and digital developments that started at the end of the 20th century and continued at a dizzying pace at the beginning of the 21st century have highlighted the issue of managing the conflicts caused by cyber elements (Radanliev et al., 2018; Broadhurst, 2006; Lin, 2012). Cyber conflict management has provided taking important steps in the prevention of cyberattacks, cybersecurity against malware, elimination of conflicts arising from the virtual environment in international negotiations, protection of intellectual property and trade secrets, hate speech and discrimination in social media, and information security (Taillat, 2019).

Initially, the basic principles of conflict theory were based on cyber conflict, taking into account the rivalries and inequalities between different groups in society (Brief et al., 2005). The conflicts that started with class conflicts and power struggles have expanded to many areas such as social, economic, psychological, military, political, and cyber (Gayer et al., 2009). The critical theory, which deals with the conflicts arising from the competitive relationship created by power structures, gained a different dimension with the feminism approach focusing on the conflicts created by gender inequality (Rush, 2004). The queer movement, which involves the thought of elimination of heterosexual prejudice, was replaced by world-systems theory based on the transnational division of labor (Rand, 2013). Thus, an important step was taken regarding the management of the wide-ranging conflicts caused by internationalization and globalization.

Globalization, digitalization, and media conflicts have brought a new dimension to the conflict by revealing the cyberwarfare movement (Gompert & Libicki, 2014). Cyber conflict, which continues to increase in international relations, politics, propaganda, racism, and discrimination, continues to be reflected in all areas of life (Bobo, 1983). Cyber conflict, spreading like a virus, damages the relations with every institution, business, person, and organization that businesses are in contact with. This type of conflict, which negatively affects business life, has turned into a crisis, especially during the pandemic period.

Relativity Theory

The theory of relativity includes the idea of predicting spacetime as a four-dimensional manifold. Three-dimensional space consists of length, width, and depth. Relativity theory adds the time dimension to these dimensions. Three dimensions provide revealing of coordinates and determination of their location in determining a point in space. According to this theory, simultaneity is relative. If the observing individuals are in relative motion, two simultaneous events may not be perceived simultaneously.

One of the notable principles of the theory is the time-gravity relationship. As gravity increases, time slows down. Another feature is that there is no difference between constant acceleration in space and gravity. This principle reveals an energy-derived property of mass.

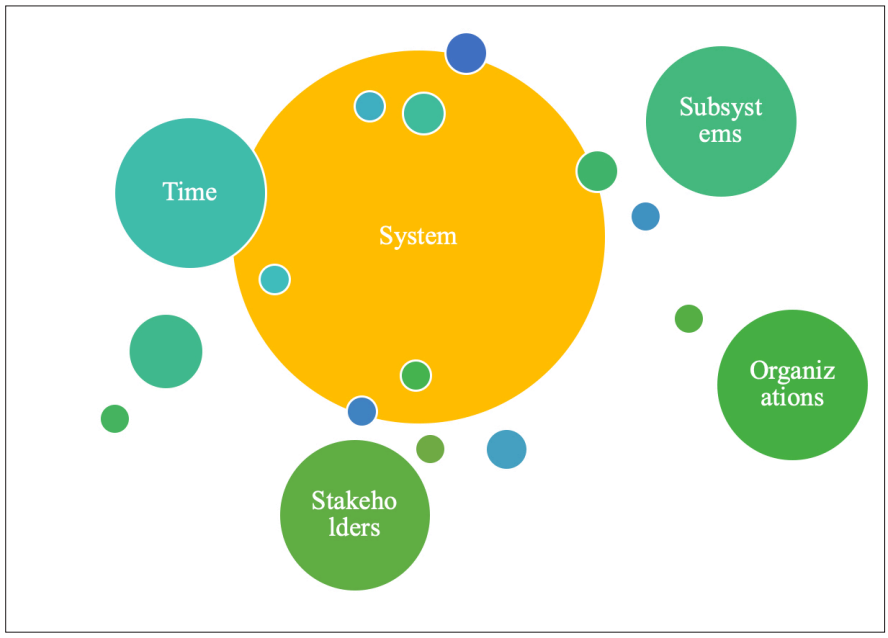

Figure 1. Relativity of the infinite system

The energy and mass of an accelerating object increase, creating a twist in space. Because mass is an indicator of resistance to acceleration. However, the photons that makeup light have no mass. Therefore, photons do not have the ability to resist acceleration. However, light is bent by the mass's warping of space. This situation is called the gravitational lens according to the theory. Thus, it has been shown that the path followed by the light moving between the shortest line is not a straight line. With its shortest definition, the curvature is a whole, consisting of space, time, and dimensions.

The fact that time is different for different parts of the world shows that different times are experienced in different regions in terms of the time concept of space. In other words, time dilation and the twin paradox are the two main determinants of this approach. The warping of the light with mass orientation causes visual and temporal misconceptions. The theory is important in that it reveals that time varies relative to the observer, not position in space.

Relativity Theory in Organizations

Planets rotating in elliptical orbits around the sun demonstrate the gravitational force between objects and cause the light warpings revealed by rotations. The theory of general relativity reveals these warpings, and special relativity does how spacetime warping slows time.

Einstein argued that the basis of the universe consists of the space-time dilemma. From this point of view, how does this theory relate to organizations, businesses, and social sciences in the context of cyber conflict? The theory emphasizes the importance of the fourth dimension, time, in determining a location in space. On the other hand, relativity reveals that time differs according to space's three-dimensional location. In the light of these explanations, the issue of the position of organizations emerges in the context of relativity and the fourth dimension.

Organizations are entities created for people's purposes. These entities are a whole in which the aims, goals, knowledge, creativity, leadership qualities, and managerial skills of the founder are organized. Businesses are organizations in which commercial operations are carried out. A business or organization established within the legal system survives in the infinite system. Systems based on many needs such as law, cyber, virtual, politics, economy, international, cultural, scientific, etc. are emerging. The infinity of these systems shows that they can be determined relatively and depending on time. Organizations emerge through three basic dimensions, human, purpose, and action. The theory of relativity is related to the idea that organizations and the systems they are in surviving depending on the time dimension. However, this relationship requires the existence of an endless cycle between past, present, and future. Sub-systems, organizations, time, and stakeholders create a trajectory around the system under the gravitational effect of the central system (Figure 1).

The trace left by an organization after its interaction and communication with its environment in the period between its establishment and its termination may

Table 1. Fundamentals of relativity approach

Basic features	Descriptions
Location in space (three dimensions)	Width, length, and depth are the main determinants of location in space.
Key position factor (time) in space	The time differs according to points in different locations in space.
Curvature of spacetime	Mass in space creates a gravitational effect with the energy released, causing space and time to warp.
Warping spacetime	The warping caused by mass and energy reveals the energy-momentum and pressure-stress cycle.
Gravitational lens	The warping of light from a source in space as it reaches the observer's observation area.

affect future organizations. Thus, the organization can adopt a strategic management approach by obtaining information about the past, present, and future. The warping space-time put forward by the relativity theory is similar to the temporary trace that appears after seating on the seat. Organizations leave some traces to their environment and systems throughout their existence. These traces provide strategically important managerial functionality considering the time dimension.

Organizational purpose and system are like time-space. According to the theory of relativity, these two complementary elements provide important information about the actual positions of the observed elements. The traces left by organizations in their relations with their environment may cause misperceptions about observation, depending on time and light warpings. This gravitational mirage can deviate the strategies of the organization, causing unsuccess. The factors that form the basis of these deviations are presented in table 1.

METHODOLOGY

The grounded theory, a qualitative research method, was adopted in this research. The principles of the grounded theory (theorizing-based theory) were applied to the realization of the research and to collect the data. This approach is a research method that enables a theory to be constructed after analyzing qualitative data (Bryant, 2017). This method allows a theory to be revealed by inductive inferences. This research method includes the stages of collecting qualitative data, analyzing the collected data based on coding, and constructing theory (Nelson, 2020). To construct an inductive theory, the data obtained are interpreted and reported. The grounded theory process followed in the study is shown in figure 2.

In grounded theory, research questions are determined at the preparation and collecting data stage, ethical

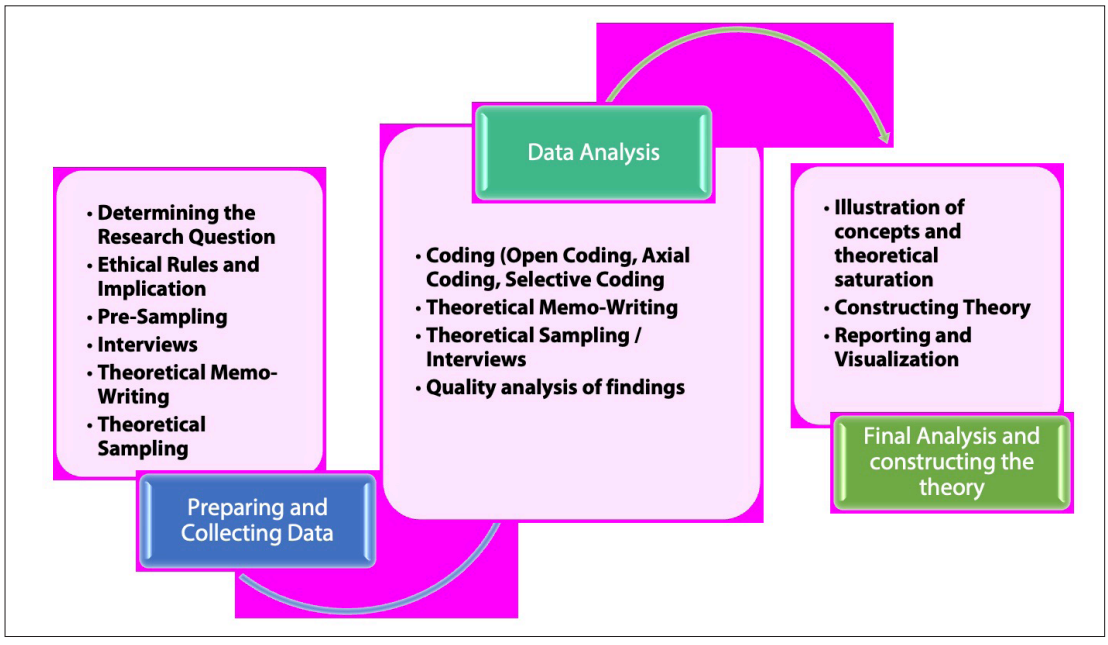

Figure 2. Grounded theory process

principles are applied for the data to be analyzed, interviews are conducted with the participants using the pre-sampling method, notes are taken about the data obtained from these interviews (theoretical memo-writing) and, if necessary, new participants are included in the sample with the theoretical sampling method (Charmaz, 2014).

The data analysis stage includes the coding of the data obtained through the interview, the inclusion of new participants in the sample with the theoretical sampling method when necessary, quality analysis in the context of the contribution of data to the new theoretical structure and results (Charmaz, 2014). In the last stage, the new theoretical structure is constructed through the illustration of concepts, theoretical saturation, and visualization. The successful execution of these processes ensures the reliability of the constructed theory (Charmaz, 2017).

Determining the Research Question

The grounded theory focuses on the causes and consequences of social events (Charmaz, 2017). This theory provides to reveal the theoretical reflections of knowledge based on experiences, thoughts, and observation in life (Strauss & Corbin, 1997). Grounded theory, which is a socio-psychological approach, plays an important role in revealing exploratory, explanatory, and interpretative information about individual-individual, individual-society, individual-environment communication, and interaction (Charmaz, 2014). The lack of cause and effect information about interactions and communications requires the determination of the research question. Unknown truths or known mistakes are tried to be determined through the research question (Charmaz, 2017).

Cyber conflict management is inspired by the concepts of crime, attack, danger, risk, espionage, information leakage, execution of the concept of cyber. Internet and digital developments have pushed businesses to adapt to these developments on the one hand and to adopt defense strategies on the other hand. Technological developments in production have created a revolution in human-based resource dependence in the workforce by enabling the use of automation and robotics. While social media, virtual reality, virtual applications support the production and service functions of businesses, they have become an important conflict factor on the other hand.

Businesses that are pioneers in the realization of economic goals and entrepreneurship and establishing international economic ties are in cyber conflicts in today's world. These conflicts are increasing with the pandemic. The current management strategies of businesses are far from meeting many needs in managing cyber conflicts. The complexity and the lack of studies in the definition of cyber conflicts in the literature raise the following questions: What are the factors that cause cyber conflicts in businesses? What should be the strategic principles that can be adopted in managing these conflicts? What is the theoretical basis for the strategic cyber conflict management of businesses?

After the determination of the research questions, the interview questions to be performed with the participants were determined (appendix). While determining the Interview questions, research questions were taken as the basis. These questions were asked during an approximately one-hour meeting/interview with the participants. In order to fill the theoretical gaps, different questions were also asked in cases where theoretical sampling was required and according to the information obtained through memo-writing.

Ethical Rules and Implication

The study was approved by the ethics committee of the [blinded for review] University. Participants were informed that participating in the interview was voluntary, that they could end the interview at any stage of the research, and that their information would be kept confidential. All information about the research was explained to the participants clearly and without any doubt before the interview. In addition, all necessary measures were taken during the coding and memo-writing phase to keep the information of the participants confidential and personal information was anonymized.

Pre-Sampling

The sampling method recommended in the implementation of the grounded theory is purposive sampling (Palinkas et al., 2015; Robinson, 2014). In this method, the sample size suitable for the purpose of the study is determined (Draucker et al., 2007). Senior and IT managers of businesses have information in determining the cyber conflict management strategy. In order to reach this sample population, joint-stock and limited companies operating in Turkey and registered to the chambers of commerce and industry were included in the sample. Among these businesses, those who use virtual merchandising, automation in production,

and robotic technology and have cyberinfrastructure in the service sector were selected. Since qualitative research causes an important constraint in the context of time, Adana, Muğla, Ankara, İstanbul, İzmir, İzmit, and Antalya provinces with the highest number of joint-stock and limited companies were preferred in sample selection. The communication and sectoral information of the companies were obtained from the trade registry directorates in accordance with the Law on Protection of Personal Data in force in Turkey. An invitation was sent to the participants via phone, Whats App, LinkedIn, e-mail, google form, and Skype about the interviews to be held with the sample.

The number of companies targeted and accessed for pre-sampling, together with their sectoral information is presented in Table 2.

Table 2. Pre-sampling findings

Provinces	**N^{tc}**	**N^{ac}**	**Sector**	
			Service	**Manufacturing**
Adana	90	72	32	40
Muğla	50	43	19	24
Ankara	150	91	36	55
İstanbul	200	89	32	57
İzmir	130	75	37	38
İzmit	270	112	46	66
Antalya	190	92	39	53
	1080	574	241	333

N^{tc}: Number of targeted companies; Nac: Number of accessed companies

Two employees from each company were selected in the sample selection to be included in the interview. Two basic executive profiles were identified (IT department manager, company senior manager) who had information about strategic cyber conflict management. 43 companies that did not meet these two criteria were excluded from the study. Among the participants included in the interview, senior managers consisted of the businesses' CEO, chairman of the board, and general managers had detailed information about the cyber conflict management and strategies of the company they were affiliated with. Both employees were included in the interview together and at the same time (in the same session, separately).

In order to minimize the time constraint of the grounded theory and the distribution error in the representation of data from each unit in the sample, the number of participants to be interviewed in each company was limited. The generalizability and reliability of the data depend on increasing the sample size and the fact that the statistical contribution of each unit included in the sample is equal with the other units.

Interviews

The research was carried out in 2021. The data collection, theoretical sampling, and analysis of the research took approximately 3.5 months. Interviews were conducted with an average of 8-9 (169 per month) businesses every day during the week (1st month: 174; 2nd month: 181; 3rd and the last month: 219+19). At the end of the second month of the research, 19 more businesses were included in the study in accordance with the theoretical sampling and memo-writing. Data were recorded and coded after each interview.

Research data were collected through semi-structured questions. Interviews were carried out with the IT department manager of the businesses and the senior manager of the company. The data obtained through the research were recorded through digital applications and tools. Interviews were carried out in accordance with COVID-19 measures. Zoom, Google meet, Skype, Whats App, Microsoft Teams applications were used for data collection and interviews. Participants were informed that the interviews were recorded in accordance with the Law on Protection of Personal Data. Participants were informed that they could refuse to record these interviews. The participants were informed about the links, ID, and password about the interview at least five days before the interview. After the interviews, the researcher took notes and processed the data related to the recorded interviews in the digital environment.

DATA ANALYTICS

Data analysis consists of the analysis steps performed until the illustration of concepts and constructing theory stage. This process requires coding (open, axial, and selective coding), theoretical memo-writing, quality analysis of findings, analysis and interpretation stages (Birks & Mills, 2015).

Coding

Open Coding

Open coding includes the process of extracting the raw data required in the construction of the theory, uncovering and categorizing the phenomena (Vollstedt & Rezat, 2019). The obtained raw data are analyzed in the context of similarity and difference. Data is extracted, labeled, encoded, and categorized. The extraction of raw data is performed by determining the central categories that attract them like a magnet. It is important to determine the phenomenon in the extraction. For this reason, sentences have been reduced to words, words to labels, labels to concepts, concepts to phenomena, and phenomena to categories. Thus, the first stage of coding was performed (Walker & Myrick, 2006).

The open coding process was carried out in three stages. Findings of the first open coding stage are presented in table 3.

Table 3. The findings of the first stage of open coding

Raw data	Data extraction	Phenomena	SC
Identifying cyber conflict.	Differences of opinion on issues such as agreement, data management, negotiation, operation, sales, marketing, production, service.	Cyber conflict is the disagreement, a clash of opposing needs or feelings, incompatibility situations that arise through elements such as negotiation, communication, competition, interaction, attack.	Determining cyber conflict within the system and in cyberspace
The types of cyber conflict that the business face.	Competition, institutionalism, operational, functional, strategic, infrastructure, negotiation	Businesses may conflict with the stakeholders, consumers, malicious attackers, and the system that they interact with.	Identifying and managing cyber conflict within the system
Solution recommendations for the cyber conflicts faced by the business.	Protecting, updating, and improvement of digital infrastructure, training, improvement of negotiations, strategy development, employment of qualified employees to fight against cybersecurity threats.	Businesses can resolve conflicts arising in social media, virtual communication, online negotiations and meetings, operational processes and production with training, infrastructure improvement, and effective human resources management.	Ensuring cybersecurity, education, improvement, and updating.
How the cyber conflicts being determined.	Employee, project reports, feedbacks, robotic automation, cobots (collaborative robots), email, virtual applications, web site	Cyber conflicts can be detected by companies' internal reporting, automation, cyberinfrastructure, and feedback.	System and cyber tools management

SC: Sub Categories (Grouping as a result of tagging)

The findings of the second open coding stage are presented in table 4.

Table 4. The findings of the second stage of open coding

Raw data (Q1)	Data extraction	Phenomena	SC
Criteria that enable the identification of cyber conflicts.	Results contrary to the goals and objectives adopted in negotiations and agreements, negative statements, negative outputs, deviations from the set target, failure.	Cyber conflicts are situations that result in failure and negative outputs in the context of negotiation, agreement, relationship, and operation in businesses.	Perceptual and detection-based criteria in cyber conflict management.
Key factors leading to the emergence of cyber conflict.	Digital and cyberinfrastructure weaknesses (software, transformation, IoT, and IIoT errors), information security risks, information deficiencies, perceptual errors, administrative and user errors, interpersonal negotiation tactic errors, cultural differences, social media.	Information, communication, culture, psychology, social media, and the organizational climate of the business are key factors in the emergence of cyber conflict.	Perceptual and detection-based criteria in cyber conflict management.
Difficulties in identifying key factors that led to the emergence of cyber conflict.	Ending the negotiation by the other party, psychological factors, legal factors, being a weak party in the agreement, perceptual difficulties, lack of education, weakness in digital transformation, depersonalization.	Ending the negotiations or internal and external factors that drive actors into conflict makes it difficult to identify key factors that lead to the emergence of cyber conflict.	Difficulty/struggling management in conflict resolution
Strategies and methods adopted to manage cyber conflict	Continuation of negotiations, rewarding those who detect cyber vulnerabilities and conflicts, sustainable education, developing and adopting corporate principles regarding information privacy, strengthening cyberinfrastructure, cooperation with cyber stakeholders, sustainability, mergers, and consortium	Negotiation, cyber threats, information privacy, cyberinfrastructure, cooperation-oriented corporate strategies are adopted in businesses.	Sustainability + empowerment + collaboration

SC: Sub Categories (Grouping as a result of tagging)

The findings of the final stage of open coding are shown in Table 5.

Axial Coding

Axial coding is a transition process in coding where main categories are associated with subcategories. This coding enables the determination of the central categories that determine the contribution of the cause and effect of the phenomenon to the theoretical structure through the paradigm model (Vollstedt & Rezat, 2019). Central categories are associated due to their practical contribution to the theoretical structure. Attracting (center) categories and sub-categories obtained after this stage play an important and mediating role in revealing selective coding (Kendall, 1999). The findings of axial coding are shown in table 6.

Selective Coding

Selective coding is an important coding process in constructing the theory. This type of coding involves linking categories, creating orbit categories, and associating the central category with these categories (Vollstedt & Rezat, 2019). The findings obtained from

Table 5. The third stage of open coding findings

Raw data (Q1)	Data extraction	Phenomena	SC
Importance and effects of methods adopted in cyber conflict management; experiences and deviations.	The methods of cyber conflict management are effective in the stakeholder-business-leader triangle. Sustainability, cybersecurity vulnerabilities are not always predictable. When financial, legal, social, cultural, identity, entrepreneurship interests conflict, deviations are encountered.	In the management of cyber conflicts, deviations may occur due to the factors required by the interests of the business.	Managerial deviations and management of illusions.
Flexibility in methods and strategies.	Crisis management, reactive behaviors, updating cyberinfrastructure, leadership qualities, human resources management.	Strategy and managerial deviations require flexibility.	Strategic flexibility + crisis management
Problems arising in cyber conflict management.	Conflicts of interest may arise between the employee-leader, employee-customer, employee-business, customer-business, stakeholder-business, parties of the negotiation. Financial and reputational losses due to operational time losses. Human resource issues.	Cyber conflicts can cause conflicts of interest and some losses in the business.	Conflict of interest management + time dilation management

SC: Sub Categories (Grouping as a result of tagging)

Table 6. Axial Coding findings

AC	Negotiation Conflict	Managerial Conflict	Infrastructure Conflict	Defense Conflict	Competition Conflict
Sub (Orbit) Categories	Inter-team conflicts	Project management	Technological infrastructure	Cyberattacks	Malicious attacks
	Business-stakeholder conflicts	Conflicts between departments	Digital infrastructure	Cybercrime	Operational Security
	Business-customer conflicts	Leader-employee conflicts	Cyber transformation conflict	Cyberterrorism	Cybersecurity Threats
	Employee-customer conflicts	Institutionalism	Virtual applications	Data and Information Security	Virtual entrepreneurship and cyber innovation
	Depersonalization / derealization	Human Resources Management	Human Resources Management	Application and Software Security	Virtual market entry conflict
		Organizational virtual climate	Technology transfer	Network and Communication Security	Company mergers and consortium

AC: Attracting (Center) Categories

the open and axial coding analysis of the phenomenon representing the research questions enabled a central and general framework about the theory to be depicted through selective coding. Relativity theory was taken as the basis in the creation of this picture. Findings of selective coding are presented in table 7.

Orbit categories were created by associating the findings of the codification of the obtained data with the relativity theory principles. Strategic categories and orbit categories in the cyber conflict were put forward after this association process. Location in space, the relativity of time, warping spacetime, gravitational lens reflect the principles of the relativity theory.

Table 7. Final Results of Selective Coding

(Orbit) Categories	Central Category	Definition
Business within the system (location in space)	Relativity of Strategic Cyber Conflict Management (SCCM)	Businesses are organizations that encounter cyber conflict in legal, economic, social, virtual, sectoral systems. Determining the position of businesses in systems is important and necessary in resolving and managing conflicts.
Business within the cyber cosmos (relativity of time)		Businesses are constantly evolving in the cyber world. Digital innovations, cybersecurity risks, cyber transformation are the relative key factors in establishing strategies and developing cyberinfrastructure.
Warping spacetime due to cyber conflict (Curvature of strategy).		When the strategies and methods determined in cyber conflict encounter an obstacle, they warp by changing direction (deviation from strategy). After this warping, cyber conflict management should be directed to its former position with an emergency action plan.
Illusions due to cyber conflict (Gravitational lens)		Perception is important in achieving the goal in cyber conflict management. Deviations and obstacles from strategy cause perceptual illusions of the business observer.

The cyber cosmos stated in the relativity of time symbolizes the Japanese word "Yūgen". "Yūgen", a Japanese aesthetic concept, represents a mysterious, dim, and deep sense of the beauty of the universe. According to this opinion, the suffering of people has beautiful aspects. In the cyber cosmos, the negative situations that occur after the cyber-attacks are faced by the businesses strengthen the businesses in a strategic context. Relativity symbolizes the sustainability of this power and the ability to cope with possible obstacles.

Theoretical Memo-Writing

The data obtained in the codification process, which is the most important step in constructing a theory with the principles of grounded theory, is interpreted through theoretical memo-writing. During or after the interview, the meanings, contradictions, questions, uncertainties, and interesting issues attributed to the raw data by the researchers and participants are noted and recorded. During the analysis process, the adequacy of the coding and sample is revealed by memo-writing. This method reveals the saturation status of the researcher regarding the analysis and sample. Coding, association, category, and classification are performed reliably through theoretical memo-writing.

The theoretical memo-writing provides observational evidence during the interview. The emotional states of the participants, body movements, emphasis on words, avoidance of answering reveal the reactions of the participants regarding the researched phenomenon. These reactions and situations are recorded by this method.

During the memo-writing phase, it was determined that the participants used expressions reflecting relativity in their statements regarding the determination and implementation of the cyber conflict strategy. In addition, illusions in conflicts, strategic deviations, and infinity of strategy were recurring issues. This situation played an important role in relating to the principles of relativity theory. In addition, the conditions required by theoretical sampling to achieve saturation in the formation of the theory were determined by theoretical memo-writing (table 8).

Theoretical Sampling

The theoretical sampling method was applied in the study. In this sampling method, data collection continues throughout the analysis until theoretical saturation (Conlon, et al., 2020). Intentional, systematic, and random sampling techniques were applied in a mixed manner, as suggested by Strauss and Corbin (1997). The

Table 8. Sample of theoretical memo-writing analysis.

Raw Data	Memo-Writing analysis / Notes
Cloud computing vulnerability attacks are causing great financial damage to the business. We often experience theft of intellectual property and cryptography problems. This situation affects our legal and economic position.	Emphasis is placed on the position of the business within the systems. System perception should be investigated in business management.
Employees' psychology is manipulated by means of ransomware or phishing. Hackers demand payment for the release of infected data. However, often our competitors do this. This causes us to deviate from the target strategically.	This is an expression regarding illusions and deviations in cyber conflicts. More evidence is needed.
The most common problem in automation is the denial-of-service attack. The security of cyber applications causes conflicts in the operational and production processes we carry out through mobile computing. We use virtual reality applications to reduce and end conflicts. We also benefit from virtual applications in bilateral agreements…. The British have an idiom: If you do not want to flog a dead horse, you must reduce or eliminate the conflict immediately….	Emphasis is placed on the impact of virtual reality on reducing conflicts. It is also emphasized that the conflict should not be prolonged in terms of time.
The business' internet, digital and virtual network provides information about the causes of the conflict. The most common problems in conflict arise due to errors in the Wi-Fi network, industrial internet of things. Manufacturing-as-a-Service can eliminate the margin of error and errors in these conflicts.	Illusions related to cyber conflict are mentioned. The relativity and solution recommendations of this situation should be investigated.
Social media accounts and e-blogs are the most important places where conflicts arise with customers, stakeholders, and malicious cyber attackers. Cybercrime cases such as hate speech and hacking create critical conflicts. Statements that do not belong to the business create a perception of conflict in third parties. Moreover, this differs from time to time.	Conflict perception that changes with time. Perception varies according to the actors. This issue should be investigated in different samples.
We are experiencing conflicts in our export relationship with many countries due to fear of cyber terrorism. Cultural, legal, digital, and social changes cause changes and mistakes in our strategies.	It is mentioned about deviations and obstacles in cyber conflict management. More information needs to be gathered on this subject (Theoretical sampling).

Table 9. Theoretical sampling variables

Provinces	**N^{ac}**	**Sector**	
		Service	**Manufacturing**
Adana	1	0	1
Muğla	1	0	1
Ankara	4	1	3
İstanbul	4	1	3
İzmir	5	1	4
İzmit	3	0	3
Antalya	1	0	1
TS^t	19	3	16
$PreS^t$	574	241	333
Total	593	244	349

N^{ac}: Number of accessed companies; TS^t: Total theoretical sampling

$PreS^t$: Total Pre-sampling

intentional sampling technique is performed to reach sampling related to the categories to be determined. The systematic sampling technique enables the detection of similarities and differences between concepts and categories. The random sampling technique enables the inclusion of probabilistic coincidences to the theory in determining the sub and central categories of the theory to be revealed (Butler, Copnell, & Hall, 2018).

Elimination of contradictions that arise in coding and theoretical memo-writing stages, analyzing new phenomena, clarifying the relationships between categories, elimination of classification errors, confirming the relations between sub-central categories, elimination of uncertainties (filling the gaps) that arise in the formation of a new theoretical structure are accomplished through theoretical sampling (Braun & Clarke, 2021). Due to the theoretical sampling requirement that emerged after pre-sampling, 19 more businesses were interviewed (Table 9). Theoretical sampling was applied to obtain more detailed information about the perception of conflict over time, perceptual differences of deviations in cyber conflict strategy, system perception in business management and to fill the coding gaps that emerged.

Quality Analysis of Findings

In qualitative research, the quality of the data obtained as a result of analysis and coding provides information about the reliability of the results. In order to ensure reliability in the results, personal information was kept separate from the data included in the analysis in the processing of data. Cybersecurity of data recorded in a digital environment was ensured. Theoretical memo-writing and raw data were recorded in a short time after the interview.

The anonymized data were delivered over to a team of seven experts for interpretation in order to ensure objectivity in the interpretation and coding of the data, association, and formation of the theoretical structure. The interview duration was limited to an average of one hour in order to avoid any deviation in the interpretation of the obtained data. Participants were advised to take a short break during the interview. Thus, it was tried to eliminate the negative stimulation of the participants about the research subject psychologically.

Analysis and Interpretation

Analysis and interpretation is the evaluation of data obtained from codification, association, categorization, theoretical memo-writing, theoretical sampling stages (Birks & Mills, 2015). At this stage, small pictures are combined to create the picture that reveals the whole puzzle. The theoretical structure is constructed by interpreting this picture and the small pictures that make up the picture together (Bryant, 2017).

Illustration of Concepts and Constructing Theory

The construction of the theory depends on reaching saturation of the data emerging during the analysis process. Saturation depends on the integrity of the picture that emerges in taking the steps in the analysis and the level of representation of the parts that make up the integrity (Bryant & Charmaz, 2007). The codes obtained in the analysis phase consist of the pixels of the big picture, and the categories consist of modules. The theory reflects the big picture made up of these small parts. Different pictures and models obtained in coding, theoretical memo-writing, and theoretical sampling stages are transformed into a single picture via illustration of concepts and constructing theory (Charmaz, 2014).

In order to construct a substantive theory, the researcher needs to reach saturation about the research subject/phenomenon, new theory, associations, and interpretations. When the data obtained from the participants are repeated and the theoretical gaps are completed, steps are taken regarding the stages of customizing the code system, category building, illustration of concepts, and constructing theory (Strauss & Corbin, 1997). In the analysis process, theoretical sampling should not be performed at a level that exceeds the objective of the research. The sampling that exceeds the objective may negatively affect the deviations in theoretical saturation and the reliability of the results (Walker & Myrick, 2006). For this reason, steps in accordance with these rules were taken during the research and analysis process.

The consistency of the data obtained as a result of the analysis during the theory constructing phase was re-analyzed. At this stage, the notes obtained through theoretical memo-writing were compared with the final analysis findings, and the quality of the analysis results was analyzed. Consistency was detected and theoretical saturation was provided. The results revealed the relativity theory of strategic cyber conflict management.

Five Orbital Forces of Cyber Conflict

The findings of the research showed that the five orbital forces were attracted to cyber conflict. These orbital forces (negotiation, managerial, infrastructure, defense, competition) create significant accelerations in the context of strategic management in the cyber conflicts of businesses (figure 3).

Figure 3. Five Orbital Forces of Cyber Conflict

Creating a strategy in cyber conflict management (CCM) depends on sustainability, investigation of the cause-effect relationships of the conflict, defining the system in which the business is involved (located), and taking measures to reduce or end the conflict.

Negotiation Conflict

The research results demonstrated that negotiation is a factor in the strategic CCM that could end, mitigate, or cause new conflicts. This conflict includes conflicts that may arise between teams. There may be differences of opinion between people in teamwork in businesses. Employees may experience conflicts for many reasons such as competition, career development, award, and prestige.

Businesses are in contact with suppliers, company partners, shareholders, social responsibility actors, and project stakeholders. These stakeholders may experience conflicts according to the benefit-loss, contribution-loss balance of the businesses. Participants stated that many actors from stakeholders and beyond were experiencing problems due to the damage businesses cause to the environment. It was stated by the participants that reducing these conflicts depends on cooperation with stakeholders and projects should be developed in this context.

Customers are at the forefront of the conflict strategy in the context of profitability and sustainability of businesses. The results of the research revealed that employee conflicts are often experienced in product diversification strategies. Customers' expectations, the rate of return of complaints, after-sales services, negotiation problems in the digital environment, the sharing of personal data recorded in the company's digital database with third parties, and security weaknesses that emerged after cyberattacks were stated as the major causes of cyber conflict.

Depersonalization/derealization occurs when negotiation requires an intense effort or when the fighting power of the individual is weak. Participants reported that deliberative cyber conflicts arise especially among women and people with executive or leader status. The reason for this was stated as those women were constantly subjected to digital assault and violence. On the other hand, it was stated that the busy pace of work, the belief that negotiations would not yield results, and having a low level of commitment to the workplace desensitized the employees against conflicts. In addition, stress, unfair practices in the workplace, lack of cyberinfrastructure were reported by the participants as other causes of depersonalization/derealization.

Managerial Conflict

Research findings showed that the cyber aspect of the managerial conflict was related to project management, interdepartmental conflicts, leader-employee conflicts, institutionalism, human resource management, and organizational virtual climate. Project management can be carried out with the virtual network of the business. In zoom, google meet, skype, and other similar virtual meeting applications, reasons such as connection breaks, low connection quality, infrastructure deficiencies, participation from home environment cause conflicts in project management.

Another type of managerial conflict is interdepartmental conflict. Departments are units in which functions such as operations, logistics, law, human resources, sales, after-sales services, marketing, procurement-purchasing are carried out. E-mail errors between these units, e-mails causing cyber attacks, and informal addressing between parties style cause cyber conflicts.

According to the participants, the leader-employee conflicts, e-mail correspondence, informal addressing, ignoring the subordinate-superior relationship, using the video-call function of the smartphone applications against the purpose cause cyber conflicts. On the other hand, the institutional structure of the businesses was specified as a managerial cause of cyber conflict. Participants directly associated institutionalism with human resources and training in the context of cyber conflict. It was emphasized that employees in human resources management should be trained for the elimination or reduction of cyber conflicts, and awareness-raising about cyber-attacks should be made.

Organizational climate is related to the perception of the employee in the organization, mood, workplace environment, management practices, and working conditions. The findings confirmed the existence of a virtual climate within the organization. The participants emphasized that the virtual application and cyberinfrastructure should be suitable for the mood of the employees, and applications that would keep them away from boredom and negative effects should be preferred. On the other hand, in virtual meetings and negotiations, it was stated by the participants that the factors that cause perceiving false of the employee or the stakeholders of the business in the context of virtual management should be eliminated. For instance, it was suggested by the participants not to send persistent emails bearing the traces of mobbing, to give equal right to speak to all employees in the teleconferencing method, to protect the digital devices of the employees and the business against cyber and malicious attacks, and to ensure compliance with digital transformation in cyberinfrastructure.

Infrastructure Conflict

Business infrastructure fulfills important functions in managing resources and channeling them to relevant units. The findings of the study showed that infrastructure issues in the cyber conflict were related to technology, digital, cyber transformation, virtual applications, human resource management, and technology transfer. Participants stated that deficiencies in technological, digital, and cyberinfrastructure triggered conflict in cyber negotiation, communication, and interaction.

Virtual meetings with stakeholders, general assembly discussions, meetings with employees, live broadcasting on social media, broadcasting of advertisements in a digital environment, the functional infrastructure of the website, accessibility to social media accounts, technical problems in robotics, and automation can cause conflicts. According to the participants, cyber problems experienced in automation and robot applications in production can cause serious complaints and customer losses in product delivery.

Participants associated human resources management with both managerial and infrastructure conflicts. This is because human resources are both a solution and a node point in cyber conflicts. The findings showed that determining certain principles regarding the cyber conflict in human resources management would prevent possible conflicts and eliminate existing conflicts. It was stated that in many companies where training on cyber conflict in human resources management was provided, there was a decrease in conflicts.

Technological infrastructure is one of the most basic requirements of a business. Especially businesses operating in the manufacturing sector apply to technology transfer for product diversification, prototype, design, and to provide innovation to the business. Participants stated that technology transfer supported and improved the cyberinfrastructure of the business and was effective in reducing cyber conflict. Website and product design, innovative product, and service design were reported by participants as factors that reduce conflicts in the context of customers and stakeholders.

Defense Conflict

Research findings revealed that businesses were exposed to attacks such as cyberattacks, cybercrime, and cyberterrorism. Participants reported that such attacks posed a serious threat and risk to businesses and caused major conflicts in their relationships with customers and stakeholders. For this reason, data and information security are important in preventing cyber conflicts in businesses. On the other hand, it was stated by the participants that the security of digital elements in the website, automation, robot applications, and business infrastructure should be protected in the context of application and software.

The exposure of businesses to cyber-attacks and cybersecurity risks causes them to take a defensive position in their relations with customers and stakeholders. Participants believed that cyberattacks could be eliminated with defense strategies for the business, stakeholders, business infrastructure, and employees. Another factor that causes defense in cyber conflict is the network and communication security risk. Automation and communication in the manufacturing sector, communication, and marketing functions in the service sector are significantly affected by this factor. Participants stated that this defense factor created conflict with the customers and stakeholders with whom the business was in contact in the procurement, production, distribution, and marketing of products. The emergence of these conflicts causes businesses to fight for prestige against actors inside and outside the organization. Therefore, businesses take a defensive position for profitability, efficiency, performance, sustainability, and cybersecurity.

Competitive Conflict

Businesses are in active competition for the realization of economic goals. Research findings revealed that this competitive situation was caused by malicious attacks in cyber conflicts, operational security, cybersecurity threats, virtual entrepreneurship and innovation, virtual market entry conflict, company mergers, and consortium. Participants stated that malicious attacks were carried out by competing businesses to weaken the business's competitiveness, damaged its commercial reputation, and ensured that it withdrew from the market, and in this case, it caused conflicts between the victim business and the attacker business.

Operational Security is a form of risk management that aims to protect business operations by protecting business managers from competing businesses and malicious cyber attackers. Applications and networks with high-security risks such as projects, customers, production planning, cyberinfrastructure must be procedurally protected. This risk management is also important for cybersecurity threats.

Research findings showed that cyber innovation and entrepreneurship cause competitive conflict in businesses selling through cyber virtual stores. This conflict also causes disputes with rival businesses in entering the virtual market, which is under the influence of social media.

It is common for businesses to apply for mergers and consortia in resource dependency. Participants highlighted the conflict of cyber roles among businesses regarding this situation. Cyber roles were specified by the participants as managerial problems in the use of cyber and digital tools such as social media, virtual networks, virtual applications specified in the partnership or merger agreements of the businesses. The most experienced cyber conflicts were stated as social media posts, virtual advertisements, and virtual promotion activities.

Relativity of Strategic Cyber Conflict Management

The findings obtained as a result of the coding enabled the relativity approach in management and strategy to be constructed theoretically. While constructing the theoretical structure, the principles of relativity theory in different branches of science were taken into consideration. The similarity of the data obtained as a result of our research to the relativity theory inspired the name given to the theory. Although the five orbital forces of cyber conflict reveal important principles in strategy formulation, it was found as a result of our research that these principles were strategically under the theoretical structure.

The structure that emerges as a result of coding qualitative data reveals relativity. In the light of these findings, businesses are organizations in the cyber cosmos and systems such as economy, law, social, culture, sector. Cyber cosmos is an unlimited area of the digital world that provides speed of operation and access for businesses and individuals such as innovation, communication networks, virtual applications, virtual reality, robotics. This area eliminates physical, functional, interactional, and communicative distances in businesses. For this reason, businesses are cyber, legal, organizational, purposeful entities within the systems and cyber cosmos (figure 4).

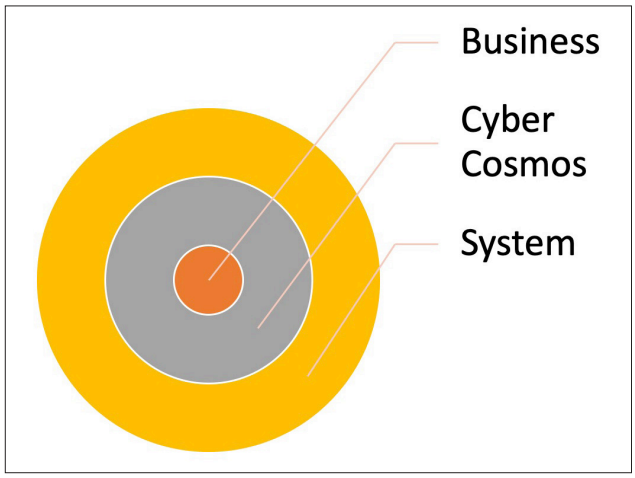

Figure 4. Cyber business within the system

Businesses in the cyber cosmos should develop strategic management principles in cyber conflicts that arise. The research results revealed that these principles were four basic principles that should be applied depending on the five orbital forces of cyber conflict (figure 5). These principles are business within the system (location in space), the business within the cyber cosmos (relativity of time), warping spacetime due to cyber conflict (curvature of strategy), and illusions due to cyber conflict (gravitational lens).

Business within the System (Location in Space)

Location in space, which is the first principle of the created theoretical structure, is related to the determination of the position of the business in the systems. Businesses can constitute subclasses of many classes such as law, culture, industry, economy, social media. In terms of determining the actors, possible attackers, and solutions, in conflict management, which of these systems businesses are included is important. Businesses pull (attract) or push businesses around them. This situation was associated with the proximity of suppliers, customers, and stakeholders to businesses in the research findings. Thus, the rules of the system in which the business is located, the strength of the conflict, and the high level of competition play a leading role in determining the strategy.

Business within the Cyber Cosmos (Relativity of Time)

The results of the research revealed that the adaptation of businesses to the changing and developing world conditions was important in achieving the strategies and targets. This ability to adapt is important in the context of dealing with conflict risks arising in the cyber cosmos. Time relativity requires businesses to keep history charts in cyber conflicts. Employees, managers, business with their institutional features, stakeholders, customers, and consumers change their views on the business-adaptation balance over time. This change should be recorded in the determined strategies, and the emerging differences and business-related developments should be kept on the agenda. Participants explained these differences, which change over time, with the expectations of customers about virtual reality and applications.

Warping Spacetime Due to Cyber Conflict (Curvature of Strategy)

When faced with an obstacle, the strategies determined by businesses regarding cyber conflicts change direction, they do disappear. Participants stated that the strategies of businesses in this direction would not end even if the business was closed, and could be a source of inspiration for other businesses. Therefore, the strategy creates an infinite light effect within the cyber cosmos and system (infinity of strategy). The results of the research revealed that the obstacles that emerged were malware, changes

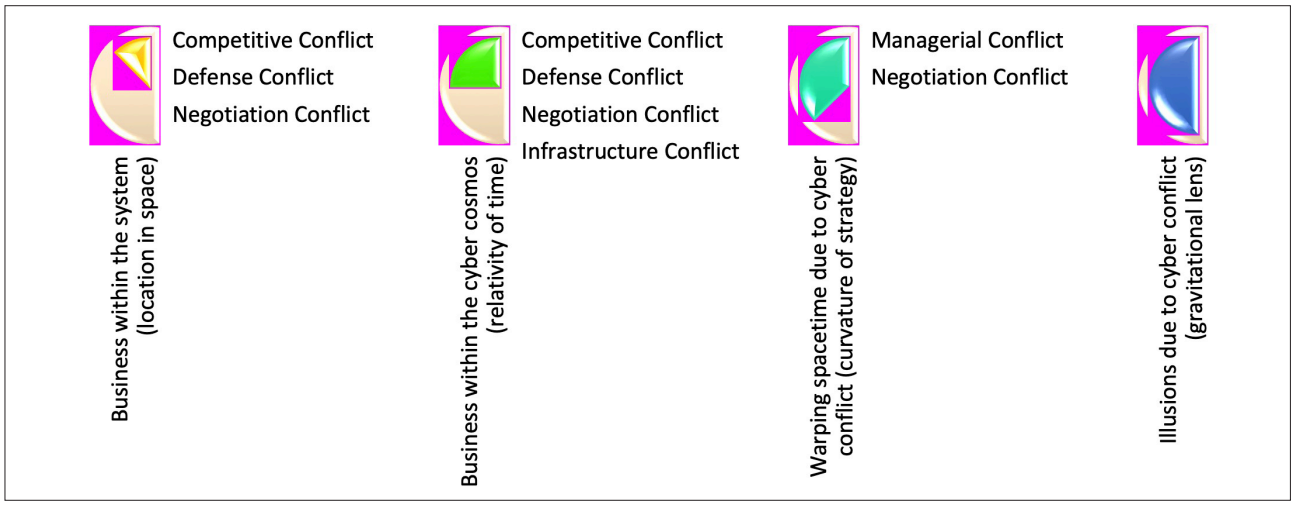

Figure 5. Relativity of Strategic Cyber Conflict Management

in cyber attacks, loss of cyber adaptability of the business, and unwillingness to negotiate with the conflict parties.

In CCM, deviation from the strategy can be improved by using an emergency action plan or using alternative routes. Participants gave examples regarding this situation, such as problems in encryption and software engineering, infrastructural problems arising in negotiations, communication problems caused by managers, and virtual interaction problems with stakeholders.

Illusions Due to Cyber Conflict (Gravitational Lens)

Perception is an important factor in CCM. Managers may be perceptually mistaken about the direction and resolution of the deviation in strategy. Misperception is linked to the obstacle, event, means of conflict, actors. Despite the implementation of negotiation methods, the termination of negotiations by the other party and misunderstanding of virtual correspondence due to cultural differences can cause perception errors. Participants stated that connection problems, emojis, and informal writing forms caused errors in communication during the interviews conducted via virtual applications. In addition, it was stated that the sensitivity to the words and sentences used in the compensatory negotiations and meetings for the elimination of conflicts was higher than the previous interviews.

The level of error (misunderstanding/misperception) in negotiation depends on whether the negotiation is synchronous or asynchronous. Since the interaction is instantaneous in synchronous negotiation, perceptual errors can be turned into solutions in the later stages of the negotiation. However, in asynchronous negotiation, the maintenance of the interaction is not synchronous, so action cannot be provided to resolve the error most of the time.

The perception of the unsuccessful methods used in reducing and ending cyber conflicts as successful by the managers puts the conflicts in an impasse. According to the data obtained from the participants, managers often acted on the basis of their past experiences. Many managers fall victim to their traits. Individuals with poor empathy skills, overly sensitive, emotional, and aggressive characteristics may be mistaken about conflict. This situation can negatively affect the success of the applied strategy.

DISCUSSION

Cyber conflict is reflected in the literature as a type of conflict that threatens the economies of the country and is related to security vulnerabilities and cyber attacks. According to this approach, cyber conflict is carried out on states, online organizations, hackers, and malicious software. Hate speech, discrimination, cyber attacks, cyberwar, law, and ethical issues are prominent types of conflict that this approach puts forward.

Studies on CCMs of businesses are related to cyber espionage, cyber warfare, and law (Akoto, 2021). These studies revealed that financial and telecommunication companies were targeted with cyber-attacks and aimed to harm the country's economy (Junio, 2013; Karatzogianni, 2008). Valeriano & Maness (2014) demonstrated the competitive dimension of this conflict in the context of cyber warfare between states. This approach was followed by cyber defense strategies (Shi et al., 2007; Heckman et al., 2013; Denning, 2014; Xu, Lu, & Li, 2015; Lu, Xu, & Yi, 2013). These studies focus on general issues such as law, government, cyber warfare.

Studies that reduce traditional conflict management approach to private are limited. Cebula & Young (2010) contributed to the reduction to private of the traditional cyber conflict approach and revealed that operational cybersecurity risks consist of technology failures, individual actions, systems, external events. Another study that highlighted individual actions was carried out by Ishii (2010). This study revealed that the cooperative-based cyber management approach was preferred among students in the event of cyber conflict.

Applegate & Stavrou (2013), which handled conflict management as individuals, systems, and events, proposed cyber conflict taxonomy. Taxonomy included forms of classification that defined the events, actors, and subjects of the taxonomy that gave rise to the conflict. Although taxonomy added a new dimension to cyber conflict, it could not provide empirical evidence and go beyond conceptual explanations. This classification form, which is beneficial in understanding complex relationships and categorizing the systemic structure, cannot offer a strategic perspective in cyber conflict.

The cyber conflict has become increasingly complex in the context of organizations, businesses, individuals, states, classes, and society. Studies on CCM cannot go beyond concepts such as inter-state war, espionage, cyber attack, malicious / ransomware, and cybersecurity. Putting forward the function and role of businesses as

an economic organization in cyber conflict, developing a strategy and theory, will provide competitive power for businesses in today's complex cyber cosmos.

This study revealed the relativity approach that enables businesses to develop strategies in cyber conflicts. A strategic management approach was revealed with the research findings beyond an attack and vulnerability approach to CCM. The relativity approach, strategic management, and the handling of cyber conflict in the context of businesses reveal three theoretical foundations. Lack of theory development in the literature on CCM, in the context of implementation and strategy development, poses risks related to the cybersecurity of businesses.

CONCLUSION

The research results reveal a new theory in the field of cyber conflict management. This theory is the "relativity of strategic cyber conflict management". This theory was constructed so that businesses can develop a strategy that suits the needs of the cyber world. The negative effects of cyber attacks and threats on the relations of businesses with stakeholders and their environment and serious damage to the business infrastructure make it necessary to develop a strategy in this direction.

According to the results of the research, five orbital forces (negotiation, managerial, infrastructure, defense, competition) were determined in the CCM. These orbital forces also constitute types of conflict in businesses. Businesses enter into cyber conflicts through these orbital forces within the system and cyber cosmos. This result provides important insights into the causes and consequences of possible cyber conflicts internally and externally. For this reason, it is necessary to pay attention to the five orbital forces when developing strategies in cyber conflicts of businesses.

The theoretical foundation revealed by the research findings proves the four basic principles of CCM. The relativity approach determines the principles of this theory. Four principles were determined as a business within the system (location in space), the business within cyber cosmos (relativity of time), warping spacetime due to cyber conflict (Curvature of strategy), and illusions due to cyber conflict (Gravitational lenses). These principles are important in determining, implementing, and sustaining the strategic CCM of the business. Managers should pay attention to the deviations and obstacles experienced in cyber conflicts that arise in the business. It should be noted that cyber conflict is not just about the management of infrastructure and resources. The relativity according to time and perception, emergency action plans, the idea that strategy is an infinite light should be adopted by businesses. In addition, time-based perceptions and experiences should be recorded by establishing a history regarding cyber conflicts.

The results of the research show that the strategic CCM based on five orbital forces can achieve the competitive power of the business, promoting in the market, rapid adaptation to cyber developments, and success in negotiations. For this reason, it is suggested that the strategic management and human resources management of the businesses should be developed according to the strategic CCM. These practical contributions will help to determine the position of the business in the system and cyber cosmos.

For a successful CCM, attention should be paid to relativity in the issues of cyber communications, cyber and online negotiations, online conflicts, depersonalization, psychological, social, cultural, and institutional factors, technological and digital infrastructure, operations, human resources management, conflict in online meetings and negotiations, management strategy. In addition, since the interaction is not synchronous in asynchronous negotiation, communication with the parties should be maintained and feedback should be obtained in order to resolve the misperceptions.

In the context of human resources management, it is important to train employees on employment, orientation, organizational culture, and conflict in organizational climate. On the other hand, awareness should be created with continuous training, as procurement, logistics control, production-planning, legal procedures, after-sales services, marketing, promotion are business functions where cyber conflicts can occur frequently.

Despite the theoretical and practical contributions of the study, empirical studies in this direction should be increased. It is recommended to conduct studies according to the theory established on subjects such as performance, competitiveness, productivity, organizational climate, employee-leader interaction, social responsibility, organizational behavior, and workplace. In addition to introducing the relativity approach to the strategic CCM into the literature theoretically, it is suggested that future studies should be carried out empirically in different types of organizations (eg public sector, associations, foundations, voluntary organizations, etc.). Investigating symbiotic sharing

in this context can make important contributions in a practical context.

LIMITATIONS

The analysis stages of the grounded theory, which is the method adopted in the research, caused a significant amount of effort and time. Data collection, theoretical sampling, and coding steps were carried out equally, requiring a great deal of effort and time. For this reason, problems can often be experienced in the abstraction of data. Communication, internet, and network problems made it difficult to encode data in video conference calls with some participants. In addition, supporting the study with more empirical evidence would benefit the development of the theory.

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Appendix

Interview questions

S1. How would you define cyber conflict in your business?

S2. What are the cyber conflicts your business face? What are your suggestions for resolving these cyber conflicts?

S3. How do you identify the cyber conflicts your business face? What are the criteria that enable these cyber conflicts to be identified?

S4. What are the key factors leading to the emergence of cyber conflict? What difficulties do you have in determining these factors?

S5. What are the strategies and methods you adopt to manage cyber conflict?

S6. What is the importance and impact of the methods you apply in preventing cyber conflict? Have you ever experienced events where you needed to be flexible in methods and strategies?

S7. Could you share your experiences regarding the methods you adopted, in the context of achieving your goals? Have you encountered events/conditions that caused you to deviate from your goals?

S8. What are the problems that arise in cyber conflict management when you consider your business, the environment of your business, departments, employees, stakeholders, customers, suppliers, and all other elements together?

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Experienced Product Quality and Brand Loyalty: Mediating Role of Customer Satisfaction

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ABSTRACT

The quality experience for a product and service is essential for building customer satisfaction and brand loyalty. The purpose of this study is to investigate the CEPQ scale's reliability and construct validity in addition to the relationship amongst customer satisfaction, experiential quality and brand loyalty for managerial and academic purposes. Within the scope of the research conducted in Turkey, online data is collected from 530 mobile phone and 665 computer users over 18. The research findings provide evidence that sub-dimensions of the CEPQ scale is reliable and valid for mobile phone and computer product groups. When the results of the study are evaluated, it is seen that the product quality experienced in both the computer and mobile phone product groups positively affected customer satisfaction. Customer satisfaction in mobile phone and computer product categories positively affects brand loyalty. Moreover, customer satisfaction plays a mediator role between experienced product quality and brand loyalty.

Keywords: Quality, Experienced Product Quality, Product Quality, Brand Loyalty, Customer Satisfaction.

JEL Classification Codes: M30, M31, M39, L15

Referencing Style: APA 7

INTRODUCTION

Many factors such as today's marketing opportunities, technological developments, and ease of access to information have escalated the competitive environment between enterprises and made the world a global village. Businesses that aim to make a difference between their competitors by producing quality products have aimed to build customer satisfaction and loyalty in this way. The promotion activities carried out by the enterprises, the brand or product perception that is tried to be created only affect the customer to a certain extent. The customer's reaching a concrete opinion occurs through experiences. In this sense, the expression of experienced product quality includes the product evaluations that emerge after the experiences.

In general terms, experience is a series of complex interactions between a business or product and a customer that are affected by context and are related to the perceptions created by the customer who encounters and experiences the product or brand towards that brand or product. Customer experience, with its low imitability and competitive advantage, has a tremendous place in the marketing world (Gupta, 2016). Product quality is related to the level of compliance of a product with the desired qualities and established standards (Forker, Vickery, & Droge, 1996). Product quality, which covers the total characteristics of products capable of meeting a request or need, can be defined as consistently meeting or exceeding a product's customer requirements and expectations. A quality product has features that can meet the wishes and needs of the customer in exchange for monetary considerations and thus provides customer satisfaction (Chinomona, & Maziriri, 2017).

Despite the general definitions introduced, product quality has also been addressed with various approaches among different branches of science. In economics, product quality has been discussed in terms of profit maximization, whereas in marketing, it has been studied regarding customer satisfaction and purchasing behaviors. On the other hand, engineering researchers have approached product quality in the context of

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production control and standards (Garvin, 1988). The quality standards determined during the product design are selected according to the target markets of the products. In order for businesses to offer their products to consumers in international markets, it is necessary to produce in accordance with the standards set by the authorized institutions in the targeted countries for the products, and this must be documented.

TSE (Turkish Standards Institute) in Turkey, DIN (Deutsches Institut für Normung) in Germany and GOST in Russia can be given as examples of these authorized institutions. Some quality elements that are not defined in these standards can be selected at the design stage in a way that will comply with the customer expectations in the targeted markets and provide the company with a competitive advantage in the market. With the quality control activities carried out within operations, it is ensured that the products comply with the determined quality standards. Quality control activities are generally of an objective nature based on measurement.

On the other hand, consumers' evaluation of quality is mostly subjective. Consumers can have a quality judgment about a brand even they have never used it before. This phenomenon is frequently occurs for brands targeting premium segments. Consumers who are not users of these brands know that they are of high quality. The experienced product quality is, however, the integrated customer assessment of how excellent the product performance is in a particular process, and it includes factors such as service quality, advertising, product packaging, product features, and additional services offered by the company (Gao, Melero-Polo, & Sese, 2019).

From a company perspective, it can be considered that providing a quality product or service is enough to create a quality experience. Nevertheless, because the assessment occurs individually and is related to environmental factors, it is quite challenging to create an excellent quality experience. Therefore, the experienced quality is not based on a single dimension of experience, but on the "total experience" (Kim & Choi, 2013).

The SERVQUAL model, which is used in the context of quality assessment of consumers in service-producing enterprises (Parasuraman et al., 1988), are frequently discussed in studies. According to the model, quality evaluation of the customers have five aspects (concrete characteristics, reliability, enthusiasm, assurance, empathy). However, there is no such widespread use for product quality. Tools used to measure product quality, like ACSI (Fornell et al., 1996), only consider particular quality dimensions. For products, Das Guru and Paulsen (2020) proposed the CEPQ model in order to create a standard scale to be used in the quality assessment of consumers. The CEPQ scale, as a valid and reliable instrument to measure product quality, eliminates this deficiency. The CEPQ model has considered product quality in eight dimensions (performance, additional properties, aesthetics, materials, reliability, durability, serviceability and ease of use) and proposes that no single dimension is solely vital for determining product quality. The goal of this study is managerial and academic: to apply and validate the CEPQ model in Turkey in two product categories (mobile phones and computers) as well as to examine the relationship between brand loyalty, customer satisfaction, and experiential quality. Hypothesis development and research methodology design are presented respectively in the next section. Then, the empirical findings are reported, and the theoretical contributions are discussed.

HYPOTHESIS DEVELOPMENT

Experienced Product Quality and Customer Satisfaction

Although product quality is defined in different ways among quality researchers, it is generally characterized as a multidimensional concept that meets human wants and needs (Lakhal, & Pasin, 2008). The quality standards established during product design are determined according to the markets targeted by the products. In order for enterprises to present their products to large masses, the products must be produced in accordance with the determined quality standards. Because, the relationship between product quality and standards affects customer experiences. The experienced product quality reaches judgments such as good/bad by comparing the customer's experience based on standards of excellence (Yoshida, 2017). These judgements focused on the customer's experience are intended to reflect the opinion the consumer has after interacting with the business.

The concept of satisfaction, an essential component in understanding human behavior, has been investigated with various approaches. It has been defined as an element that triggers post-purchase behaviors in the marketing literature and has been seen as a means of achieving corporate goals (Tse, Lefkoşa, & Wilton, 1990). On the other hand, in some studies, satisfaction is associated with product and performance ratings; thus, a numerical definition of satisfaction is made (Czepiel, & Rosenberg, 1977). Customer satisfaction is a perceptual, evaluative,

and psychological end-state arising from the consumption experience (Pizam, Shapoval, & Ellis, 2016). Customer satisfaction, which provides low failure costs, an improved reputation, and low price sensitivity, offers the business the chance to manage the process more easily in case of any malfunction in the product or service (Anderson, Fornell, & Lehmann, 1994). High customer satisfaction also indirectly refers to company profitability. Especially since it has become clear that new customer acquisition is more costly than retaining an existing customer, customer satisfaction has become a corporate goal for businesses (Chan et al., 2001). In a study conducted with customers using hotel restaurants, it has been found that customer satisfaction is positively impacted by physical quality (Bilhamta et al., 2017). The link between quality and satisfaction, closely related to the expectation/approval paradigm, has been the subject of many studies and has proven that an increase in quality will also increase customer satisfaction (Caruana, Money & Berthon, 1998). In addition, Moraira, Silva and Moutinho (2017) show that perceived quality positively influences customer attitudes and ultimately leads to customer satisfaction. Hypothesis 1 is formed in light of these studies.

H1: The experienced product quality positively affects customer satisfaction.

Experienced Product Quality and Brand Loyalty

Brand loyalty is a mental state that ensures the brand is constantly purchased over time. In this sense, brand loyalty adds value to businesses and causes high profitability (Severi, & Ling, 2013). The importance of brand loyalty in marketing has increased since the 1950s, with the finding that most sales come from loyal customers. Increased loyalty to a brand reduces the elasticity of demand toward price (McConnell, 1968). In addition, brand loyalty affects customers' preferences against the product or brand and creates awareness in terms of purchasing. In this sense, brand loyalty includes the degree of loyalty of businesses and competing companies (Percy, & Rosenbaum-Elliott, 2021).

In a study on fast food goods, Reich et al. (2008) found that quick takeaway, product taste, freshness, and portion size are all related to quality, and that product quality affects brand loyalty almost twice as much as the quality of service. It has been shown that the perception of quality can enable brand loyalty (Malai, & Speece, 2005). In addition, product quality significantly supports brand loyalty (Wang et al. 2013; Chinomona, & Maziriri, 2017). Based on these studies, Hypothesis 2 is developed.

H2: The experienced product quality positively affects brand loyalty.

Customer Satisfaction and Brand Loyalty

When a product fulfills or surpasses a customer's expectations based on prior interactions with the product, the consumer is satisfied. In this sense, customer satisfaction also influences attitudes about whether the product will be preferred in the future or not (Liang et al., 2018). Customer satisfaction arises when a product or brand meets customer expectations (Spreng, & Mackoy, 1996). The loyalty created by customer satisfaction leads to re-purchase and positive word-of-mouth marketing activities to the brand's environment. In addition, customer satisfaction creates both mental and emotional satisfaction. This, in turn, creates a happy and satisfied customer (Yee & Mansori, 2016). However, it should be noted that not every customer who continues regular purchasing activities may feel satisfied with the brand. Customer satisfaction can create loyal customers, but not every loyal customer is a satisfied customer. Being loyal can be based on several factors (Fornell, 1992).

In Bloemer and Ruyter (1998)'s study on store customers, satisfaction is conceptualized in a continuum (latent to manifest). The study shows that customers who show manifest satisfaction visit the store more often and nurture loyalty. Customers who showed latent satisfaction, on the other hand, are only seen to accept the store and do not realize an attitude of loyalty as intense as in manifest satisfaction (Bloemer, & Ruyner, 1998). In this sense, satisfaction significantly affects brand loyalty (Caruana, 2000). Several studies have proven that companies that offer better products and services than their competitors have more loyal customers. That's because customers tend to rely on their past experiences when performing the act of making a purchase (Moreira, Silva, & Mountinho, 2017). Based on these studies, Hypothesis 3 was developed.

H3: Customer satisfaction positively affects brand loyalty.

The Mediating Role of Customer Satisfaction in the Relationship Between Experienced Product Quality and Brand Loyalty

Product quality, which is seen as an expression of superior performance, is the driving force for many strategic goals of a company, such as survival in an intensely competitive environment, providing high profitability, and expanding the market volume. These returns provided by a quality product to the business

Table 1: Demographic Characteristics of Respondents

		Mobile Phone		Computer	
		Frequency	**%**	**Frequency**	**%**
Gender	Female	320	60.4	412	62
	Male	210	39.6	253	38
Education	High School and Below	107	20.2	66	9.9
	College	36	6.8	18	2.7
	Undergradute	243	45.8	344	51.7
	Graduate	144	27.2	237	35.6
Marital Status	Married	173	32.6	148	22.3
	Single	357	67.4	517	77.7
Monthly Income	Below one minimum wage	89	16.8	142	21.4
	1 to 2 minimum wage	150	28.3	251	37.7
	2 to 3 minimum wage	140	26.4	168	25.3
	4 minimum wage or above	151	28.5	104	15.6
Product usage time in years	1	177	33.4	123	18.5
	2	122	23.0	84	12.6
	3	99	18.7	72	10.8
	4	60	11.3	82	12.3
	5 and above	72	13.6	304	45.7
Fee Paid for the Product	0-1000 TL / 0-2000 TL	27	5.1	144	21.7
	1001-2000 TL / 2001-4000 TL	148	27.9	270	40.6
	2001-3000 TL / 4001-6000 TL	149	28.1	134	20.2
	3001-4000 TL / 6001-8000 TL	78	14.7	70	10.5
	4001-5000 TL / 8001-10000 TL	52	9.8	23	3.5
	5001-6000 TL / 10001-12000 TL	19	3.6	9	1.4
	6001 TL and above / 12001 TL and above	57	10.8	15	2.3
Mobile Phone Brands	Samsung	172	32.5		
	Apple	198	37.4		
	Huawei	60	11.3		
	Xiaomi	62	11.7		
	Oppo	6	1.1		
	General Mobile	7	1.3		
	LG	6	1.1		
	Other	19	3.6		
Computer Brands	Casper			47	7
	Toshiba			37	5.5
	HP			108	16.2
	Apple			40	6
	Lenovo			137	20.5
	Dell			47	7
	Asus			107	16
	Acer			43	6.4
	Samsung			23	3.4
	Huawei			9	1.3
	Xiaomi			3	0.4
	MSI			7	1
	Monster			6	0.9
	Other			51	8.4

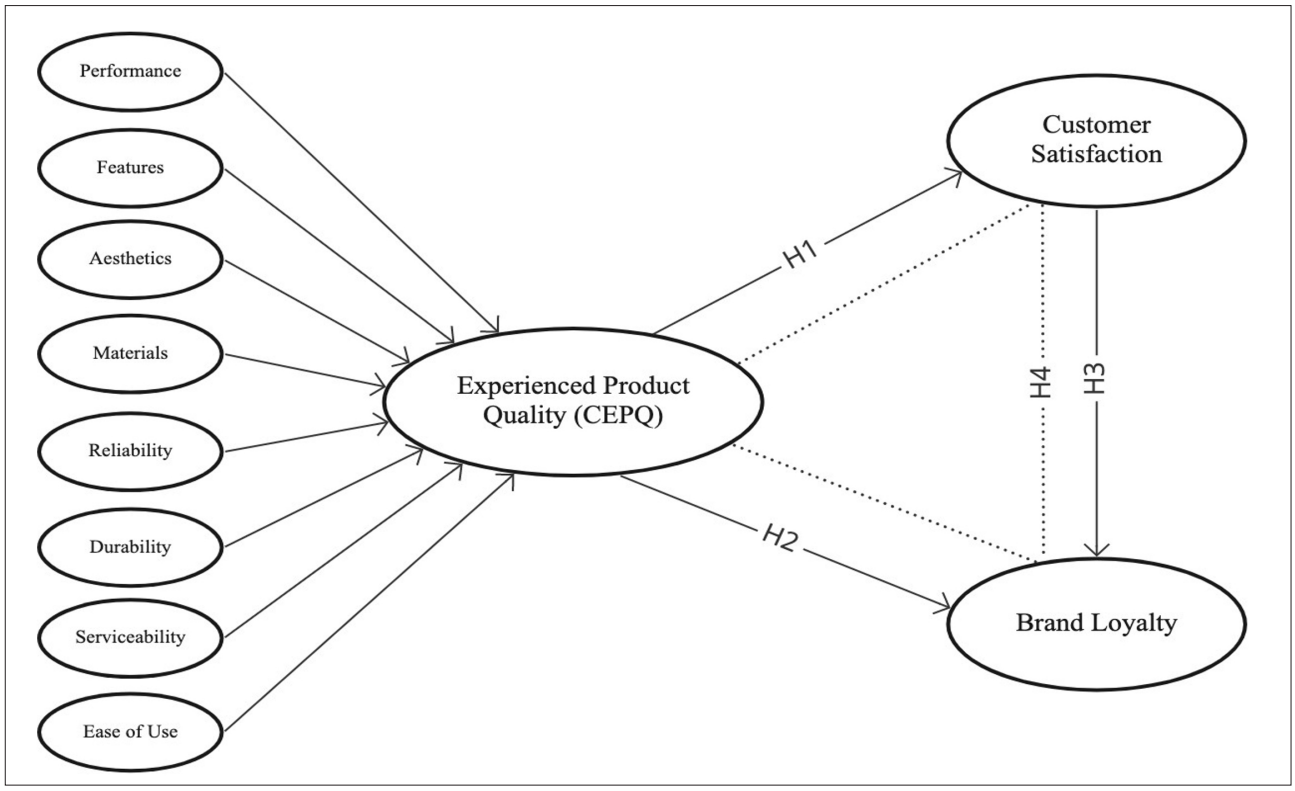

Figure 1: Proposed Conceptual Model

create customer satisfaction and ensure brand loyalty. This has made product quality studies vital for both academics and company managers. The relationship between experienced product quality and brand loyalty is not always direct.

The ACSI model does not specify a direct link between customer loyalty and quality. In contrast, the direct impact of customer satisfaction on brand loyalty is emphasized. In the ACSI model, perceived quality has an impact on customer satisfaction (Fornell et al., 1996). Therefore, the evaluation of the mediating function of customer satisfaction in the link between experienced quality and brand loyalty is included in the scope of this study. Based on the literature, Hypothesis 4 is developed.

H4: Customer satisfaction has a mediating role in the relationship between the quality of the product experienced and brand loyalty.

Figure 1 summarizes the hypotheses regarding the research and illustrates the research model.

METHOD

Sample

Sample of the study consists of mobile phone and computer users in Turkey. A cross-sectional research design is used to evaluate research hypotheses and accomplish the study objectives. Due to the COVID-19 pandemic, data is gathered via online surveys. Only respondents over the age of 18 are allowed to complete the survey questions. Therefore, a convenience sampling approach is adopted in the study. Data is collected from 530 mobile phone users from 12.2020 to 02.2021 and 665 computer users from 03.2021 to 05.2021. According to the data results, the mean age of mobile phone users is 29.08, and the standard deviation is 8.05. On the other hand, the mean age of computer users is 27.94, and the standard deviation is 5.90. Table 1 provides the demographic properties of the participants.

Procedure

The instrument utilized for the study includes sections called "personal information form" "experienced product quality scale", "brand loyalty scale", and "customer satisfaction scale". The survey questions (given in Appendix) are translated into Turkish by marketing academics fluent in English and Turkish. This study uses the CEPQ scale (Das Guru, & Paulssen, 2020) for experienced product quality. In case of any item deletion after reliability and validity examination, two more scale items adapted from Delgado-Ballester (2004) and Bruhn et al. (2012) are added to the reliability dimension of the CEPQ scale. In order to measure brand loyalty, scale items are borrowed from Bashirov (2019). Items adopted from Magi's (2003) and Reichheld's (2003) studies are

Table 2: Exploratory Factor Analyses Results

		Factor Loadings		Communalities		Variance Explained %	
Factors	**Items**	**MP***	**C****	**MP**	**C**	**MP**	**C**
Durability	Dur1	0.81	0.80	0.84	0.87	7.75	7.22
	Dur2	0.82	0.81	0.84	0.89		
	Dur3	0.77	0.65	0.79	0.81		
Aesthetics	Aes1	0.82	0.85	0.90	0.90	7.98	8.25
	Aes2	0.81	0.82	0.91	0.90		
	Aes3	0.82	0.84	0.89	0.90		
Reliability	Rel1	0.95	0.93	0.91	0.90	7.47	8.16
	Rel2	0.93	0.94	0.87	0.92		
	Rel3	0.90	0.91	0.85	0.88		
Ease of Use	Eas1	0.73	0.69	0.82	0.82	7.49	7.68
	Eas2	0.82	0.83	0.90	0.92		
	Eas3	0.77	0.78	0.87	0.89		
Materials	Mat1	0.78	0.79	0.91	0.92	7.47	7.44
	Mat2	0.79	0.82	0.93	0.94		
	Mat3	0.75	0.71	0.89	0.88		
Serviceability	Ser1	0.85	0.88	0.92	0.92	8.16	8.61
	Ser2	0.88	0.89	0.94	0.94		
	Ser3	0.85	0.89	0.92	0.93		
Features	Fea1	0.75	0.74	0.85	0.87	7.40	7.20
	Fea2	0.77	0.76	0.88	0.91		
	Fea3	0.74	0.75	0.83	0.85		
Performance	Per1	0.64	0.65	0.86	0.88	7.38	4.90
	Per2	0.66	0.64	0.89	0.88		
	Per3	0.58	0.61	0.83	0.84		
Customer Loyalty	Loy1	0.82	0.83	0.76	0.79	18.73	18.91
	Loy2	0.84	0.84	0.76	0.81		
	Loy3	0.84	0.82	0.75	0.73		
	Loy4	0.85	0.79	0.85	0.81		
	Loy5	0.85	0.83	0.79	0.80		
	Loy6	0.78	0.77	0.80	0.81		
	Loy7	0.80	0.81	0.76	0.79		
	Loy8	0.71	0.64	0.76	0.74		
Customer Satisfaction	Sat1	0.69	0.70	0.87	0.88	8.02	7.81
	Sat2	0.75	0.68	0.86	0.84		
	Sat3	0.73	0.66	0.83	0.80		
	Sat4	0.69	0.66	0.86	0.87		

*: Mobile Phone

**: Computer

used for customer satisfaction measurement. The CEPQ and brand loyalty scales consists of respectively 33 and 8 questions of 5-point Likert-type. The first 3 questions of the customer satisfaction scale are 7-point semantic differential scale while the subsequent 4 questions are 11-point. The questionnaire also includes questions about the demographic variables of the participants.

Table 3: Confirmatory Factor Analysis Results

		Factor Loadings		AVE		Cronbach's Alpha		CR (rho_a)	
Factors	Items	MP*	C**	MP	C	MP	C	MP	C
Durability	Dur1	0.909	0.922	0.815	0.831	0.886	0.899	0.886	0.901
	Dur2	0.918	0.916						
	Dur3	0.882	0.897						
Aesthetics	Aes1	0.948	0.944	0.901	0.897	0.945	0.943	0.945	0.944
	Aes2	0.955	0.952						
	Aes3	0.945	0.946						
Reliability	Rel1	0.941	0.946	0.861	0.897	0.927	0.925	0.949	0.945
	Rel2	0.883	0.954						
	Rel3	0.957	0.942						
Ease of Use	Eas1	0.898	0.909	0.853	0.867	0.913	0.923	0.913	0.923
	Eas2	0.945	0.943						
	Eas3	0.926	0.942						
Materials	Mat1	0.955	0.959	0.913	0.914	0.952	0.953	0.953	0.954
	Mat2	0.965	0.966						
	Mat3	0.946	0.944						
Serviceability	Ser1	0.960	0.959	0.924	0.929	0.959	0.962	0.959	0.962
	Ser2	0.963	0.968						
	Ser3	0.961	0.966						
Features	Fea1	0.921	0.939	0.851	0.877	0.912	0.930	0.912	0.932
	Fea2	0.943	0.953						
	Fea3	0.903	0.917						
Performance	Per1	0.933	0.935	0.872	0.870	0.927	0.925	0.927	0.925
	Per2	0.946	0.940						
	Per3	0.923	0.923						
Customer Loyalty	Loy1	0.854	0.860	0.748	0.750	0.952	0.952	0.960	0.957
	Loy2	0.846	0.856						
	Loy3	0.795	0.790						
	Loy4	0.923	0.905						
	Loy5	0.854	0.886						
	Loy6	0.903	0.905						
	Loy7	0.877	0.884						
	Loy8	0.862	0.837						
Customer Satisfaction	Sat1	0.933	0.940	0.843	0.849	0.938	0.941	0.941	0.942
	Sat2	0.924	0.918						
	Sat3	0.884	0.891						
	Sat4	0.931	0.936						

Findings

Exploratory Factor Analysis

During the analysis phase, two exploratory factor analyses with SPSS are applied to the data collected from both computer and mobile phone users. Thus, the eight quality dimensions that make up the CEPQ scale developed by Das Guru and Paulssen (2020) and two related constructs (customer satisfaction and brand loyalty) are evaluated in terms of construct validity.

KMO and Bartlett tests are first used to assess whether the data are appropriate for exploratory factor analysis. According to the results of Bartlett's Test of Sphericity, the data fit into the multiple normal distribution for both computer (approx. Chi-Square= 26443.065; df= 630; sig= 0.000) and mobile phone (approx. Chi-square= 20076.460; df= 630; sig= 0.000) data. Results of the Kaiser-Meyer-Olkin (KMO) test indicate adequate sample size for both computer (KMO = 0.953) and mobile phone (KMO = 0.947) data. Thus, it is concluded that exploratory factor analysis could be performed on both data groups. Since the number of scale factors is determined in the study, Varimax and Principle Component methods are applied to the analyzes performed with Fixed Factors. When the analyses are carried out according to the Eigen value, 8 factors emerge. However, since it is known that the scale consists of 10 constructs the analysis are run with the Fix Factors option. In Table 2, exploratory factor analyses results are provided.

When exploratory factor analyses results for both product groups are evaluated, the factor loadings of the scale items range from 0.58 to 0.95 and are above the minimum suggested threshold of 0.5 (Hair et al, 2014). The smallest communality value is 0.73. With the ten-factor structure, the total variance is explained for mobile phone data is 85.32, while for computer data is 86.16%. Results indicate that the scale items are collected under the related factors for both data groups. Therefore, the exploratory factor analyses conducted on the data of mobile phone and computer users provide evidence that measures of the study have adequate construct validity.

Assessing Reliability and Validity of Measures with PLS-SEM

PLS-SEM approach enables researchers to examine various types of research instruments in terms of reliability and validity. Moreover, more complex research models containing higher-order constructs have been tested with PLS-SEM approach by marketing scholars with various methods. Sarstedt et al. (2019) provide a comprehensive review regarding such approaches and models. The CEPQ, can be classified as a reflective-formative (type II) model. In order to assess the research model the embedded two-stage approach is used.

In line with the embedded two-stage approach, in the first stage validity and reliability of the first order reflective constructs are evaluated. Moreover, for using in the second stage, latent construct scores are saved (Sarstedt et al., 2019). In the second stage, by using first-order scores as formative indicators, validity of the formative construct is assessed.

For the scales in the study, confirmatory factor analysis is run using SmartPLS 4 (PLS Algorithm) after conducting exploratory factor analysis. Since the CEPQ scale has a second-order formative structure, the variance-based structural equation modelling approach is adopted. Two confirmatory factor analyses are performed with PLS algorithm using data obtained from mobile phone users (n=530) and computer users (n=665).

For computer and mobile phone products, it can be shown in Table 3 that the factor loadings of the scale items are at least 0.79. Besides, as a result of 5000 units of bootstrapping, all factor loadings are found to be statistically significant (p<0.001).

Table 4: Correlations among Constructs for Computer / Mobile Phone Data

	1	2	3	4	5	6	7	8	9	10
Aes.(1)	**.95/.95**									
Dur.(2)	.43/.52	**.91/.90**								
Eas.(3)	.57/.60	.63/.55	**.93/.92**							
Fea.(4)	.61/.59	.56/.46	.63/.60	**.94/.92**						
Cus.(5)	.47/.45	.52/.32	.47/.44	.56/.48	**.87/.87**					
Mat.(6)	.51/.51	.68/63	.57/.60	.58/.61	.58/.46	**.96/.96**				
Per.(7)	.57/.61	.69/.60	.71/.68	.70/.70	.58/.52	.67/.71	**.93/.93**			
Rel.(8)	-.22/-.11	-.28/-.21	-.26/-.11	-.17/-.01	-.21/-.02	-.27/-.12	-.33/-.18	**.95/.95**		
Sat.(9)	.57/.59	.57/.49	.57/.56	.63/.59	.73/.69	.61/.55	.69/.66	-.34/-.11	**.92/.92**	
Ser.(10)	.43/.43	.44/.41	.47/.47	.50/.51	.42/.46	.46/.55	.51/.53	-.10/.05	.49/.48	**.96/.96**

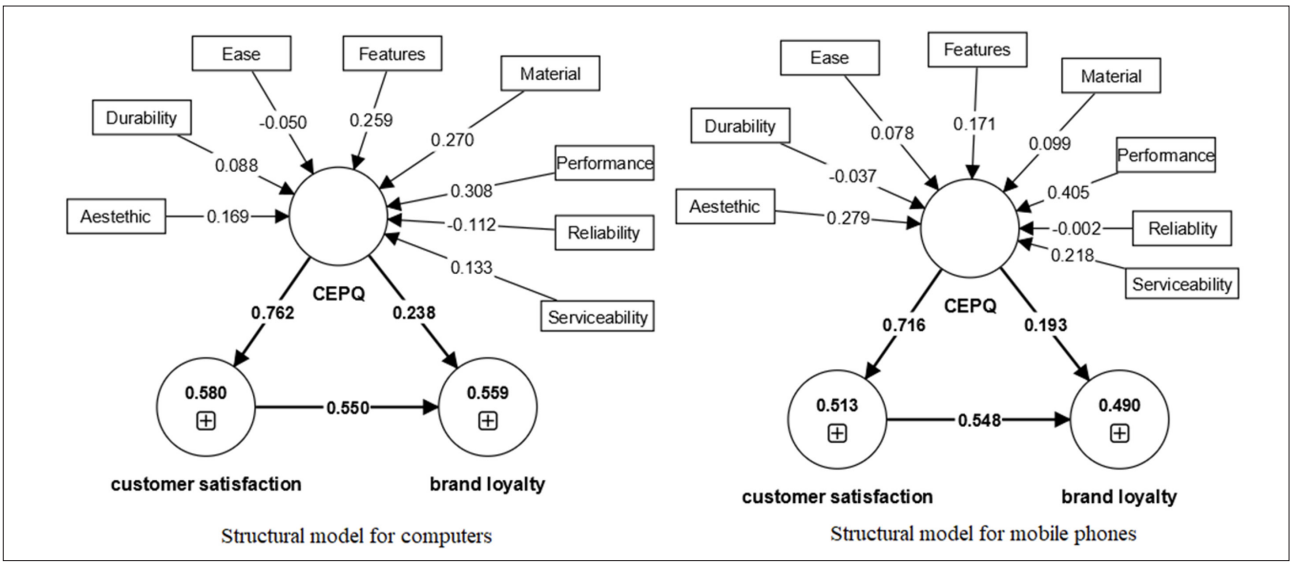

Figure 2: Structural Models for Computer and Mobile Phone Data Sets

For mobile phone and computer data, the CEPQ scale and other research instruments show good Cronbach's alpha and composite reliability. Moreover, two confirmatory factor analyses indicate AVE values greater than 0.5 threshold (Hair et al., 2021) for all dimensions of the CEPQ and other research measures. As a result, scales used in the study show an acceptable convergent validity in two product categories.

The square root of AVE values and intercorrelations among constructs are given in Table 4. It is seen that all square roots of the AVEs (given in bold) are higher than correlation values between constructs. Therefore, according to the Fornell-Larcker criterion (Hair et al., 2021), it could be concluded that measures of the study shows good discriminant validity for both mobile phone and computer data sets.

Another criterion for evaluating discriminant validity between two constructs is heterotrait-monotrait ratio (HTMT). In Table 5, HTMT matrix is given for both computer and mobile phone data sets. It can be seen that all HTMT ratios are below the threshold (0.90) (Hair et al., 2021). As a result, an adequate discriminant validity between constructs is proved.

In the second step of the embedded two stage approach, validity of the second order construct is evaluated. Duarte and Amaro (2018) summarize types of validity criteria for reflective-formative second-order constructs. Formative indicator weights should be statistically significant and above 0.1. Variance inflator factor (VIF) values of formative indicators should be below 0.5. Correlations between second-order construct and other constructs are suggested to be less than 0.7 to show an adequate discriminant validity. For nomological validity, there should be a significant relationship between the second-order construct and other related constructs.

Table5: Heterotrait-monotrait Ratio Matrix for Computer/Mobile Phone Data

	1	2	3	4	5	6	7	8	9
Aes.(1)									
Dur.(2)	.46/.57								
Eas.(3)	.61/.64	.69/.61							
Fea.(4)	.65/.64	.61/.52	.68/.65						
Cus.(5)	.49/.46	.55/.34	.49/.46	.59/.51					
Mat.(6)	.53/.54	.73/.69	.61/.64	.61/.65	.60/.47				
Per.(7)	.61/.65	.76/.66	.76/.74	.76/.76	.61/.54	.71/.75			
Rel.(8)	.23/.10	.30/.21	.28/.10	.18/.04	.21/.05	.28/.11	.35/.17		
Sat.(9)	.60/.62	.61/.53	.61/.60	.68/.64	.77/.72	.64/.59	.74/.71	.36/.10	
Ser.(10)	.45/.45	.47/.45	.49/.50	.53/.55	.44/.48	.48/.57	.54/.56	.10/.07	.51/.50

Table 6: Weights and VIF of the First-order Constructs

Construct level		Computer				Mobile Phone			
Second-order construct	First-order construct	Weight	*t*	*p*	VIF	Weight	*t*	*p*	VIF
CEPQ	**Aesthetic**	0.169	3.650	0.000	1.853	0.279	4.196	0.000	1.948
	Durability	0.088	1.595	0.111	2.434	-0.037	0.615	0.539	1.963
	Ease of use	-0.050	0.819	0.413	2.434	0.078	1.186	0.236	2.224
	Features	0.259	4.868	0.000	2.462	0.171	2.298	0.022	2.372
	Material	0.270	5.184	0.000	2.278	0.099	1.429	0.153	2.557
	Performance	0.308	4.631	0.000	3.299	0.405	4.646	0.000	3.196
	Reliability	-0.112	2.803	0.005	1.157	-0.002	0.050	0.960	1.114
	Serviceability	0.133	2.993	0.003	1.494	0.218	3.092	0.002	1.629

Figure 2 illustrates structural models run with the embedded two-stage approach. As mentioned previously, latent variable scores obtained in the first stage are used as second-order construct indicators in the second stage. Therefore, scores for sub-dimensions of the CEPQ scale are saved and analyses are run with such scores as indicators of the CEPQ by using SmartPLS 4 software.

In Table 6, results regarding weights and VIF values of the first-order constructs are given. In the computer data set, apart from ease of use and durability dimensions, all constructs have shown to play significant role in the consumers experienced product quality. Significant weights in the computer model are all above 0.1. In addition, VIF values of the first-order constructs are lower than 5. In computer products, quality experience regarding the performance, features and materials are found to be the most important quality facets. It should be noted that, the reliability measure of the study is about propensity to be a product causes problems. Therefore, increase in the reliability score means the customer experiences more problems with the product. For this reason, weight score of the reliability dimension is negative.

With respect to mobile phones, only four significant dimensions of the CEPQ scale play an important role on consumer quality experience. Weights of aesthetics, performance, features and serviceability dimensions are above 0.1 and shown to be statistically significant. On the other hand, VIF values of the first-order constructs are shown to be in the limits. Performance is by far the most important quality dimension for the mobile phone users.

Results indicate that, ease of use and durability dimensions of the CEPQ scale do not provide sufficient validity for both mobile phone and computer product groups. On the other hand, four dimensions (aesthetic, features, performance and serviceability) of the CEPQ scale remain valid for both product groups.

With regard to computer data, the CEPQ correlates positively with brand loyalty (0.65) and customer satisfaction (0.75). The discrimination between customer satisfaction and the CEPQ is to some extent weak, due to correlation coefficient over 0.71. On the other hand, the CEPQ discriminates well with the brand loyalty construct. As for mobile phone data, the CEPQ show a good discriminant validity. The CEPQ's correlation coefficient between brand loyalty is 0.58, while 0.70 with the customer satisfaction. Overall, the discriminant validity of the CEPQ is acceptable.

Table 7 provides evidence that the CEPQ construct is related with customer satisfaction and brand loyalty. Bootstrap with 5000 samples indicate significant path coefficient in the proposed research model. Therefore, H1, H2 and H3 hypotheses are accepted for both computer and mobile phone data. For mobile phone data set, effect size (f-square) of the CEPQ on customer satisfaction is high (1.052). On the other hand, CEPQ has relatively small effect (0.036) on brand loyalty. Akin to mobile phones, in

Table 7: Nomological Validity and Hypothesis Test Results

	Computer			Mobile phone		
Hypotheses and Paths	Path coefficient	*t*	*p*	Path coefficient	*t*	*p*
H1:CEPQ -> customer satisfaction	0.756	38.527	0.000	0.712	23.757	0.000
H2:CEPQ -> brand loyalty	0.239	4.818	0.000	0.168	2.736	0.006
H3:customer satisfaction -> brand loyalty	0.551	11.072	0.000	0.567	9.518	0.000

Table 8: Means of the Scales for Mobile Phone Brands

	Aes	Dur	Eas	Fea	Mat	Per	Rel	Ser	Cus	Sat
Samsung	10.49	10.34	12.00	10.35	10.44	11.01	7.08	9.63	24.50	15.07
Apple	12.57	11.49	12.89	12.04	12.32	12.67	7.40	11.89	30.93	17.66
Huawei	11.13	11.15	12.42	9.92	11.25	11.62	7.55	10.17	23.12	15.68
Xiaomi	12.23	11.89	12.61	11.87	11.84	12.74	6.27	9.77	23.53	16.58
Oppo	11.50	11.50	11.33	11.17	10.33	10.83	7.50	9.00	25.00	17.33
General Mobile	10.57	9.43	11.86	9.29	11.14	10.71	7.57	9.00	16.43	13.29
LG	9.67	9.00	10.00	9.17	10.17	9.67	10.67	10.33	23.00	11.00
Other	10.67	11.67	12.44	11.06	12.33	11.94	6.83	10.83	23.17	15.06

computer data set the CEPQ has a strong effect (f-square= 1.381) on customer satisfaction, whereas it has small effect size (f-square= 0.054) on brand loyalty. Customer satisfaction moderately effects brand loyalty in both computer (f-square= 0.288) and mobile phone (f-square= 0.287) groups. Therefore, it could be concluded that the CEPQ has an acceptable level of nomological validity.

The effect on the CEPQ on brand loyalty is weak due to mediating role of customer satisfaction. In order to test mediation, two bootstrap analyses are performed with 5000 samples. The CEPQ has significant indirect effect on brand loyalty through customer satisfaction for both computer (**β**=0.419, *t*=9.837, *p*<0.001) and mobile phone (**β**=0.393, *t*=8.262, *p*<0.001) data. In addition in Table 7, the CEPQ has been shown to have a positive direct effect on brand loyalty. Considering Hair et al. (2021)'s procedure, a complementary (partial) mediation role of customer satisfaction is shown for both computer and mobile phone data. As a result, H4 hypothesis is accepted for both product groups.

Comparisons of Mobile Phone Brands

This section compares mobile phone brands in terms of CEPQ scale dimensions, customer satisfaction, and brand loyalty**.** In this sense, the averages of scales for brands are given in Table 8.

One-way ANOVA results show that mobile phone brands differ significantly (*p*<0.05) regarding the ten constructs. In this study Apple, Samsung, Huawei and Xiaomi have the greatest market share. According to Table 8, it can be said that on the whole, Apple users have experienced a high level of quality, been satisfied with the brand and are loyal to it. Post-hoc tests (Tukey and Dunnett T3) reveal that Apple provide more quality experience than Samsung in each CEPQ dimensions. Moreover, Xiaomi significantly (*p*<0.001) outperforms Samsung in terms of durability, aesthetics, ease of use, features, materials, and performance quality dimensions.

Comparisons of Computer Brands

In this section, averages of CEPQ scale dimensions, customer satisfaction and loyalty scores are given in Table 9. Participants in the computer market mostly use Lenovo, HP and Asus brands. In order to compare brands across the industry one-way ANOVA is carried out. Results show that, in terms of the ten constructs, brands are found to be statistically different (*p*<0,05). As in the mobile phones, it can be said that Apple provides its users a good level of quality experience. Post-hoc tests (Tukey and DunnettT3) indicate that Apple dominates most of the major brands (Lenovo, HP, Asus), especially in terms of aesthetics, durability, features, materials, performance and serviceability dimensions of product quality. Besides, results of the post-hoc tests show that Apple customers are significantly more satisfied and loyal than Lenovo, HP and Asus customers in the study.

CONCLUSIONS AND SUGGESTIONS

The concept of experienced product quality is founded on the idea that a consumer evaluates a product's quality based on his or her personal interactions with it. It is important to stress that the customer interprets the product through their experiences with the product. The term "quality" is typically used to refer to "perceived quality" in modern marketing literature, however, ''experienced product quality" also should be addressed as a key concept based on the fact that the consumer experiences the product to reach a more concrete and realistic interpretation of the quality. Moreover, the concept of experienced product quality focuses on how well the experience between the consumer and the product meets the expectations.

Table 9: Means of the Scales for Computer Brands

	Aes.	Dur.	Eas.	Fea.	Mat.	Per.	Rel.	Ser.	Cus.	Sat.
Casper	10.03	10.18	10.86	8.85	8.85	10.41	8.09	9.06	18.35	13.06
Toshiba	10.51	10.70	10.92	9.51	9.51	10.65	7.76	9.89	20.95	13.78
HP	11.06	10.67	11.66	10.16	10.16	11.25	7.46	10.02	23.46	14.73
Apple	13.38	12.40	12.63	12.50	12.50	12.98	6.68	12.60	31.40	17.43
Lenovo	10.87	11.02	11.84	10.25	10.25	11.32	7.26	10.15	24.01	14.93
Dell	10.40	11.40	11.85	9.57	9.57	11.17	7.11	9.34	23.06	14.62
Asus	10.97	11.04	11.66	10.41	10.41	11.26	7.18	10.29	24.03	15.30
Acer	9.95	10.72	11.30	9.28	9.28	10.49	8.12	9.44	17.56	13.30
Samsung	9.91	9.74	10.30	8.70	8.70	10.26	7.83	9.61	22.61	14.70
Huawei	13.22	13.67	13.89	11.89	11.89	13.89	4.11	11.78	26.78	17.11
Xiaomi	12.00	10.00	10.67	10.67	10.67	12.00	6.33	8.33	24.67	14.67
MSI	12.57	11.86	13.00	11.86	11.86	13.00	6.86	9.14	28.71	16.86
Monster	13.17	13.33	13.83	13.00	13.00	13.17	9.33	12.67	29.67	17.17
Other	10.24	10.91	10.91	10.00	10.00	10.91	7.59	9.09	21.76	13.09

The purpose of this study is to assess how experienced product quality affects consumer satisfaction and brand loyalty. In this sense, this study aims to adapt the CEPQ scale into Turkish literature and assess its reliability and validity. Also, scale's associations with brand loyalty and consumer happiness are examined. With the research carried out in two different product groups, it is seen that the sub-dimensions of CEPQ scale has good validity and reliability in different product groups. In addition to that, a comparison of these two product groups is made within the study. The research is the first study in Turkey to bring the experienced product quality scale to the Turkish literature and measure the relationship between experienced product quality and customer satisfaction and brand loyalty.

Many studies have addressed the impact of the quality experience for a product, service or brand on customer satisfaction and loyalty attitude. For example, Reich et al. (2008) have shown that quality positively affects brand loyalty. Furthermore, the work of Iacobucci, Ostrom and Grayson (1995), reveals that customer satisfaction and quality are directly related. In addition to these studies, it is seen that a customer who experiences high quality about the product tends to be satisfied with it and develop loyalty towards the brand.

The research also examines the relationship between customer satisfaction and brand loyalty to test the nomological validity of the CEPQ scale. In this context, it is seen that the experienced product quality is nomologically valid in mobile phone and computer product groups as in other studies.

The study is carried out with survey questions directed to a total of 1195 participants, including 530 mobile phone and 665 computer users. In the first phase, the study collected data from customers over the age of 18 who were already using mobile phones. In the next stage of the research, the survey questions were directed to computer users over the age of 18. The data are obtained by using the convenience sampling method via online.

The results show that the experienced product quality affects customer satisfaction. Based on these results, it can be concluded that if the quality dimensions of the brand reach or exceed the expected quality, the consumer will be satisfied with this brand. Similar results are obtained in both product groups. From this point of view, the H1 hypothesis is accepted. Similarly, according to the results, the higher the product quality experience, the higher the customer satisfaction. Therefore, the H2 hypothesis is accepted. In addition, findings showed that customer satisfaction positively affects brand loyalty which indicates a customer who is satisfied with a brand can become loyal to the same brand. In this regard, the H3 hypothesis is accepted. The association between experienced product quality and brand loyalty has also been shown to be mediated by consumer satisfaction. Therefore, it is concluded that the H4

hypothesis is accepted. Results of the study show that providing customers a good quality experience leads to satisfied and loyal customers. Quality experience is shown to have both direct and indirect effect on brand loyalty.

The CEPQ scale has been questioned in terms of reliability and validity in two product categories. Overall, results of the study prove that the CEPQ scale is a reliable measure for experienced quality. In addition, the CEPQ scale is shown to be a satisfactorily valid tool for quality assessments. The sub-dimensions of CEPQ scale shows good convergent, discriminant and nomological validity for both cell phone and computer products. On the other hand, at the second-order level validity of sub-dimensions of the CEPQ varies across two industries. Four quality dimensions (aesthetic, features, performance and serviceability) are found to be valid for both product groups. Ease of use and durability dimensions, however, are shown to be insignificant for both groups. At the second-order level, the CEPQ is proven to have a reasonable level of nomological and discriminant validity.

When the findings are examined, the quality dimensions of performance, features and materials are found more significant than other dimensions for the computer product group. In the mobile phone product group, aesthetics, performance and serviceability dimensions are shown to be more important than other dimensions. Particularly the performance is the most essential dimension influencing the level of experienced quality for both computer and mobile phone product groups.

The CEPQ scale provides important managerial insights by enabling brand comparisons with competitors in terms of relevant quality factors. The CEPQ scale reveals the sufficiencies and deficiencies of brand quality, allowing enterprises to compare their brand quality with their competitors. The eight dimensions in the scale can be considered separately, which allows enterprises to reveal in which quality dimensions their product is deficient while evaluating the quality of their products. Thus, it can be argued that the CEPQ scale can guide enterprises to identify and remedy the deficiencies in brand quality. Therefore, improvements in weak quality dimensions result in a competitive advantage for the company.

In this study, in addition to the evaluating important dimensions above, brand-based comparisons are made in mobile phone and computer product groups. Results indicate that the Apple brand provides a high quality experience to customers, has a good customer satisfaction and brand loyalty in both the mobile phone and computer product groups. According to Mao et al. (2020), Apple, which has a strong brand personality, has achieved a large part of its market volume with the brand image. Yıldız (2014) shows that Apple brand mobile phone users take into account their satisfaction levels consisting of their past experiences when evaluating the product. On the other hand, Samsung users are influenced by marketing practices such as promotions, discount coupons, etc. Also, on the whole, it is seen that Xiaomi mobile phone users experience better quality than the Samsung users.

In line with the results obtained in this study, the following concrete recommendations can be made for enterprises that produce and sell in mobile phone and computer product groups:

- Providing customers with a good performance experience seems vital to improving customer satisfaction and brand loyalty for both mobile phone and computer brands.
- In addition to functionality, the aesthetic elements of the products have an impact on the quality experience for the customers of computers and mobile phones. Computer and mobile phone brands may alter product design to increase customer satisfaction and brand loyalty.
- Businesses that produce mobile phones and computers are advised to avoid attitudes that negatively affect customer satisfaction, such as selling defective products, deceptive advertisements and high service charges.
- Superiority over rivals in after-sales customer service increases the quality of the customer experience even though it is not a tangible component of the product. Therefore, both computer and mobile phone brands could take into account serviceability facet of the CEPQ to develop better customer satisfaction and loyalty.
- It is advised that brands and companies, which are judged to be of low quality, particularly by the customer, take steps to boost customer satisfaction and loyalty by placing a premium

on quality, having a trained and polite employee structure, and offering simple return, free repair, and one-to-one replacement options in the event of failure.

- For both PC and mobile phone brands, frequently monitoring the CEPQ dimensions may reveal fresh product ideas or enhancements.

Due to the convenience sampling procedure, the study's findings are limited to its sample. In addition, in this study the CEPQ scale is applied in mobile phone and computer products. Its reliability and validity is limited to two product categories. Further studies could apply the CEPQ scale in various contexts and provide more insights into its reliability and validity.

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APPENDIX: EXPERIENCED PRODUCT QUALITY SCALE

Lütfen aşağıdaki soruları yanıtlayarak diğer cep telefonları/bilgisayarlar ile karşılaştırıldığında, mevcut ürününüzün boyutlarını nasıl değerlendireceğinizi belirtin.

ESTETİK	Çok Yetersiz	Yetersiz	Ortalama	Yeterli	Çok Yeterli
Ürünümün tasarımının çekiciliği					
Ürünümün genel albenisi					
Ürünümün görünümü ve hissi					
DAYANIKLILIK	Çok Kısa	Kısa	Ortalama	Uzun	Çok Uzun
Ürünümün herhangi bir büyük kusur olmadan çalıştığı/ çalışacağı zaman aralığı					
Ürünümün ömrü					
Ürünümün yoğun kullanımda bile mükemmel bir şekilde çalıştığı/çalışacağı süre					
KULLANIM KOLAYLIĞI	Çok Yetersiz	Yetersiz	Ortalama	Yeterli	Çok Yeterli
Ürünümün sunduğu çeşitli işlevlerle kullanıcı deneyimim					
Ürünümün kullanım kolaylığı					
Ürünümün kullanılabilirliği					
ÖZELLİKLER	Çok Yetersiz	Yetersiz	Ortalama	Yeterli	Çok Yeterli
Ürünümün sunduğu ek özelliklerin sayısı					
Ürünüm tarafından sunulan ek özelliklerin yenilikçiliği					
Ürünümün ekstra özelliklerinden duyduğum heyecan					
MALZEMELER	Çok Yetersiz	Yetersiz	Ortalama	Yeterli	Çok Yeterli
Ürünümde kullanılan malzemelerin dayanıklılığı					
Ürünümde kullanılan malzemelerin sağlamlığı					
Ürünümde kullanılan malzemelerin standardı					
PERFORMANS	Çok Yetersiz	Yetersiz	Ortalama	Yeterli	Çok Yeterli
Ürünümün genel performansı					
Ürünümün istikrarlı çalışması					
Ürününüz temel işlevlerini ne kadar iyi yerine getiriyor?					
GÜVENİLİRLİK	Çok Düşük	Düşük	Ortalama	Yüksek	Çok Yüksek
Ürünümün kusur/aksaklıklarının sıklığı					
Ürünümün kusurlarının/aksaklıklarının ciddiyeti					
Ürünümün hata veya arıza olasılığı					
SERVİS KOLAYLIĞI	Çok Yetersiz	Yetersiz	Ortalama	Yeterli	Çok Yeterli
Ürünümün müşteri hizmetleri personelinin yetkinliği					
Ürünümün müşteri hizmetleri personelinin hızlı çözüm bulabilmesi					
Ürünümün müşteri hizmetlerinin sorunlarıma tepki verme sürati					

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The Mediating Role of Hedonic Buying Behavior in the Effect of Consumers' Attitudes Towards Social Media Ads on Impulse Buying Behavior

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ABSTRACT

Social media networks, besides being an area where users communicate and share with each other, have become one of the important promotion activities of businesses. Businesses are trying to influence the purchasing behavior of consumers by using the advertising element effectively in social media networks. Hedonic and impulse buying behaviors can be expressed as important buying behaviors that are becoming increasingly widespread among consumers today. This study, focused on investigating the correlation among that despite the growing prevalence of digital technological developments, social media advertising which has seen little work done in scientific journals the impulse buying and hedonic buying behavior that has become a common phenomenon in the purchasing decision process. In this context, it is thought that the findings will contribute to the relevant literature. The data within the extent of the study were obtained by applying the survey method. In total, 992 survey data were obtained. The result, it is concluded that social media ads have a positive predictive effect on impulse and hedonic buying behavior. In addition, the partial mediation effect of hedonic buying behavior has been determined in this relationship.

Keywords: Social Media Advertising, Impulse Buying Behavior, Hedonic Buying Behavior.

JEL Classification Codes: M30, M31, M37, M39

Referencing Style: APA 7

INTRODUCTION

In recent years, developments in internet networks along with digital technology have led to major changes in traditional communication channels (Tuten, 2008; Taiminen & Karjaluoto, 2015; Quesenberry, 2020). The worldwide spread of internet networks with the developing technology has contributed to the emergence of many virtual channels where people can easily interact with each other. These developments have changed many of the existing communication facts and habits and brought new concepts with them. Today, the phenomenon of social media, where individuals come together and socialize, share their likes, thoughts, and suggestions, is one of the important concepts brought together by these developments. Social media is the general name of web-based software and services that allow users to come together online and participate in all kinds of social interactions, discussions, and communication (Newman et al. 2013; Mangold & Faulds, 2009). According to the, We Are Social January 2021 report, there are 4.66 billion internet users worldwide (59.5 percent of the world population). On the other hand, 4.20 billion (53.6 percent of the world's population) internet users use social media networks. Internet users spend an average of 6 hours 54 minutes a day on internet networks, and social media users spend 2 hours and 25 minutes on social networks (Kemp, 2021). With the increasing popularity and increasing interest of social media networks around the world, these networks have become an important communication and interaction tool, which is frequently preferred in many different areas.

Approximately 54% of social media network users define that they use social media network to research any reputation or brand (Kavanagh, 2018). 50% of consumers state that seeing members-created content on social media network will increase the chances of buying any brand's product. 73% of consumers on social media networks want to see discounts made by brands and other posts about these discounts, 60% want to see posts promoting new products or services of brands, and 59% want to see educational posts about products or services. In addition, 74% of consumers share

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content promoting products or services of brands.88% of marketing managers state that social media networks are important in terms of brand promotion and customer service (Zote, 2019). Consumers can easily share their likes, thoughts, and comments about products and brands with their social circles and processes by following the products and brands closely through social media networks (Heinrichs et al. 2011). Businesses, on the other hand, can easily and cost-effectively obtain important information about consumer behavior by following the traces left by consumers on social media networks. It directs the marketing activities with this information in the social media networks of the businesses. (Hajli, 2014). Therefore, social media networks are not only an important area for individuals to communicate with each other, but also provide important opportunities for businesses to communicate and interact with their customers easily, quickly, and at a low cost by increasing the expansion of consumer markets (Zarrella, 2010). For this reason, today, businesses have started to gradually move their marketing communication activities to social media networks to communicate and interact with their consumers at any time, to make product promotions, and to increase brand awareness and awareness (Waters et al. 2009; Akar & Topcu, 2011; Chen et al. 2014; Lee and Hong, 2016). In this context, today's social media ads constitute one of the important promotional tools that are among the marketing communication elements of businesses (Alalwan et al. 2017; Duffett, 2015; Shareef et al. 2018; Cuevas et al. 2020; Arora et al. 2019; Saxena & Khanna, 2013. Gallaugher & Ransbotham, 2010). Zote (2019) states that 37% of social media users are influenced by the content on these channels and make purchases. Singh & Goyal (2009) state that since the early 2000s, more than 60% of American consumers now consider advertising on social media rather than television ads. Based on this, it can be stated that the advertising element in social media networks is an important variable that affects the purchasing behavior of consumers. For this reason, businesses try to ensure that consumers buy now or in the future by not affecting the purchasing behavior with the impressive advertising content they create by using banners, audio, video, and similar media tools in social media networks (Ahmed et al. 2018; Jothi et al. 2011).

Impulse and hedonic buying behavior are important variables that play a prominent role in the purchasing decisions of the consumer. Impulse buying behavior is a purchasing behavior that makes quick decisions and is dominated by emotional evaluation rather than rational evaluation (Mai et al. 2003). Hedonic buying behavior is a purchasing behavior in which the emotional states of the consumer prevail during the shopping process (Jones et al. 2006). Based on the definitions, it can express that the emotional state of the consumer has a determining effect on both buying behaviors. Madhavaram & Laverie (2004) describe impulse buying behavior, purchasing a behavior that emerges with the effect of consumers' hedonic feelings and is generally activated by external stimuli. Schumann et al. (2014) state that external stimuli such as banner advertisements, prices, or special offers that consumers are exposed to in social media networks can affect the buying behavior of consumers. Besides, it states that it can create positive emotions in consumers with effective, correctly targeted, and personalized advertisements prepared in social media networks. Based on this, it can be said that effective advertising content that will activate the emotions of the consumers and create a positive mood can activate the hedonic and impulse behavior of the consumer.

In the left behind parts of the study, we justify the conceptual framework for understanding social media advertising, hedonic buying behavior, and impulse buying behavior. Also, we discussed theoretically the relationship between variables. Afterward, we tried to present a new perspective by trying to reveal the relationships between variables, based on the theoretical literature on variables. Relevant models and hypotheses have been created based on the toric discussions. For the testing of models and hypotheses, the data were collected by applying the survey method. Results, inferences, limitations, and suggestions for further studies were discussed by performing statistical analysis for analyzing the data.

THEORETICAL BACKGROUND

Social Media Advertising

Social media can be defined as all kinds of internet set digital media that individuals communicate with to share their ideas, thoughts, and experiences with other individuals by using internet technologies (Safko, 2010; Kaplan & Haenlein, 2010). According to Wang & Huberman (2012) in parallel with the rapid developments in social media, technology, and internet networks, it continues to spread by expanding its usage area day by day. Today, social media has brought many innovations within the interaction of individuals also businesses, resulting in a unique change in the field of communication (Patrick & Dostsika, 2007 Constantinides et al. 2011; Zotos et al. 2014; Roberts et al. 2016; Appel et al. 2020). These new media are increasingly attracting the attention of businesses, institutions, communities,

and individuals, with the ability of virtual communities to facilitate collaboration and provide a productive environment for mutual sharing and interaction (Goh et al. 2013). Social media offers its users a wide range of access and a rich promotion area with different media content. The rich promotion opportunity provided by social media has enabled large businesses to gradually shift their product and brand promotions to these areas (Lee & Hong, 2016). Today, many businesses have official Facebook pages, Twitter accounts, and corporate blogs to promote their products and brands. All these show that these media have turned into an essential piece of the routine operations of corporate organizations as well as being an indispensable part of the daily lives of consumers (Ohajionu & Mathews, 2015).

The advantages of social media such as ease, low cost, and direct communication with consumers have encouraged businesses in many different sectors to gradually move promotional activities to these channels (Dwivedi et al. 2015). In this context, social media ads must turn into a significant marketing communication element through which businesses interact with consumers (Alalwan et al. 2018). Social media advertising can be defined as the whole of promotional activities that allow users to interact and share content with content created to convince users of anything (Alhabash et al. 2017). Social media advertising offers businesses many opportunities. Some of these can be listed as follows: Social media advertisements provide significant contributions to the formation of a new interactive modern communication style between businesses and consumers (Orsburn, 2011; Zhao & Lu, 2012). It offers the opportunity to reach large consumer audiences with small budgets (Andrews & Shimp, 2017). It is probable to analyze the responses to social media ads in an easy and very fast way with little cost (Tuten, 2008). It provides the opportunity to target advertising messages in a personalized way (Okazaki & Taylor, 2013). Advertising messages can be targeted based on the demographic and psychographic information of consumers (Li et al. 2014; Enders et al. 2008). Therefore, these and similar important advantages provided by social media ads have increased the interest of businesses in social media ads and businesses are increasingly shifting their advertising expenditures towards digital areas (Chi, 2011). Digital ad spending is expected to hold more than 50% of all ad spending by the end of 2020 (Guttmann, 2020).

Impulse Buying Behavior

Impulse buying behavior is one of the concepts that try to explain the purchasing behavior of the consumer by jumping or changing some stages of the purchasing decision process in different situations and conditions. Besides, it is one of the important research topics that attract the attention of both marketing researchers and researchers from different disciplines, who investigate consumer behavior today. Also, impulse buying behavior has been one of the topics that have attracted attention and researched for a long time by business (Clover, 1950; Stern, 1962; Dantoni & Shenson, 1973; Rook, 1987; Piron, 1991; Hausman, 2000; Peck & Childers, 2006). Once the related literature is investigated, it is seen that many definitions have been made about impulse buying behavior. Some of those

- It is a purchase behavior that is motivated by an impulse created by sales promotion tools in the store (Applebaum, 1951).
- It is smart shopping by consumers (Nesbitt, 1959).
- It is a behavior that disrupts a normal purchase habit, non-routine, innovation, or avoidance of purchase (Stern, 1962).
- It is an impulse behavior that happens instantly and quickly without a purchasing plan (Dantoni & Chanson, 1973).
- It is a purchase process involving reactive, emotional, and cognitive components (Weinberg & Gottwald, 1982).
- It is a spontaneous purchase with a strong and persistent urge to buy something instantly (Rook, 1987).
- It is an unplanned purchase involving a propensity to make a fast decision and urgent obtaining of the good (Rook & Gardner, 1993).
- It is a spontaneous, non-reflective, immediate, and kinetic buying tendency (Rook & Fisher, 1995).
- It is a sudden, compulsive, and hedonically complex purchase that disables options for gathering information and evaluating alternatives (Bayley & Nancarrow, 1998).
- It is all unplanned purchases before purchase (Hausman, 2000).

Impulse buying behavior is one of the important purchasing behaviors that continue to become common (Cobb & Hoyer, 1986; Hausman, 2000). Today, impulse buying behavior has become an extensive phenomenon especially in certain product categories and in-store

decision-making and constitutes an important part of total purchases (Amos et al. 2014). Welles (1986) states that most customers at least occasionally engage in impulse buying behavior. Kollat & Willet (1967) state that more than 50% of supermarket products are purchased unplanned. Prasad (1975) states that 62% of consumer purchases are sudden purchases due to discounts in stores. Bellenger et al. (1978) state that more than 30% of the consumers who shop in stores make their shopping unplanned. DuPont studies (1978) found that more than 51% of the beauty and wellness products of consumers were purchasing unplanned. Rook & Fisher (1995) state that 38% of adults define themselves as someone who buys unplanned. Kelly et al. (2000) state that 64% of consumers engage in impulse buying behavior in discount stores. In the study conducted by Kwon & Armstrong (2006), it was concluded that 30% of licensed products were purchased unplanned. According to the CreditCards report, 84% of shoppers are in sudden and unplanned purchasing behavior (Kossman, 2016). Studies indicate that impulsive buying behavior is an important part of consumers' purchasing behavior.

Hedonic Buying Behavior

In the consumer behavior literature, consumption activities are generally classified as utilitarian and hedonic (Blázquez, 2014; Chiu et al. 2014). Utilitarian consumption refers to the rationality of consumption, which emphasizes the achievement of desired results from shopping activities (Babin et al.1994). According to Batra & Ahtola (1991), utilitarians are exogenously driven, about the task, and quite rational in the purchasing process. Hedonic consumption is related to the emotional and multi-sensory aspects of the shopping experience (Holbrook & Hirschman, 1982; Jones et al. 2006). Sherry (1990) defines hedonic consumption value as the festive, ridiculous, and ever-seeking side of shopping. In other words, hedonic buying value is the reward for emotional excitement and enjoyment that an individual obtains during the buying (Babin et al. 1994). Babin & Attaway (2000) state that hedonic shopping value reflects the value found in the shopping experience. According to Wang et al. (2000) hedonic consumers focus on sensory values such as the appearance of the product or brand, its symbolic and psychological value, rather than the rational benefits of the products. Besides, consumers with high hedonic buying behavior are more sensitive to promotional effects when choosing products or brands. The main motivation of this value is buying knowledge and simplicity that have their lives funnier and more convenient (Kim 2002).

RESEARCH MODEL AND HYPOTHESES

Consumer's Attitude Towards Social Media Advertising and Impulsive Buying Behavior

The attractive and impressive visuality of the advertisement element can activate the purchasing impulse of the consumers. Stern (1960) states that some purchases that are postponed or forgotten due to various reasons before the purchase can be remembered through advertising and impulse buying. The consumer may not realize the natural process but maybe in a purchasing behavior to meet the needs of some external stimuli such as advertising messages. For example, when the consumer passes in front of a bakery, perceiving the fresh smell of bread, or tending to meet the feeling of hunger caused by the effect of the advertisement message (Kotler et al. 2005). Impulse buying behavior is defined as the result of exposure to a stimulus that encourages purchasing and is decided in place (Weinberg & Gottwald, 1982; Piron, 1991: 512; Abratt & Goodey, 1990). The stimulus in the definition can be the external features of the product and the shopping context, such as an actual product or shopping environment, sales, and other buyers (Parboteeah et al. 2009). Abratt & Goodey (1990) state that the advertising element, which is among the in-store situational stimuli, encourages the consumers to buy impulse behavior. Youn & Faber (2000) state that consumers can recall the products that are not in the shopping list they prepared before shopping, but they can buy impulse by the effect of the advertisements made in the store environment. The advertising element is an important external stimulus that activates the purchasing intentions of consumers both online and offline. In this context, it can be said that the impressive visual content created with the advertising element in social media networks can easily affect the purchasing intentions of the consumers and encourage the consumers to purchase the products impulse.

Hypothesis 1: Consumer's attitude towards social media advertising has a significant and positive effect on impulse buying behavior.

Consumer's Attitude Towards Social Media Advertising and Hedonic Buying Behavior

Consumers with a high hedonic buying behavior see their shopping activities as getting rid of their negative mood, getting away from stress, having a getaway, or looking for an adventure to have fun. Hedonic buying behavior is often accompanied by intense moods.

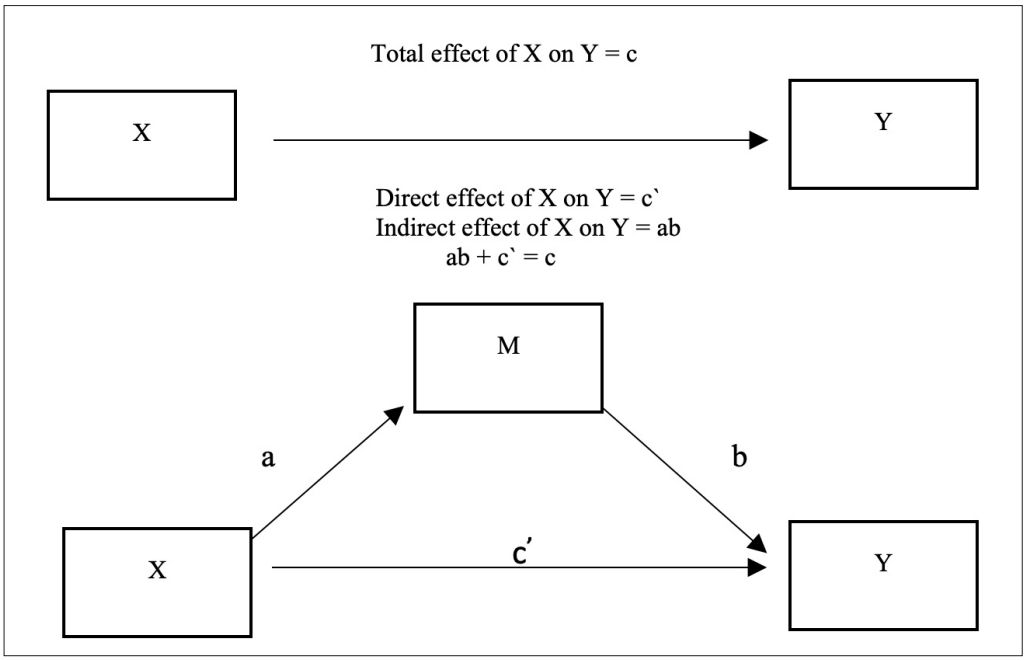

Figure1. Mediator Model

Attractive online advertisements influence consumers' moods, encouraging them to make impulsive buying. This can give consumers a hedonic experience (Madhavaram & Laverie, 2004). One of the significant features of social media networks is that users can easily access information about their consumption habits and behaviors. Summers et al. (2016) state that targeting advertisements in social media networks based on behavioral information can count the formation of positive emotions in consumers. Therefore, it can be said that attractive visual and audio advertising messages in social media networks can positively affect hedonic buying behavior, which is defined as looking for fun, festivities, pleasure, and continuous happiness.

Hypothesis 2: Consumer's attitude towards social media advertising has a significant and positive effect on hedonic buying behavior.

Mediating Roles of Hedonic Buying Behavior

Impulse buying behavior, beyond being rational, is more of a buying behavior accompanied by hedonic and emotional components (Cobb & Hoyer, 1986; Rook, 1987; Piron, 1991; Rook & Fisher, 1995). Beatty & Ferrell (1998) state that the positive mood of consumers is an important factor that encourages impulse buying behavior. Van Doorn & Hoekstra (2013) targeted social media advertisements, which are prepared to meet the needs of consumers, create positive emotions in consumers and encourage the buying impulse of the consumer. Setyani et al. (2019) state that the hedonic and utilitarian motivations of consumers, which are stimulated by the personalized advertising content provided by social media ads, can lead consumers to impulse buying. The design features of online websites such as personalization/interactivity can lead the consumer to impulse buying behavior by revealing hedonic feelings (Childers et al. 2001). In this context, it can be said that hedonic consumption value has a mediating effect on the positive emotions created by social media advertisements in the consumer to direct the consumer to impulse buying.

Hypothesis 3: The hedonic buying behavior has a mediating role in the effect of consumer's attitude towards social media advertising on impulse buying behavior.

RESEARCH MODEL AND DATA ANALYSIS

A mediation analysis utilization multiple regression was used to the mediator impact of hedonic buying behavior in the correlation among social media ads and impulse buying behavior (Baron & Kenny, 1986). According to this model, firstly, regression analysis should be performed to determine the impact of social media advertising on the impulse buying behavior and secondly, the impact of social media advertising on the mediator variable. In each regression analyzes, if the independent variable has a predictive effect on dependent variables, the mediation effect analysis can only be performed. After obtaining results suitable for the procedure summarized by Baron & Kenny (1986), multiple regression analysis is

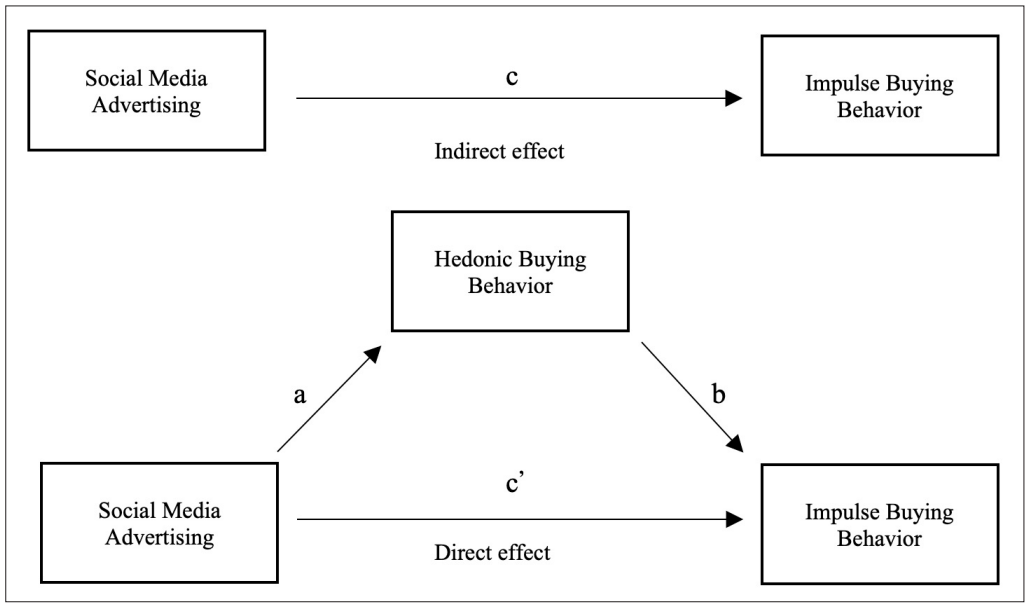

Figure 2. Predictors and Mediator of Impulse Buying Behaviors

performed by with the inclusion of the mediator variable in this correlation between the independent variable and the dependent variable. When the mediator variable is included in the regression analysis, if there is a decrease in the beta coefficient between the dependent variable and the independent variable and any deterioration in the significance level, we can talk about the mediating effect. If the meaning disappears completely, we express it as a full mediator effect, if partial distortion occurs in the media, we express it as a partial mediator effect (Howell, 2012; MacKinnon et al. 2007). Also, in addition to the conditions to be met to be able to talk about the mediating effect, it is necessary to define if the indirect effect (a.b path) is meaningful. To determine this, the significance Z score test of the Sobel Test should be performed, and the result obtained should be greater than 1.96 and the p-value should be significant (Frazier et al. 2004). According to this model, the mediation relationship between variables is tested with a model in Fig. 1 shown below.

Figure 2 indicates the model for this research. This study of the research model shows that social media advertising directly affects the hedonic and impulse buying behavior and mediating the correlation among hedonic buying behavior for social media ads and impulse buying behavior

RESEARCH METHOD

The study is quantitative research dependent on descriptive investigative. It belongs to the descriptive research group according to the research purpose. In this framework, firstly, a literature review was made regarding the variables in the model. The "survey" tool, which is frequently used in social sciences as a quantitative data collection tool, has been selected in obtaining primary data.

Measures

The statements in the scales of consumers' attitudes towards social media advertisements, impulsive and hedonic buying behavior were scaled in their original form in previous studies. In this context, the statements in the scales were translated into Turkish by sending their opinions to the lecturers who are experts in English Language and Literature and marketing. Likert Type Scale was used in the measurement. The statements addressed to the participants in the scale were requested to be answered as 1: Strongly Agree, 2: Agree, 3: Neither Agree, nor Disagree, 4: Disagree, 5: Strongly Disagree. The 16 statements ("Social media ads are a good source of information about products and brands.", "I think that the ads on social media show me the products and brands that have the features I am looking for.", "Social media ads provide up-to-date information about products and brands", "I think social media ads are fun.", "I think social media ads are enjoyable.", "I think social media ads are gratifying.", "I think social media ads are interesting.", "I think social media ads are convincing.", "I think social media ads are safe.", "I think social media ads make sense.", "I think social media ads have positive effects on the economy.", "I think that social media ads raise the living standards of individuals.", "I think social media ads help people get better products.", "When I see social media ads, I watch the ad carefully.", "When I see social media ads,

Table 1. Reliability Analysis Results Related to Scales

Scales	Item	N	Cronbach Alpha
Social Media Advertising	16	992	0,947
Impulse Buying Behavior	9	992	0,909
Hedonic Buying Behavior	6	992	0,911

I click the ad to find more information.", "I'm interested when I see a social media ads.") scale developed to measure the attitude towards social media ads was created by making use of Wang et al. (2009) and Chu et al. (2013) studies. Hedonic consumption, 6 statements ("I like to shop for the novelty of it", "Shopping satisfies my sense of curiosity", "Shopping offers new experiences", "I feel like I'm exploring new worlds when I shop" "I go shopping to be entertained", "I get a real ``high" from shopping.") scale developed for measurement was created by making use of their studies Hausman (2000). Impulse buying behavior, 9 statements ("I often buy things spontaneously.", "Just do it" describes the way 1buy things.", "I often buy things without thinking.", "I see it, I buy it" describes me.", "Buy now, think about it later" describes me.", "Sometimes I feel like buying things on the spur-of-the-moment.", "I buy things according to how 1feel at the moment.", "I carefully plan most of my purchases.", "Sometimes I am a bit reckless about what I buy.") scale developed for measurement was created by making use of their studies Rook &Fisher (1995).

Data Collection

The study is quantitative research based on descriptive research to determine the effects of independent variables on dependent variables. In the study, survey research has been carried out based on the screening method. The data were collected using the convenience sampling technique. The convenience sampling method was preferred in the research design because it is an easily applicable, less costly, and not time-consuming method. The universe of the study consisted of social media users in Turkey. Datareportal (datareportal.com, 2020) in 2020 According to the report social media user numbers in Turkey 54 million, has been the case. Turkey's population (83.88 million), 64% uses social media. Research a million and more to be the number of persons in the universe in the case of (0,05 confidence interval) 384 person sample size is accepted to be sufficient (Cohen et al. 2017). To test the comprehensibility of the statements in the survey, a pre-test survey was applied with the participation of 77 students from Erciyes University and 34 students from Nevşehir Hacı Bektaş Veli University by using the convenience sampling method. The participants were asked to evaluate the statements by interviewing them face to face. At this stage, the average survey response time and the order of the statements in the survey were checked. As a result of the pre-tests, it was concluded that the questions in the survey were easy, simple, and understandable. Data from social media users in Turkey is collected by the convenience sampling method. The survey form was first applied by sharing with the close social environment, of the researchers. Afterward, it was applied by sharing their close environment, with its social environment. The survey was started with the convenience sampling method. The survey form was applied by sharing the social media accounts of the researchers and researchers' social environment via Google drive. A total of 992 survey data was obtained. Regarding the survey data, the demographic variables of the participants are included in Appendix 1, daily social media usage time in Appendix 2, and social media usage frequency in Appendix 3.

Validity And Reliability Analysis

Cronbach Alpha analysis was applied to test the reliability of the scales. In the literature, it is suggested that the acceptable value of Cronbach Alpha should be a minimum 0,70. As indicated in Table 2, the scales relative to the model are above 0.70 Cronbach's alpha value (DeVellis, 2016).

As seen in Table 1, the scales related to the model are above 0.70 Cronbach's alpha value. Cronbach's Alpha factor was accepted to test the reliability of the scales waste in the study. As a result, it is seen that all three scales included in the model have sufficient reliability.

According to the results of the correlation analysis for social media advertisements, impulse and hedonic buying behavior in Table 2, AVE values except social media advertising are above 0.5, moreover, all factor loadings in Appendix 4 are above 0.5. (Hair et al. 2010). AVE values are below 0.50 for the social media ad variable, but CR values are above the acceptance limit (> 0.70). In cases where the AVE is less than 0.5 but the composite reliability is higher than 0.6, the convergent validity of the structure is still sufficient (Fornell & Larcker, 1981). Also, the fact that

Table 2. Discriminant Validity Test

Variables	CR	AVE	SMA	IBB	HBB
SMA	0,996	0,492	**0,701**		
IBB	0,995	0,918	,285**	**0,958**	
HBB	0,974	0,561	,321**	,625**	**0,749**

the square root of the AVE value of each variable (square root values are shown in parentheses) is higher than the correlations belonging to other variables, indicating that the discriminant validity is also provided (Fornell & Larcker, 1981).

Correlation is significant at the 0.01 level (2-tailed). Sma: Social media advertising, Ibb: Impulse buying behavior, Hbb: Hedonic buying behavior

After performing factor values, validity analysis, and correlation analysis, the study model and hypotheses were tested with the SPSS Proces Macro mediation model 4.

RESULT

The mediating effect of hedonic buying behavior on the relationship between social media advertising and impulse buying behavior has been examined. When Table 3 is examined, social media ads have a significant predictive impact on hedonic buying behavior in the linear regression analysis performed in the first stage, and the model is significant (R^2: 0.1032, F: 113,92, p <0.05). The power of social media advertising to affect hedonic buying behavior is (β = 0.4004, t = 10.67, p < 0.000). Also, the bootstrap confidence interval does not contain a "0" point and has a positive value. This result shows that the H1 hypothesis is accepted. In the second stage regression, social media advertising has a significant predictive effect on the impulse buying behavior and the model is significant (R2: 0.0811, F: 87,92, p <0.05). The power of social media advertising to affect impulse buying behavior is (β = 0.3010, t = 9.34, p < 0.000). Also, the bootstrap confidence interval does not contain a "0" point and has a positive value. This result shows that the H2 hypothesis is accepted. Finally, in the third stage, the hedonic buying behavior variable was included in the model to determine the mediating role of hedonic buying behavior between social media advertising and impulse buying behavior. In this model, in which social

Table 3. Predictors and Mediator of Impulse Buying Behavior

First stage regression: Hedonic Buying Behavior (Dependent Variable)						
	β	s.e	t	p	LLCI	ULCI
Constant	0.7182	0.1021	16.12	0.000	1,4453	1,8458
Independent Variable: Social media advertising	0.4004	0.0375	10.67	0.000	0.3268	0.4740
Model Summary	R^2: 0.1032 s.e: 0.8783 F: 113.92 p: 0.000					
Second stage regression: Impulse Buying Behavior (Dependent Variable)						
	β	s.e	t	p	LLCI	ULCI
Constant	1,477	0,0876	16,86	0,000	1,3052	1,6489
Independent Variable: Social media advertising	0.3010	0.0332	9.34	0.000	0.2378	0.3642
Model Summary	R^2: 0.0811 s.e: 0.6469 F: 87.92 p: 0.000					
Third stage regression: Impulse Buying Behavior (Dependent Variable)						
	β	s.e	t	p	LLCI	ULCI
Constant	0.6467	0.0796	8.11	0.000	0.4904	0.8030
Independent Variable: Social media advertising	0.0990	0.0275	3.59	0.003	0.0450	0.1529
Mediator Variable: Hedonic buying behavior	0.5046	0.0221	22.86	0.000	0.4613	0.5478
Model Summary	R^2: 0.3988 s.e: 0.4237 F: 328,02 p: 0.000					

Table 4. Total, Direct, And Indirect Effects

The Relationship between Mediator of Hedonic Buying Behavior	Total Effect	Direct Effect	Indirect Effect	Bootstrap confidence interval BoLLCI-BoULC	Mediator Effect Type
Social media ads Impulse Buying Behavior	0.3001	0.0990	0.2021	0.1577-0.2476	Partial

media advertising and hedonic buying behavior take place together the model is significant (R2: 0.3988, F: 328,02, p <0.05). It was also observed that the effect of social media advertising was reduced (β = 0.0990, t = 3,59, p<.000), although it maintained its level of significance in predicting impulse buying behavior. Based on these results, based on the analysis of the mediating variable effect of Baron & Kenny (1986), it shows that hedonic buying behavior is in a partial mediating position between social media advertising and hedonic buying behavior. To test whether the mediation was statistically significant or not, the sobel test was performed and the z value calculated according to the results of the Sobel test was found to be 9.74 (p <.0.000). This result shows that hedonic buying behavior is the mediating variable in the correlation among social media ads and impulse buying behavior. This result shows that the H3 hypothesis is partially accepted.

The total, direct and indirect effect values and bootstrap confidence intervals of the mediating effect of hedonic buying behavior in the effect of impulse buying behavior of social media advertising are given in Table 4. The total effect of social media advertising on impulse buying behavior is β = 0,3010 and the significant value is p = 0,000. With the inclusion of hedonic buying behavior in the model, there is a decrease in the beta coefficient of social media advertising and a partial deterioration in the significant value. As seen in the table, the total effect value was determined as 0,3001, the direct effect value was 0.0990, the indirect effect value was 0.2021, and the bootstrap confidence interval was 0.1577-0.2476. Since the confidence intervals do not contain zero, it was concluded that the mediating effect was significant (Baron & Kenny,1986).

CONCLUSIONS AND DISCUSSION

The analysis indicated that social media advertising is effective variable in predicting impulse buying behavior. In the study conducted by Venkatalakshm & Poornima (2018) and Xiang (2016), it was concluded that the visual appeal elements offered by product or brand advertisements of social media websites encourage consumers to buy impulse behavior. Setyani et al. (2019) determined that the hedonic and utilitarian motivations of consumers with the personalized advertising contents provided by social media ads can lead consumers to impulse buying behavior. Liu & Li (2019) state that the images or behaviors of idealized users in social media networks can be motivated by making them attractive to consumers through advertising and the impulse buying behavior of consumers can be activated. The ads factor, which is between the marketing communication actions, is an important stimulus that activates the buying impulse of the consumers. In this context, it can be said that effective use of advertising in social media networks will encourage to impulse buying behavior of consumers.

Another result reached in the analysis is that social media ads are an effective variable in predicting hedonic buying behavior. Summers et al. (2016) stated that targeting advertisements in social media networks based on behavioral information can count the formation of positive emotions in consumers. Fernandes et al. (2020) state that online advertising has a significant impact on hedonic buying behavior. Therefore, a positive mood can be created in consumers with effective content created in social media ads. A positive mood will drive consumers to adopt hedonic buying behavior.

Another important result reached in the analysis is that hedonic buying behavior is partly the mediator variable in the correlation among social media ads and impulse buying behavior. This result shows that hedonic buying behavior is a determining variable in the effect of social media ads on impulse buying behavior. In other words, hedonic buying behavior increases the effect of social media ads on impulsive buying behavior. Zhou & Wong (2004) state that advertisements at the point of purchase can stimulation the hedonic or emotional side of the consumption experience and encourage impulse buying. Therefore, it can be said that impulse buying behaviors can be encouraged by stimulating the hedonic and emotional tendencies of consumers with impressive advertising messages conveyed to consumers through images, videos, and posters with visual appeal at the points of purchase in social media networks (Madharavan & Laverie 2004).

Theoretical Implications

Advertising activities, which are one of the important elements of marketing communication in social media networks, affect the perceptions and attitudes of many online consumers towards products or brands. Although consumers spend a long time joining social media networks more and more every day, studies on how the advertisements that consumers encounter in these networks affect their purchasing behavior are still limited. In this context, the findings of our study provide important theoretical contributions to the literature of variables as they try to explain the communication and interaction of consumers with social media advertisements. The study makes various contributions to the marketing communication literature in general, and to the advertising literature in social media networks, with the findings it obtained. The study contributes to the expansion of the literature in the relevant field by examining the relationship between unplanned and hedonic purchasing behavior of advertisements that consumers encounter during online periods on social media networks. Another contribution of the study to the relevant literature is the determination of new relationships between variables and the correlation of variables with each other. In this context, the fact that there has not been any study specifically aimed at determining the relationship of variables with each other shows that the study has a theoretical contribution to the literature.

Managerial İmplications

Social media networks, which allow communication based on interaction with consumers, make significant contributions to understanding consumers' tastes and expectations easily and completely. In this context, businesses can influence the buying behavior of consumers who will create positive perceptions and attitudes about their products and brands by communicating and interacting with consumers through social network advertisements. The conclusions obtained indicate that the advertising element affects impulse and hedonic buying behavior positively in social media networks. For this reason, it can be said that it is very important for businesses to carry their advertising activities, which are among the marketing communication elements, to social media networks that are increasingly widespread throughout the world and become an important part of the daily lives of consumers, and that they actively operate here. In this context, businesses need to be active in these areas by moving some of their promotional and advertising expenditures to these areas. Also, employing people who will direct and manage marketing communication activities in social media networks will contribute to the active presence in these areas. Besides, businesses should receive consultancy support from people who are experts in social media marketing and ensure that their employees receive training in this area.

Limitations and Future Lines of Research

The research has some limitations as well as making significant contributions to both businesses and the relevant literature. Convenience sampling method in time and cost and convenience constitute the limitations of this study. Since the findings obtained in the interview in the convenience sampling method are for the interviewed group, the generalization power of the research results remains weak. To contribute to the generalization of the results of the study, it is recommended to apply a larger sample of future studies.

Appendix 1: Demographic Variables

Demographic Variables		Frequency	Percent
Gender	Female	426	42,9
	Male	566	57,1
Marital status	Single	546	55
	Married	446	45
Age	20 and under	92	9,3
	21-30	357	36
	31-40	327	33
	41-50	144	14,5
	51-60	57	5,7
	61 and more	15	1,5
Monthly Income	250 $ and under	15	1,5
	251-500 $	92	9,3
	501-750 $	154	15,5
	751-1000 $	495	49,9
	1001 $ and more	236	23,8
Educational level	Primary education	278	28
	High school	152	15,3
	Associate degree	170	17,1
	Bachelor's degree	180	18,1
	Master's degree and more	212	21,4
Total		992	100

Appendix 2: Daily Social Media Usage Time

Daily Social Media Usage Time	N
Less than 1 hour	153
1-2 hour	342
3-4 hour	319
5-6 hour	101
6 Hours or more	77

Appendix 3: Social Media Frequency of Use

	Social Media Frequency of Use				
Network	Continually	Often	Sometimes	Rarely	None
Facebook	378	223	234	108	49
Twitter	457	141	180	141	73
Instagram	184	106	200	308	194
LinkedIn	10	46	129	145	662

Appendix 4: Measurement Items Adopted

Scales	Items	Mean	SD	W.F.	% of Variance
Social Media Advertising	SMA1	3,06	1,20	0,63	56,173
	SMA2	3,02	1,12	0,61	
	SMA3	3,29	1,05	0,57	
	SMA4	2,48	1,09	0,65	
	SMA5	2,36	1,05	0,66	
	SMA6	2,42	1,04	0,73	
	SMA7	2,79	1,19	0,69	
	SMA8	2,38	1,01	0,66	
	SMA9	2,31	0,92	0,66	
	SMA10	2,58	0,99	0,66	
	SMA11	3,03	1,11	0,52	
	SMA12	2,36	1,02	0,65	
	SMA13	2,66	1,06	0,68	
	SMA14	2,25	1,03	0,69	
	SMA15	2,34	1,10	0,67	
	SMA16	2,30	1,00	0,70	
Impulse Buying Behavior	IBB1	2,59	1,19	0,55	59,281
	IBB2	2,46	1,18	0,51	
	IBB3	1,96	0,97	0,49	
	IBB4	1,88	0,94	0,54	
	IBB5	2,51	1,23	0,53	
	IBB6	2,15	1,07	0,58	
	IBB7	2,55	1,20	0,43	
	IBB8	2,30	1,12	0,50	
	IBB9	1,95	0,97	0,58	
Hedonic Buying Behavior	HBB1	2,47	1,17	0,71	69,298
	HBB2	2,40	1,19	0,69	
	HBB3	2,72	1,24	0,78	
	HBB4	2,90	1,19	0,68	
	HBB5	3,24	1,20	0,61	
	HBB6	2,39	1,15	0,69	

SMA (Social Media Advertising), IBB (Impulse Buying Behavior), HBB (Hedonic Buying Behavior), W.F. (Weight factor),

Appendix 5: Kaiser-Meyer-Olkin Measure of Sampling Adequacy

		SMA	IBB	HBB
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0,943	0,924	0,892
Bartlett's Test of Sphericity	Approx. Chi-Square	11613	5089	3797
	df	120	36	15
	Sig.	0.000	0.000	0.000

SMA (Social Media Advertising), IBB (Impulse Buying Behavior), HBB (Hedonic Buying Behavior)

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The Effect of Perceived Pay Equity on Counterproductive Work Behaviors: The Mediating Role of Organizational Cynicism

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ABSTRACT

The influence of pay equity perception has been ignored largely in the human resource literature so far. The aim of this study was to fill this gap by investigating the effect of perceived pay equity on counterproductive work behaviors and whether organizational cynicism had mediating role on this effect. Data were gathered via e-mail survey from 252 white-collar employees working at various private companies in Istanbul. In data analysis, besides the frequency distributions of demographic variables, correlation and regression analyzes were also used. The results of the study demonstrated that organizational cynicism did not play a mediating role, since pay equity did not affect counterproductive work behaviors. However, it has been observed that perceived pay equity affected organizational cynicism negatively and organizational cynicism also affected counterproductive work behaviors positively. In addition to these, it was determined that pay equity, CWBs and organizational cynicism showed a significant difference according to some demographic characteristics. Various theoretical and practical implications were presented in the discussion and conclusions section of the research.

Keywords: Perceptions of pay equity, cynicism, organizational cynicism, counterproductive work behaviors, deviant behavior.

JEL Classification Codes: M10, M12

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INTRODUCTION

Employees are regarded as the main resource of the organizations and attracting, retaining and rewarding talented employees is essential for organizational success (Osibanjo, et al., 2014: 66). A critical issue for both employees and employers, pay is at the core of employment relationship (Gerhart, Minkoff & Olsen, 1995: 2). Pay, which is one of the most crucial impacts on the quality and productiveness of human capital, influences the quality of applicants, the quality of hired employees, the probability of job acceptance, and the motivation and performance level of the employees (Gupta & Shaw, 2014: 1).

The meaning and importance of pay differ from one interested party to another. It is also a measure of equity for some people (Acar, 2007: 16). Equity theory attempts to explain employees' perceptions of equity (Sweeney, 1990: 329).

According to this theory, employees compare the ratio of the outcomes they obtain and the inputs they provide with others' outcome/ input ratio (Miles, Hatfield & Huseman, 1994: 585). If these ratios are not equal, it is understood that inequity exists (Adams, 1965: 280). Perceived inequity leads to dissatisfaction which is revealed either in the form of anger (underreward) or guiltiness (overreward). In this case, a tension arises proportionally to the quantity of inequity (Miner, 2005: 137).

Organizational justice is a topic that draws attention, since it is a determinant of employees' attitudes and behaviors (Colquitt & Rodell, 2011: 1183). Attitudes are an evaluation of a person or object and cause an individual to behave in a certain way toward them (Pickens, 2005: 44). Work-related attitudes play a vital role in the transformation of aggressive feelings into aggressive behaviors (Othman & Suleiman, 2013: 195).

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This study was produced from the MA thesis prepared by the first author in consultation with the second author.

Organizational cynicism, which expresses the negative attitude of the person towards the organization in which he or she works and is expected to emerge from negative experiences at work (Pfrombeck et al., 2020: 580) can influence an entire organization by reducing productivity or even preventing the organization from achieving its goals (Dobbs & Do, 2019: 4). Because there is a link between organizational trust and cynicism, it can be expected that the perception of organizational justice, which increases the organizational commitment and trust of employees, reduces cynicism (Chiaburu et al., 2013: 184). Cynical employees may engage in stealing, decreasing their effort and other counterproductive work behaviors because of their frustration and negative emotions (Naseer, et al., 2021: 93-94).

Irrespective of how negative behaviors are defined, whether or not they are classified as bullying, aggression or workplace incivility, such behaviors have a negative impact on organizational effectiveness and individual well-being besides long-term psychological harm (Burnes & Pope, 2007: 290). That is, negative organizational behaviors exhibited intentionally carries the potential for a diversity of negative outcomes for not simply individuals but also organizations (Dimotakis, Ilies & Mount, 2008: 249).

Employees who perceive equal treatment from the organization and its authorities are likely to feel an obligation to respond to it well (Pan et al., 2018: 2). In contrast, they may react most negatively to unequal and unethical outcomes provided by the organization (Kickul, 2001: 293). Social exchange theory suggests that individuals who perceive that get treated unfavorably reciprocate with negative attitudes and behaviors (Li & Chen, 2018: 3). In order to prevent negative consequences in organizations, determinants of them should be detected. In this context, it was thought that it might be important and interesting to understand the impact of pay equity on counterproductive work behaviors and the mediating role of organizational cynicism on this effect, and the study centered upon these issues.

LITERATURE REVIEW

Pay Equity

Perception of equity which is important to all human resource decisions and processes is particularly critical to compensation decisions (Jawahar & Stone, 2011: 297). Perception of pay equity rests upon objective measures and subjective considerations (Kao et al., 2017: 812).

Once the pay has equaled the value of the work done, equity is achieved. On the other hand, inequity occurs when the value of the work done has not matched the value of the pay obtained (Romanoff, Boehm & Benson, 1986: 18).

Not only do employees compare their own pay with the work they do, but also compare it with the pay of colleagues doing similar work. Moreover, they compare it with the pay of employees doing similar work in other organizations. In this regard, pay should be equal as well as being sufficient (Bingöl, 2016: 422).

Perceived equity in compensation is an extremely critical concept that matters to employees. A compensation program which is perceived to be equal is likely to result in fewer complaints and problems related to pay (Caruth & Handlogten, 2001: 6). However, employees who perceive inequity could use negative strategies in an attempt to restore equity. They may exhibit some negative behaviors like arriving late at work, leaving work early, absenteeism, lowering productivity, reducing the quality of their job or even resignation (Banks, Patel & Moola, 2012: 1; Al-Zawahreh & Al-Madi, 2012: 158).

Pay equity comprises of four dimensions, namely:

- Internal equity refers to the comparison among colleagues' effort-income ratio (Zheng, Wang & Song, 2014: 1222).

- External equity refers to the perceived equity of an employee's pay compared with other employees' pay in other organizations (Livingstone, Roberts & Chonko, 1995: 35).

- Individual equity refers to the pay equity based upon the performance of employees who are doing same type of work in the same organization. Hence, performance contributions are important in pay differences (Terpstra & Honoree, 2003: 68).

- Procedural equity refers to the perceived equity of the processes and procedures used in making decisions about pay (Mathis & Jackson, 2008: 365).

Previous studies have revealed that perceived pay equity is positively related to job satisfaction (Livingstone, Roberts & Chonko, 1995: 33), pay satisfaction (Motshegwa, 2011: 1), intrinsic motivation (Hartmann & Slapnicar, 2012: 4283) and organizational commitment (Buttner & Lowe, 2017: 80-81; ElDin & Rahman, 2013: 889). In the light of these studies, it is clear that creating perception of pay equity in organizations is a necessity.

Organizational Cynicism

Cynicism is a term which was used by ancient Greeks to define some negative beliefs such as apathy, lack of hope, lack of trust in others, pessimism and suspicion (Mousa, 2017: 48; Grama & Todericiu, 2016: 49). The existence of cynicism, which can be seen in all areas of social life, in business life is called organizational cynicism (Torun & Çetin, 2015: 138).

Organizational cynicism is an employee's negative attitude towards the organization that he or she works for and it consists of three dimensions, namely (Dean, Brandes & Dharwadkar, 1998: 345-346):

- Cognitive cynicism refers to employees' belief that the organization lacks integrity, equity, honesty and sincerity.
- Affective cynicism refers to employees' several emotional reactions such as anger, distress, disgust and shame towards their organizations.
- Behavioral cynicism refers to employees' negative and humiliating behaviors. These behaviors could be seen as criticism of the organization, sarcastic humor and pessimistic predictions about organization's future actions.

Organizational cynicism, an important response that may have deep implications for both employee and the organization, is a form of self-defense to be able to overcome unpleasant thoughts and feelings of disappointment about actions taken by the organization and its management (Naus, Iterson & Roe, 2007: 689). According to the research conducted by Mirvis and Kanter (1989), 43 percent of American employees could be classified as cynical and these cynics do not trust in management and their coworkers. They do not find their own pay to be equal or think they have a equal chance at advancement. Cynics also believe that management does not care about them or values they create on their jobs.

On the basis of the above, it could be argued that perceived equity is an important determinant of organizational cynicism. Equity perceptions are expected to reduce employees' cynicism toward the organization because they enhance employees' commitment to and trust in the organization (Chiaburu et al., 2013: 184). Several studies have shown a negative relationship between organizational justice and organizational cynicism (Kristina & Mangundjaya, 2017: 1; Bernerth et al., 2016: 303; Shaharruddin, Ahmad & Musa, 2016: 49; Öztürk, Eryeşil & Bedük, 2016: 548; Akar & Çelik, 2019: 189). In this respect, the first hypothesis of this research, the focus of which is on pay, is as follows:

H_1: Perceived pay equity has an effect on organizational cynicism.

Counterproductive Work Behaviors (CWBs)

Counterproductive work behaviors (CWBs) can be described as intentional actions by members of organizations to do threatens the well-being of organizations, their members, or both (Vardi & Wiener, 1996: 151; Robinson & Bennett, 1995: 556). These actions stemmed from negative emotions violate established organizational norms (Robbins & Judge, 2013:119). Sackett (2002) has claimed counterproductive work behaviors are contrary to organizations legitimate interests.

Counterproductive behaviors can take many forms such as theft, fraud, absenteeism, physical and verbal aggression, or substance use (Marcus & Schuler, 2004: 647). Some of these are pervasive and costly problems faced by organizations (Vardi, 2001: 325). Although CWBs have been conceptualized in a variety of forms, they have a common theme in that they harm to the organization by affecting its functioning or property, or by reducing employees' effectiveness (Fox, Spector & Miles, 2001: 292).

CWB is a multidisciplinary topic occupied by researchers from the disciplines of psychology, sociology, economy, and others (Marcus & Schuler, 2004: 649). By reason of the increasing prevalence of these kinds of behaviors and the enormous costs associated with them, many studies documented financial, social and psychological effects of negative organizational behaviors have been carried out (Peterson, 2002: 47).

Spector et al. (2006) have identified five dimensions of CWBs: abuse toward others, production deviance, sabotage, theft, and withdrawal. Abuse toward others is the most frequent form of CWBs (Keashly, 1998: 86). This dimension consists of harmful behaviors toward others such as making threats and nasty comments, ignoring them, or undermining their ability to work effectively (Chand & Chand, 2014: 43). Behaviors classified as production deviance violate the norms delineating the quality and quantity of work (Vardi & Weitz, 2003: 19). While production deviance refers to purposeful failure to complete tasks correctly, sabotage refers to destroying physical property that belongs to the employer (Bauer, 2011: 3). Any intended behavior exhibited by an

employee to inflict a production or profit loss for the organization could be termed as sabotage (Giacalone & Rosenfeld, 1987: 367). Employee theft is classified as criminal and it is one of the costliest forms of CWBs (Tucker, 1989: 319; Weitz, Vardi & Setter, 2012: 263). Lastly, withdrawal concerns behaviors that limit the working time to less than is determined by the organization. Absence, arriving late or leaving early, and taking longer breaks than authorized are various forms of withdrawal (Spector et al., 2006: 450).

The literature review shows that CWB is positively associated with workplace incivility (Bibi & Karim, 2013: 330), psychological capital (Baloch, Latif & Azam, 2016: 139), interpersonal conflict (Penney & Spector, 2005: 777), perceived organizational politics (Meisler, Drory & Vigoda-Gadot, 2019: 1215), and psychological contract breach (Li & Chen, 2018: 5). On the other hand, it is seen that CWB is negatively related to organizational commitment (Ramshida & Manikandan, 2013: 59), positive affectivity (Ugwu & Asogwa, 2018: 6), perceived organizational support (Joy & V G, 2016: 61), and organizational citizenship behavior (Bukhari & Ali, 2009: 88).

As negative perception can usually result in a negative behavior (Danaeefard & Boustani, 2016: 16), it has been suggested that perceptions of employees are one of the predictors of CWBs. For example, if employees perceive the employer to be unequal, they may be more likely to exhibit CWBs in the organization (Gruys, 1999: 18). According to this view, the person who perceives unequal treatment feels anger, outrage, and resentment. As a result of these feelings, desiring for retribution could occur and the harmed party experiences a need to punish those who treat unequally (Skarlicki & Folger, 1997: 434).

Studies on the subject have reached conclusions indicating that there is a negative relationship between organizational justice and CWBs (Hany, Hassan & Badran, 2020: 255; Dora & Azim, 2019: 41; Weldali & Lubis, 2016: 246-247; Roy, Bastounis & Poussard, 2012: 1348; Oluwole, Aderibigbe & Mjoli, 2020: 217). Based on these arguments, the second hypothesis of this research is as follows:

$H_{2:}$ Perceived pay equity has an effect on counterproductive work behaviors.

Because attitudes consist of beliefs, expectancies, and behavioral intentions, organizational cynicism known as a negative attitude held by an employee regarding his or her organization is expected to cause alienation and produce negative behaviors such as criticism of the organization (Wilkerson, Evans & Davis, 2008: 2276; Yıldız & Şaylıkay, 2014: 622). Evans et al. (2011) found a positive relationship between organizational cynicism and employee deviance. Similarly, Tong et al. (2020) revealed that organizational cynicism is a predictor of CWBs. The results of the research conducted by Dar et al. (2020) also indicated that there was a significant and positive correlation between organizational cynicism and deviant workplace behaviors. Based on these arguments, the third hypothesis of this research is as follows:

$H_{3:}$ Organizational cynicism has an effect on counterproductive work behaviors.

The main purpose of the current study was to explore the mediating role of organizational cynicism in the effect of perceived pay equity on CWBs. Hence the following hypothesis has been developed:

H_{4}: Organizational cynicism mediates the effect of perceived pay equity on counterproductive work behaviors.

METHOD

Purpose and Model of the Study

The purpose of this study was to test a model linking pay equity with organizational cynicism and counterproductive work behaviors.

The following is the research model of this study formed depend on the Blau's social exchange theory dealing with the relationship between perception, attitude and behavior:

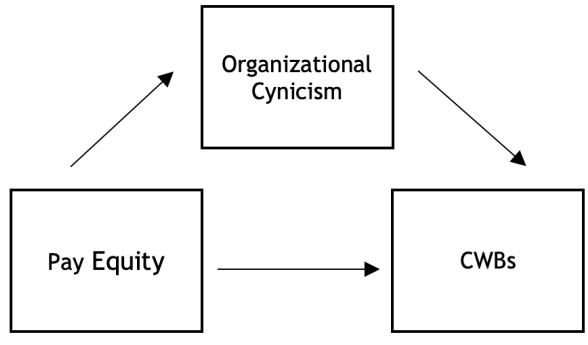

Figure 1: Hypothesized Model

Sampling of the Study

The data was collected from 252 white-collar employees who work at various private companies in Istanbul, Turkey. Respondents participated in the study via an online survey tool and responses were anonymous. The

Table 1. Demographic Characteristics of the Respondents

Characteristics		**N**	**%**
Gender	Female	116	46
	Male	136	54
Age	<25	23	9,1
	25-34	128	50,8
	35-44	65	25,8
	>45	36	14,3
Marital Status	Single	105	41,7
	Married	147	58,3
Level of Last Education	High school and below	29	11,5
	Associate degree	23	9,1
	Bachelor's degree	143	56,7
	Master's degree	49	19,4
	Doctoral degree	8	3,2
Working Experience	<1 year	12	4,8
	1-5 years	68	27
	6-10 years	81	32,1
	>10 years	91	36,1
Total Monthly Income	2000-3000 TL	55	21,8
	3001-4000 TL	43	17,1
	4001-5000 TL	39	15,5
	5001-6000 TL	28	11,1
	>6000 TL	87	34,5
Total		252	100

response rate was 49,4 percent. Surveys were answered from December 26, 2019 to February 10, 2020 and all of 252 completed surveys were included in the analysis.

The main factor affecting the decision to focus the research on the private sector was that wages are determined by law in the public sector and therefore it is pointless to make comparisons with other organizations in the industry. In accordance with, employees who work in a wide range of occupations, organizations and departments in private sector were requested to fill-up the survey. Thus, for sampling a certain occupation, organization or department was avoided, rather all were represented.

Respondents' gender, age categories, marital status, level of last education, working experience and total monthly income are presented in the Table 1.

As indicated in the Table 1, 54% of employees are male, while 46% are female. Most of the employees (50,8%) are at the age of 25-34. 58,3% of employees are married, whereas 41,7% are single. When looked at level of last education, it is seen that most of the employees have a bachelor's degree. According to the table, 36,1% of employees have been working for more than 10 years. Employees who have more than 6000 TL monthly income are in the majority compared to employees in other income groups.

Data Collection Tools

Pay equity. The pay equity scale that used in current research has been developed by Livingstone et al. (1995), Zheng et al. (2014), and Terpstra and Honoree (2003). Adaptation to Turkish language was conducted by Demir and Uyargil and reliability level of the scale was found to be .930 for internal equity, .910 for individual-procedural equity, and .819 for external equity (2014). This scale has 4 dimensions with 22 items. Internal equity is measured by 9 items (1, 2, 3, 4, 5, 6, 7, 8 and 9). External equity is measured by 6 items (10, 11, 12, 13, 14 and 15). Individual

Table 2. Internal Consistency of the Scales

Scale	Number of Items	Cronbach's Alpha coefficient
Pay Equity	16	,890
Organizational Cynicism	12	,921
Counterproductive Work Behaviors	16	,838

equity is measured by 2 items (17 and 18). Procedural equity is measured by 4 items (19, 20, 21 and 22).

The items were scored on a 5-point scale ranging from "strongly disagree" (1) to "strongly agree" (5). Sample items of this scale were "I think the salary given to me is equal compared to salaries given to my colleagues" (internal equity), "I think my salary is equal compared to salaries paid in other organizations" (external equity), "When i consider my qualifications, i am satisfied with my pay" (individual equity), and "I think the procedures applied in determining my pay are equal" (procedural equity). 2., 6., 9., 10., 12., 15. and 16. items in this scale were reverse coded before analyses.

Organizational cynicism. The organizational cynicism scale that used in current research has been developed by Brandes et al. (1999). Adaptation to Turkish language was conducted by Nitelik Ödemiş and reliability level of the scale was found to be .931 (2011). This scale has 3 dimensions with 13 items. Cognitive cynicism is measured by 5 items (1, 2, 3, 4 and 5). Affective cynicism is measured by 4 items (6, 7, 8 and 9). Behavioral cynicism is measured by 4 items (10, 11, 12 and 13).

The items were scored on a 5-point scale ranging from "strongly disagree" (1) to "strongly agree" (5). Sample items of this scale were "I believe that what is said and what is done are different at my company" (cognitive cynicism), "When i think of my company, i get angry" (affective cynicism), and "I criticize practices and policies at my company with others" (behavioral cynicism). There are not any reverse items in the scale.

Counterproductive work behaviors. The CWBs scale that used in current research has been developed by Spector et al. (2006). Adaptation to Turkish language was conducted by Kalağan and reliability level of the scale was found to be .918 (2009). This scale has 5 dimensions with 33 items. Abuse is measured by 18 items (2, 9, 10, 15, 16, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32 and 33). Production deviance is measured by 3 items (3, 11 and 13). Sabotage is measured by 3 items (1, 6 and 7). Theft is measured by 5 items (8, 17, 18, 19 and 23). Withdrawal is measured by 4 items (4, 5, 12 and 14).

The items were scored on a 5-point scale ranging from "strongly disagree" (1) to "strongly agree" (5). Sample items of this scale were "I verbally abused someone at work" (abuse), "I purposely failed to follow instructions" (production deviance), "I purposely damaged a piece of equipment or property" (sabotage), "I took money from my employer without permission" (theft), "I came to work late without permission" (withdrawal). There are not any reverse items in the scale.

Data Analysis

So as to determine whether the data display normal distribution or not, Kolmogorov-Smirnov Test has been applied seperately to the data gathered by the three scales. As a result of the test, it has been seen that only Counterproductive Work Behaviors Scale didn't have a normal distribution (ppf: 0.388 > 0.05, poc: 0.752 > 0.05, pcwb: 0.00 < 0.05). Therefore, analyses of the study have been conducted by using both parametric and non-parametric tests.

In the data analysis process, Pearson correlation analysis, simple regression analysis, T-tests and one-way analysis of variance have been used for pay equity and organizational cynicism. Spearman correlation analysis, simple regression analysis, Mann-Whitney U tests and Kruskal-Wallis H analysis have been used for CWBs as well. The data obtained from the survey has been analyzed by using SPSS (Statistical Package for the Social Sciences) 21.0 program. Significance at a level of 0.05 has been seeked in all statistical processes.

RESULTS

In order to find out the factor structure of all scales, as an initial starting point, exploratory factor analysis with principal component by varimax rotation has been conducted. According to the analysis results, pay equity scale has showed a 16-item and 3-factor structure as internal equity, external equity, and individual-procedural equity (KMO: .898, sig.: .000, total variance explained: %59.301). That is, individual equity dimension has been combined with procedural equity dimension. 6 items (4, 8, 11, 13, 14 and 16) have been extracted from the scale.

Table 3. Correlations, Means, and Standard Deviations

Variable	Pay Equity	*Internal* Equity	*External* Equity	*Individual-Procedural* Equity	Organizational Cynicism	*Cognitive Cynicism*	*Affective Cynicism*	*Behavioral Cynicism*	CWBs	*Abuse*	*Theft*	*Withdrawal*	Mean	SD
1	-	,885**	,519**	,872**	-,486**	-,508**	-,444**	-,209**	-0,12	-0,044	-0,093	-0,086	2,77	0,67
2		-	,261**	,623**	-,349**	-,342**	-389**	-89	-0,066	-0,074	-0,119	-19	3,03	0,82
3			-	,312**	-,301**	-,348**	-,227**	-,144*	-0,084	-0,018	0,012	-0,084	2,75	0,84
4				-	-,492**	-,524**	-,394**	-,273**	-,149*	-0,002	-0,068	-0,119	2,47	0,83
5					-	,876**	,851**	,773**	,365**	,152*	,142*	,301**	2,75	0,81
6						-	,587**	,537**	,311**	0,11	0,103	,281**	3,07	0,91
7							-	,520**	,199**	,138*	,159*	0,121	2,25	1,02
8								-	,396**	,142*	0,088	,392**	2,88	0,99
9									-	,831**	,620**	,766**	1,19	0,27
10										-	,481**	,328**	1,1	0,27
11											-	,257**	1,08	0,31
12												-	1,47	0,57

Notes: *** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed).*

Organizational cynicism scale has showed a 12-item and 3-factor structure as cognitive cynicism, affective cynicism, and behavioral cynicism (KMO: .904, sig: .000, total variance explained: %77.267). Only eleventh item has been extracted from the scale. Dimensions are the same as original scale's ones.

CWBs scale has showed a 16-item and 3-factor structure as abuse, theft, and withdrawal (KMO: .842, sig.: .000, total variance explained: %61.473). That is, unlike the original scale, two dimensions named sabotage and production deviance have not occured. 3 items (1, 6 and 7) regarding sabotage and 3 items (3, 11 and 12) regarding production deviance have been extracted from the scale. In addition, 9 items (2, 9, 15, 16, 20, 21, 22, 31 and 33) regarding abuse and 2 items (8 and 23) regarding theft have been extracted from the scale.

According to these values, the sample of the study is suitable for the hypothesis tests. After factor analyses, reliability of all scales has also been calculated.

As can be seen in Table 2, so as to examine the reliability of the measurement tools, Cronbach's Alpha coefficient values were calculated for the scales of "pay equity", "organizational cynicism" and "counterproductive work behaviors" and were found to be .890, .921, and .838 respectively. All Alpha values are greater than .80, showing very good internal consistency (Ursachi, Horodnic & Zait, 2015: 681).

The means, standard deviations, Pearson correlation between pay equity and organizational cynicism (along with their dimensions) and Spearman correlation between CWBs and both pay equity and organizational cynicism (along with their all dimensions) are reported in Table 3.

As shown in Table 3, Employees' pay equity perception is slightly below the midpoint of the five-point scale (M=2.77). Their organizational cynicism is almost the same as pay equity perception (M=2.75). The frequency of their CWBs is highly low (M=1.19).

According to the correlation coefficients given in Table 3, pay equity and its subdimensions have a significant negative relationship with organizational cynicism. However, no relation has been found between pay equity and CWBs. When the relationship between subdimensions of pay equity and CWBs are examined, a low-level negative correlation is observed between only individual-procedural equity and CWBs. The results also show that organizational cynicism and its subdimensions have a significant positive relationship with CWBs.

Table 4. Results of Regression Analysis Examining the Effect of Pay Equity on Organizational Cynicism

	R	R^2	B	P
Pay Equity	.486	.237	-.591	.000

a. Predictor: (Constant), Pay Equity
b. Dependent Variable: Organizational Cynicism

Table 4 reports the findings of regression analysis of pay equity and organizational cynicism which indicates the value of R, R-square, B, and the P-value. The value of R2 .237 shows that perceived pay equity accounts for 23.7% of the variance of organizational cynicism. With regard to the value of B, a one unit increase in pay equity results in a decrease by .591 in organizational cynicism. P value is <0.05 which shows that perceived pay equity has significant effect on organizational cynicism, hence H1 was accepted.

Table 5. Results of Regression Analysis Examining the Effect of Pay Equity on Counterproductive Work Behaviors

	R	R^2	B	P
Pay Equity	.090	.008	-.036	.154

a. Predictor: (Constant), Pay Equity
b. Dependent Variable: Counterproductive Work Behaviors

Table 5 reports the findings of regression analysis of pay equity and CWBs which indicates the value of R, R-square, B, and the P-value. The value of R2 is .154 which shows that perceived pay equity accounts for only 0.8% of the variance of counterproductive work behaviors. P value is .154 which means that perceived pay equity does not have significant effect on counterproductive work behaviors, hence H2 was rejected.

Table 6 reports the findings of regression analysis of organizational cynicism and CWBs which indicates the value of R, R-square, B, and the P-value. The value of R2 .075 shows that organizational cynicism accounts for 7.5% of the variance of counterproductive work behaviors. With regard to the value of B, a one unit increase in organizational cynicism results in an increase by .092 in counterproductive work behaviors. P value is <0.05 which shows that organizational cynicism has significant effect on counterproductive work behaviors, hence H3 was accepted.

Table 6. Results of Regression Analysis Examining the Effect of Organizational Cynicism on Counterproductive Work Behaviors

	R	R^2	B	P
Organizational Cynicism	.274	.075	.092	.000

a. Predictor: (Constant), Organizational Cynicism
b. Dependent Variable: Counterproductive Work Behaviors

All the hypotheses of the research were developed using the Baron and Kenny's method for mediation. Accordingly, three conditions must be fulfilled to establish mediation: firstly, the independent variable must affect the mediator variable; secondly, the independent variable must affect the dependent variable; and thirdly, the mediator variable must affect the dependent variable (Baron & Kenny, 1986: 1177). Hypothesis 4 proposes that organizational cynicism mediates the relationship between pay equity and CWBs. However, second condition of mediation (i.e., pay equity predicts CWBs) was not met. Therefore, mediated regression analysis could not be used and Hypothesis 4 was rejected. The results of study hypotheses are presented in Table 7.

The Independent Samples T-Test was used to reveal differences between both gender and marital status, if there are any, in terms of their perceptions of pay equity and level of organizational cynicism. The Mann-Whitney U Test was used for frequency of counterproductive work behaviors as well. The result of the tests revealed that females had significantly higher levels of organizational cynicism compared to males (p:.009<0.05 and t:2,619) when equal variances assumed. Average level of organizational cynicism for females was 2.89 (SD=0.83) whereas it was 2.62 (SD=0.78) for males. Besides, single employees had significantly higher levels of organizational cynicism compared to married employees (p:.001<0.05 and t:3,439) when equal variances assumed. Average level of organizational cynicism for single employees was 2.95 (SD=0.84) whereas it was 2.60 (SD=0.76) for married employees.

According to the results, there are not significant differences between males and females, and also single and married employees in terms of pay equity and CWBs.

The one-way analysis of variance (ANOVA) was used to determine whether there are any differences between age, level of last education, working experience and total monthly income in terms of their perceptions of pay equity and level of organizational cynicism. The Kruskal-Wallis H test was used for frequency of counterproductive work behaviors as well.

Table 7. Results of Hypothesis Testing

Hypotheses	Result
$H_{1:}$ Perceived pay equity has an effect on organizational cynicism.	Supported
$H_{2:}$ Perceived pay equity has an effect on counterproductive work behaviors.	Not Supported
$H_{3:}$ Organizational cynicism has an effect on counterproductive work behaviors.	Supported
$H_{4:}$ Organizational cynicism mediates the effect of perceived pay equity on counterproductive work behaviors.	Not Supported

Post-hoc analysis (LSD & Scheffe) revealed that employees aged 25-34 had significantly higher pay equity perceptions compared to those aged 35-44 and under 25 years of age (p:.046<0.05; 2.8828>2.6740 and 2.8828>2.5788). The results also showed that employees who earn more than 6000 TL per month had significantly high pay equity perceptions in comparison with those who earn 2000-3000 TL, 3001-4000 TL and 4001-5000 TL (p:.000<0.05; 3.0359>2.5364, 3.0359>2.6294, 3.0359>2.5849).

Organizational cynicism in the 25 years and under group was significantly higher than all other groups (p:.010<0.05; 3.2500>2.7376, 3.2500>2.7013, 3.2500>2.5463). Furthermore, employees who earn 2000-3000 TL and 4001-5000 TL had significantly higher organizational cynicism level than that of employees who earn more than 6000 TL (p:.022<0.05; 2.9197>2.5594, 2.9551>2.5594).

No differences have been found in pay equity and organizational cynicism according to level of last education and working experience.

Based on the Kruskal-Wallis H test, the median of the groups does not match, so there is a statistically significant difference depend on level of last education (X2: 15,081, df: 3, p:.002). According to the Dunn's test, employees who have bachelor's degree exhibit more counterproductive work behaviors than those who have associate degree and high school and below (135,40>88,83; 135,40>95,17).

No differences have been found in CWBs according to age, working experience and total monthly income.

DISCUSSION AND CONCLUSIONS

The aim of this study was to investigate the mediating role of organizational cynicism on the relationship between pay equity and CWBs. In addition to this, the differences of pay equity, organizational cynicism and CWBs according to demographic variables were examined.

The results indicate that there is no significant effect of pay equity on counterproductive work behaviors. Nevertheless, as expected, pay equity has a negative effect on organizational cynicism while organizational cynicism positively affects counterproductive work behaviors. These results mean that even though the negative perceptions of employees about pay do not cause negative behaviors directly, negative perceptions affect attitudes (organizational cynicism) and also negative attitudes affect behaviors negatively (counterproductive work behaviors).

In comparison with previous research, it has been found similar results. For example, in a research by Kanbur & Canbek (2018), the effect of organizational justice on organizational cynicism was examined in 530 police officers. The results of the study showed that there was a negative correlation between these variables. In another research by Ülbeği & İplik (2018), the relationship between perceived injustice and cynicism was examined in 244 white-collar employees. As a result of the research, a positive correlation was found between these variables. A study conducted among 286 teachers by Girgin & Gümüşeli (2018) also showed a negative correlation between organizational justice and organizational cynicism. All these results clearly show that the perception of justice is an important determinant of cynicism.

On the basis of all these research findings, it is recommended that managers should create pay equity perception, which in turn can affect employee attitudes. If they want to decrease organizational cynicism, it would be better to increase pay equity. Based on the research findings, it can be said that it is important to implement performance-related pay systems, to be transparent in the processes of making pay decisions, to take into account the payments in other organizations while determining the pay, and not to determine a pay that is far below the average. An employee whose salary increases when performing well will see that he or she is not equated with her/ his colleagues with poor performance and will want to maintain this high performance.

The findings also reveal that the perception of pay equity differs according to the age and total monthly income. Consistent with the results of this research, Güneş (2022) revealed that pay equity differed according to age and middle-aged employees had higher pay equity perception than younger and older employees. According to the same research, as the pay increases, pay equity perception also increases. So, perception of pay equity differs according to total monthly income.

It can be thought that employees who receive satisfactory pay will not take account of the issue of pay equity as much as low-paid employees. Therefore, the higher pay equity perception of highly paid employees supports the expected result. It is also an expected result that the perception of pay equity is lower among young employees who are newly recruited and have lower pay and other rights than other employees.

On the other hand, organizational cynicism of the employees should be reduced in order to reduce CWBs. Consistent with this study, there are many studies in the literature revealing that organizational cynicism leads to CWBs (Parisa, Jalil & Mansour, 2016: 196; Otori, Mutiu & Calvin, 2020: 1; Kurnaz & Kökalan, 2020: 55; Nemr & Liu, 2021: 34; Butt & Yazdani, 2021: 390).

The obtained results revealed that CWBs were differentiated according to level of last education. It was seen that employees who have bachelor's degree exhibit higher CWBs than others who have high school and below and associate degree. It was also found in another study conducted by Özüren (2017) that employees who have a bachelor's degree have a higher tendency to exhibit counterproductive work behaviors. The study conducted by Behrem (2017), which reveals that counterproductive work behaviors decrease as the level of education decreases, and that behaviors increase as the level of education increases, also supports this study.

Given that the expectations from the organization of qualified employees who have received a good education are more diverse, it can be thought that individuals who do not meet these expectations have less fear of being unemployed compared to less qualified employees, and they intend to take revenge on the organization by exhibiting such negative behaviors more than they do.

It has been determined that organizational cynicism is more common in female employees. The studies conducted by Çelebi (2019), Öz (2020), Gözcü (2020), Aksin (2020) and Zaza (2021) support this finding. There are also studies showing that only the cognitive

dimension of organizational cynicism differs according to gender and it is higher in female employees (Bayraktar, 2016: 51; İpek, 2018: 55; Çillik, 2019: 74; Küçükkaya, 2019: 87).

Consistent with this study, there are some other studies in the literature revealing that the level of organizational cynicism is higher in single (Çankaya, 2018: 299; Karadede, 2021: 59, Zaza, 2021: 85; Yanar, 2022: 46), young (Çankaya, 2018: 301; Öztürk, 2021: 74-75; Sevda, 2021: 76-77; Yanar, 2022: 45-46) and low-paid employees (Erer & Şahin, 2020: 2955; Zaza, 2021: 86).

It can be thought that the negative discrimination that organizations make to female employees in situations such as recruitment, promotion and providing training to them may cause this. The finding that married employees have less organizational cynicism than singles can be explained by the extra opportunities provided to them. Marriage allowance and maternity leave, financial aid for children's education can be given as examples.

The higher level of organizational cynicism among lower-paid employees shows that pay dissatisfaction is reflected in negative thoughts and feelings. The fact that the level of organizational cynicism is higher in younger employees is a result that reflects the expected. It is not surprising that individuals who have just started working life and have less rights than other employees have more negative thoughts towards the organization compared to employees who have been working in the same organization for many years and have higher organizational commitment.

This research has several limitations that can be addressed by future research. A limitation of the research is that the sample consists of employees working in private institutions. Another limitation of the research is that the data were collected from white-collar employees. Due to the survey questions, it was thought the research is appropriate for white-collar employees. Besides, the effects of the dimensions of the variables were not examined.

The research has been conducted on a Turkish sample of employees. Therefore, the findings of the research may not be transferable outside the Turkish national context. It could be tested on cross-cultural samples.

As a general result of the research, this research model examining the mediating role of organizational cynicism in the relationship between pay equity and CWBs has not been supported. It can be said that this research will inspire the others to investigate the relationships between pay equity and CWBs in varied contexts. Cynicism can be a moderator in this relationship in future studies. Moreover, it could be taken into consideration pay equity' effect on other topics that were not measured in the current study such as organizational silence, turnover intention and organizational citizenship behaviors.

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Minimizing Makespan in a Permutation Flow Shop Environment: Comparison of Scatter Search, Genetic Algorithm and Greedy Randomized Adaptive Search Procedures

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ABSTRACT

Solving scheduling problems enables more efficient use of production capacity. It involves defining the sequence of operations, determining the capacity of resources, and balancing workloads. Different methods, especially metaheuristics, have been used to solve these problems. This study presents the application of Scatter Search (SS), Genetic Algorithm (GA), and Greedy Randomized Adaptive Search Procedures (GRASP) for minimizing makespan in a permutation flow shop environment. In this study, the performances of these methods are compared through various test problems in the literature and a real-life problem of a company operating in the automotive sector. Study comprises 48 jobs that must be planned within a day for eight consecutive operations. In cellular manufacturing, the sequence in which each job is processed in eight operations is the same. In solving permutation flow shop scheduling problems (PFSP), one of the NP-hard problems, meta-heuristic methods are widely applied due to their successful results. From this point of view, SS, GA, and GRASP are employed in this study, and their performances are compared.

Keywords: Scheduling, Permutation Flow Shop Scheduling Problem, Makespan, Scatter Search, Genetic Algorithm, GRASP.

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INTRODUCTION

Scheduling is the process of planning and coordinating the production of goods or services to meet customer demand and achieve specific goals or objectives. It involves determining the sequence of operations, identifying and allocating resources (such as people, equipment, and materials), and establishing deadlines for completing each task. Production scheduling is important because it helps to coordinate the production process, allocate resources effectively, and meet customer demand in a timely and efficient manner. It also helps reduce waste, improve production efficiency, reduce inventory costs, and avoid production delays and bottlenecks. Additionally, it enables better communication and collaboration between different departments and ensures that the production process is aligned with the overall business strategy. Scheduling problems, which are combinatorial optimization problems, involve finding a schedule or assigning tasks to resources that optimize some objective function, subject to certain constraints. The higher the complexity, the harder it is to find the optimal solution to the problem (Widmer et al., 2008). Production scheduling problems have widespread coverage in the literature and have been addressed using different production systems, restrictions, source types, and objective functions. This research focuses on a particular type of scheduling problem, called the "PFSP", which is a subset of the more general class of scheduling problems known as "flow shop scheduling problems". The study applies this concept to a real-world scenario in the automotive industry, examining a specific company's operations.

PFSP contains a set of jobs that must be executed on a set of machines. Each job's execution should start from the first machine and finish on machine m following the same route of machines (Bautista et al., 2012). The processing time of all jobs on all machines is known in advance and can not be negative. All jobs are assumed to be ready before processing, and the processing of each job cannot be stopped after the processing has started. Only one job can be assigned to a machine at any given time. For example, to begin to process a job on

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a machine, that machine should be available, and the job processing on the previous machine from that machine should be completed. The aim is to sequence these n jobs to optimize the objective function (Zhang and Wu, 2014).

FSP and PFSP are scheduling problems that involve allocating resources to a set of tasks under certain constraints. The FSP involves scheduling a jobs on a set of machines such that each job must be executed on each machine in a specific order. Every job undergoes processing on each machine only once. (Ben-Daya and Al-Fawzan, 1998). The PFSP is a more restrictive version of the FSP. In the PFSP, the job order must be the same on all machines (Yenisey and Yagmahan, 2014). This means that the job schedule on the first machine determines its schedule on all other machines by aiming the makespan minimization. Therefore, the objective of the scheduling is also to minimize the makespan and total completion time. FSP and PFSP are combinatorial optimizations and NP-hard problems, which are computationally challenging. NP-hard problems are generally considered computationally difficult because most problems don't have efficient algorithms for solving them. For this reason, many metaheuristic algorithms have been proposed to find approximate solutions to these problems.

Various studies in the literature address PFSP using exact and approximate algorithms to minimize the makespan of all jobs. As the dimension and complexity of the problems increase, it becomes impossible to solve them within a reasonable time using exact algorithms that guarantee the optimal solution. Today, most studies use heuristic and meta-heuristic methods, yielding good results within a reasonable time. In the literature, the study by Johnson (1954), which examined a PFSP with n jobs processed on two machines, was followed by other studies that suggest various heuristic methods for solving a PFSP with three or more machines. One of these heuristic methods is the CDS algorithm proposed by Campbell et al. (1970) by generalizing Johnson's (1954) algorithm to flow shop problems with m machine. Then, Gupta (1972) proposed three heuristic algorithms that address PFSP through makespan minimization. The NEH algorithm is a well-known heuristic algorithm for solving the PFSP. It was first proposed by Nawaz et al. (1983). In comparing the performances of heuristics for solving PFSP using Taillard's (1993) benchmarks, the NEH algorithm was found to have the most outstanding performance in makespan minimization (Ruiz and Maroto, 2005).

Various studies in the literature address FSP and PFSP using meta-heuristic methods. This study used three meta-heuristic methods, SS, GA, and GRASP, to solve PFSP. The introduction part of the study contains a literature review of production scheduling and PFSP. The second section of this study introduces the methods of SS, GA, and GRASP and the studies in the literature using these methods to solve such problems. The third section presents the problem analyzed in this study with its details. In the fourth section, the results obtained by the application of the addressed methods are given. This section compared the methods' performances using the various benchmarks (rec31, rec33, rec35) in the literature and then a real problem. Finally, this study finalizes by presenting the conclusions regarding the results.

APPLIED META-HEURISTIC METHODS

In the literature, meta-heuristic methods have received considerable attention in solving FSP. Meta-heuristic methods are approximate optimization algorithms designed to find near-optimal solutions to difficult optimization problems. They do not guarantee that the solutions they find are globally optimal, but they are often able to find high-quality solutions. Meta-heuristic methods are particularly useful for solving problems that are computationally intractable, such as NP-hard problems, for which no exact algorithm can find the optimal solution in polynomial time. They are also useful for solving problems with many variables or constraints complexity, where traditional optimization methods may struggle to find reasonable solutions. Besides, they perform an efficient search and find a solution in a much shorter time than the traditional methods since they do not search the search space. Today's intensely competitive business environment drives companies to find quick and reasonable solutions instead of optimum but slow solutions (Kocamaz and Çiçekli, 2010). Therefore, faster scheduling solutions can significantly impact the efficiency and effectiveness of operations, overall profitability, and competitiveness. This section presents the applied meta-heuristic methods in this study, SS, GA, and GRASP, and studies that applied these methods for PSFP.

Scatter Search

SS is a powerful and versatile population-based method metaheuristic optimization algorithm. A population-based approach commences with an initial set of solutions referred to as the reference set. Then, it gradually enhances them through a process of combination and modification in each iteration. SS is designed to handle complex, high-dimensional problems with multiple objectives and

constraints. SS flexibility can handle various optimization problems, including mixed integer and nonlinear problems. It has been applied to many problems, such as scheduling, logistics, and resource allocation (Çiçekli and Bozkurt, 2015). SS is a robust algorithm that can handle a wide range of problem characteristics and quickly adapt to different problem domains. Compared to other optimization methods, scatter search has a relatively simple implementation process and does not require much fine-tuning of parameters.

Additionally, it can be integrated with other optimization algorithms and methods to improve performance and find more accurate solutions. It finds reasonable solutions to these problems in a relatively short computation time. Unlike other evolutionary algorithms, SS combines solutions through strategic designs to create a new one instead of relying on randomization (Haq et al., 2007).

SS aims to create new solutions by combining reference solutions. The logic behind combining solutions is to create a new solution using a linear (convex or concave) combination of at least two reference solutions (Laguna and Marti, 2003). The new reference set is developed until SS is finished by deleting the old solutions.

The fundamental steps of the SS algorithm include:

1. Initialization: Initial population of solutions is created.
2. Solution combination: New solutions are generated by combining existing solutions in the reference set.
3. Solution evaluation: The quality of the new solutions is evaluated using a suitable objective function.
4. Solution selection: The best solutions are selected to form the new reference set.
5. Iteration: The process is done again till satisfying a stopping criterion.

Various studies use this algorithm to solve FSP and PFSP in the literature. Nowicki and Smutnicki (2006) addressed PFSP using a new algorithm they proposed by combining some properties of neighborhoods, SS, and path relinking. Bozejko and Wodecki (2008) considered an FSP that aims to minimize the completion time using an SS-based parallel algorithm. Finally, Çiçekli and Bozkurt (2015) developed a model using SS to solve PFSP. To test their model, they used the PFSP called rec41, consisting of 75 jobs and 20 machines, developed by Reeves (1995).

Genetic Algorithm

As an optimization technique, GA reflects the principles of natural evolution. Michalewicz (1992) considers GAs as stochastic optimization techniques that mimic genetic inheritance and Darwin's principles of natural selection. GAs are population-based algorithms inspired by nature (Goldberg, 1989). They rely on the biological evolution models, which simulate survival of the fittest among individuals. This principle provides a mechanism to search for near-optimal solutions without trying all potential solutions. GAs do not guarantee the optimal solution, as it is often not possible to guarantee that the global optimum will be found (Çiçekli and Kaymaz, 2016). However, they can often find reasonable solutions close to optimal, especially when the search space is large and complex. The independent evaluation of candidate solutions allows for parallel processing, which can significantly speed up the optimization process.

The procedure for implementing a GA to solve a problem can be summarized as follows (Goldberg, 1989):

1. Encoding: The first step is encoding the problem as a set of binary strings or chromosomes representing the potential solutions. Each bit or gene in the chromosome represents a decision variable or feature of the problem.
2. Initialization: A population of chromosomes is randomly generated to represent the initial set of solutions.
3. Evaluation: The fitness value of each chromosome is evaluated with a suitable objective function. The objective function should be defined such that it assigns a higher fitness value to chromosomes that represent better solutions.
4. Selection: The selection method is usually grounded in the concept of natural selection, wherein chromosomes possessing higher fitness values have a greater probability of being selected.
5. Crossover: Chromosomes are combined to generate new offspring through a process called crossover. Crossover involves exchanging genetic information between chromosomes to create new genetic diversity.
6. Mutation: A small probability of mutation is applied to the offspring, introducing random changes in the genetic information. This helps to maintain genetic diversity and preserve getting stuck in local optima.

7. Replacement: The new offspring replace the previous population, and the process is done again till satisfying a stopping criterion.

8. Decoding: The final solution is obtained by decoding the best chromosome in the final population back into the original problem space.

The first step of GA involves finding the proper encoding methodology suitable for the problem. In each scheduling problem, the encoding of the chromosomes, mutation methods, and representation methodology is entirely different. Therefore, finding the proper encoding method before applying a GA to a problem is essential. Permutation coding is the most suitable approach for problems related to ordering (Borovska, 2006).

There are various important genetic operators in permutation coding, including crossover, selection, mutation, and elitism. These operations are utilized on the starting generation to uncover improved solutions in subsequent generations. The Genetic Algorithm begins by selecting parent individuals from the population (Kocamaz et al., 2009). Then, operators are used to select suitable parents. The selection of the most suitable parents and the next generation's production depends on the crossover operators. In most GA methods, crossover operators use two parents to create offspring. The new offspring always use the fittest alternative, thus ensuring the best ordering compared to the current one (Huang et al., 1997). The mutation is another genetic algorithm operator. Mutation relies on a random search for the optimal solution, while the initial generation does not impact the solution. In permutation coding, a mutation happens by swapping the place of the genes in the chromosomes. After that, GA repeats, generating new offspring until the expected number of iterations is achieved.

GA is an approach known to be effective in solving combinatorial optimization problems like scheduling problems. Various studies are using GA in solving PFSP. These studies investigated the problem of minimizing the total finishing time (Ruiz et al., 2005), total tardiness (Vallada and Ruiz, 2010) and total earliness and tardiness (Schaller and Valente, 2013). In the literature of GA-based solutions to the FSP, Babaei et al. (2012) dealt with the issue of lot sizing and scheduling in a flow shop setup with n-products and m-machines, considering factors such as sequence-dependent setup times, inventory costs, and the expenses associated with production delays and product waiting. Shahsavari Pour et al. (2013) also tackled the FSP using a GA-based strategy aimed at minimizing completion time, total waiting time, and overall tardiness.

Grasp

GRASP is a metaheuristic optimization technique combining greedy search and randomization elements to find near-optimal solutions. The basic idea behind GRASP is to iteratively construct solutions by selecting the best candidate among a set of randomly generated options while incorporating a local search component to improve the solution's value. GRASP can be easily adapted to different problem domains and can be combined with other heuristics to form hybrid algorithms. GRASP is a fast and effective algorithm that has been shown to produce good results on a wide range of problems. The GRASP iteration consists of two stages: the construction phase and the local search phase. The adaptive randomized greedy function is utilized during the construction phase to generate a feasible solution. Then, this solution is improved using local search algorithms in the following local search phase (Feo and Resende, 1995).

At each iteration, all candidate elements are evaluated based on a greedy evaluation function, and a new element selected from the ground set is included in the solution. This process ends when a feasible solution is found. The greedy evaluation function usually represents the change occurring in the objective function value when a new element is incorporated into the partial solution (Resende and Ribeiro, 2014).

A greedy parameter α [0,1] is used in a greedy evaluation function. GRASP is adaptive because the effects of each remaining element on the objective function are updated to reflect the effect brought on by choosing the last element at each iteration. GRASP is randomized because elements are selected randomly from a restricted candidate list, including the best candidates (Shahul Hamid Khan et al., 2007).

Locally optimality of the solutions produced during GRASP's construction phase is not exact. Therefore, GRASP's second phase, local search, is applied to improve these solutions (Festa and Resende, 2002). The studies applying GRASP indicate that different approaches are adopted in the construction and local search phases. In this study, we used the procedure proposed by Feo and Resende (1995) in the construction phase and the block insertion proposed by Allahverdi (2003) in the local search phase. The procedures are given step by step below:

GRASP- The Steps of the Construction Phase

Step1 - Compute each job's objective function value separately

Step2 - Estimate the objective function's minimum and maximum values

Step3 - Calculate Width=[α x (Max-Min)]

Step4 - Calculate the threshold values of the Restricted Candidate List (RCL)

RCL={ min, min + width}

Step5 - Randomly choose a candidate element from the RCL

Step6 - Repeat steps 1-5 till all jobs' assignments are completed

GRASP- The Steps of the Local Search Phase

Step 1: Take the job sequence (π) obtained in the constructing phase

Step 2: Assign as K=1. Generate alternative sequences of the first two jobs in π. Save the sequence, which has the best objective function value, as the best solution

Step 3: Assign as k=k+1. Take the following two jobs in π. Insert the kth block, which includes these two jobs, to all steps of the existing optimal solution both as it is and by changing the sequence of the jobs in the block. Out of all the candidate solutions, save the one with the best objective function values as the best solution.

Step 4: Repeat Step 3 till assignments of all jobs in π are completed.

GRASP is particularly useful for problems with many possible solutions and can be computationally expensive to solve. GRASP can be employed in a range of scheduling scenarios to optimize objectives such as makespan, total flow time, or total tardiness. There are studies in the literature that address FSP and PFSP using GRASP. For example, Considering FSP to minimize the makespan and maximum tardiness, Shahul Hamid Khan et al. (2007) used a semi-greedy heuristic in the construction phase and block insertion and random insertion perturbation in the local search phase. On the other hand, Arroyo and de Souza Pereira (2011) used a multi-objective GRASP-based heuristic to solve PFSP. They aimed to simultaneously minimize the completion time, maximum tardiness, and makespan and total flowtime. They used an NEH-based heuristic in the construction phase and insertion, general pairwise interchange, and two jobs insertion neighborhood during the local search phase. Finally, Molina-Sánchez and González-Neira (2016) used GRASP to solve PFSP to minimize the total weighted tardiness.

PROBLEM

This study analyzed the scheduling problem of a company that manufactures different-size pressure plates, discs, and release bearings for automobiles. The company has been operating in Izmir for nearly forty years. For the company using cellular manufacturing technologies during the manufacturing phase, a manufacturing cell consisting of eight consecutive machines which produce 215-430 mm rigid and pre-damper hub-type discs with organic bearings was analyzed. A total of 48 jobs in the manufacturing program of the manufacturing cell at a randomly selected shift were used in the study to create a manufacturing plan. All 48 jobs are processed on eight machines in the cell in the same order with different processing times. For this reason, it is seen that the company has a PFSP problem. Table 1 presents the codes of these jobs and the processing times of the machines.

There is no return and repetition between the operations. As a result, processing times are known for all jobs, and no setup is necessary during the transition from one product to another.

APPLICATION

In evaluating the performances of meta-heuristic methods, the extent to which the solutions created by these methods are close to the optimal solution is crucial. Unfortunately, the optimal solution to the real-life problem used in this study is unknown, and it takes too long to obtain it. Therefore, it may be challenging to evaluate the performances of meta-heuristic methods in solving large-scale scheduling problems whose optimal solution cannot be estimated. Therefore, to assess the performances of the meta-heuristic methods used in this study, we solved the test problems called rec31, rec33, and rec35 proposed by Reeves (1995) since these test problems consisting of 50 jobs and ten machines were closest to the real-life problem used in this study in terms of scale. The correlation between test data and real-world data is crucial in securing the results' validity and dependability. A higher degree of similarity between the two leads to more precise and representative results.

We used the Analytic Solver Platform developed by Frontline Systems, which can work with Microsoft Office Excel, to apply the SS and GA methods. The GRASP algorithm was coded using the VBA language. We used

Table 1: Jobs in the Shift Production Schedule and Their Processing Times

	Machines in the Manufacturing Cell							
Job	**RPr-O1**	**RPr-O2**	**RPr-O3**	**RPr-O4**	**RPr-O5**	**RPr-O6**	**RPr-O7**	**RPr-O8**
J01	1′10″	2′20″	2′00″	2′10″	2′25″	3′55″	2′30″	0′45″
J02	0′50″	2′20″	1′30″	2′10″	2′45″	2′50″	1′40″	0′25″
J03	2′00″	1′40″	3′40″	1′30″	2′25″	3′55″	2′30″	0′45″
J04	2′00″	1′40″	3′40″	1′30″	2′25″	3′55″	2′30″	0′45″
J05	2′00″	1′40″	3′40″	1′30″	2′25″	3′55″	2′30″	0′45″
J06	0′50″	1′40″	1′30″	1′30″	2′45″	3′00″	1′40″	0′45″
J07	1′10″	2′20″	2′00″	2′10″	3′45″	3′55″	2′30″	0′45″
J08	1′30″	2′20″	3′20″	2′10″	5′50″	2′20″	1′30″	0′25″
J09	1′30″	2′20″	3′20″	2′10″	5′50″	2′20″	1′30″	0′25″
J10	2′00″	1′40″	3′40″	1′30″	2′25″	2′50″	1′40″	0′25″
J11	1′10″	2′20″	2′00″	2′10″	2′45″	3′55″	2′30″	0′45″
J12	1′10″	2′20″	2′00″	2′10″	2′45″	3′55″	2′30″	0′45″
J13	1′10″	2′20″	2′00″	2′10″	2′45″	3′55″	2′30″	0′45″
J14	0′50″	2′20″	1′30″	2′10″	5′30″	3′55″	2′30″	0′45″
J15	2′00″	2′20″	3′40″	2′10″	3′50″	3′55″	2′30″	0′45″
J16	2′00″	2′20″	3′40″	2′10″	3′50″	2′50″	1′40″	0′25″
J17	1′30″	2′20″	3′20″	2′10″	5′50″	2′50″	1′40″	0′25″
J18	0′50″	2′20″	1′20″	2′10″	3′50″	3′55″	2′30″	0′45″
J19	1′30″	2′20″	3′20″	2′10″	5′50″	3′00″	1′40″	0′45″
J20	1′10″	1′40″	2′00″	1′30″	5′30″	2′50″	1′40″	0′25″
J21	1′30″	2′20″	3′20″	2′10″	3′50″	3′00″	1′40″	0′45″
J22	1′30″	2′20″	3′20″	2′10″	3′50″	2′50″	1′40″	0′25″
J23	2′00″	2′20″	3′40″	2′10″	2′45″	2′50″	1′40″	0′25″
J24	1′10″	1′40″	2′00″	1′30″	3′50″	2′50″	1′40″	0′25″
J25	0′50″	2′20″	1′20″	2′10″	3′50″	2′50″	1′40″	0′25″
J26	0′50″	2′20″	1′20″	2′10″	3′50″	2′50″	1′40″	0′25″
J27	0′50″	2′20″	1′20″	2′10″	3′50″	3′00″	1′40″	0′45″
J28	1′10″	1′40″	2′00″	1′30″	4′45″	3′55″	2′30″	0′45″
J29	1′10″	1′40″	2′00″	1′30″	5′50″	3′00″	1′40″	0′45″
J30	1′30″	2′20″	3′20″	2′10″	2′25″	3′00″	1′40″	0′45″
J31	2′00″	1′40″	3′40″	1′30″	3′50″	2′50″	1′40″	0′25″
J32	0′50″	1′40″	1′20″	1′30″	4′45″	3′00″	1′40″	0′45″
J33	0′50″	1′40″	1′20″	1′30″	4′45″	3′00″	1′40″	0′45″
J34	0′50″	1′40″	1′20″	1′30″	4′45″	3′00″	1′40″	0′45″
J35	0′50″	1′40″	1′20″	1′30″	4′45″	3′00″	1′40″	0′45″
J36	1′10″	2′20″	2′00″	2′10″	5′50″	2′50″	1′40″	0′25″
J37	1′10″	1′40″	2′00″	1′30″	5′30″	2′50″	1′40″	0′25″
J38	1′30″	2′20″	3′20″	2′10″	4′45″	3′00″	1′40″	0′45″
J39	1′10″	1′40″	2′00″	1′30″	3′45″	3′55″	2′30″	0′45″
J40	1′10″	1′40″	2′00″	1′30″	3′45″	3′55″	2′30″	0′45″
J41	1′10″	1′40″	2′00″	1′30″	3′45″	3′55″	2′30″	0′45″
J42	0′50″	2′20″	1′20″	2′10″	2′25″	3′00″	1′40″	0′45″
J43	1′10″	2′20″	2′00″	2′10″	3′45″	3′00″	1′40″	0′45″
J44	1′30″	1′40″	3′20″	1′30″	3′45″	3′00″	1′40″	0′45″
J45	1′30″	1′40″	3′20″	1′30″	3′45″	3′55″	2′30″	0′45″
J46	0′50″	1′40″	1′20″	1′30″	4′45″	2′50″	1′40″	0′25″
J47	1′10″	1′40″	2′00″	1′30″	2′25″	2′50″	1′40″	0′25″
J48	1′10″	1′40″	2′00″	1′30″	2′25″	2′20″	1′30″	0′25″

Table 2: Performance Summary of SS, GA, and GRASP for the Problems rec31-rec33-rec35

	Problem	Opt.	Min	Mean	Max	Dev (%)
SS	**rec31**	50′45″	54′11″	55′09″	62′35″	6,77%
	rec33	51′54″	52′20″	53′38″	55′02″	0,83%
	rec35	53′47″	55′42″	56′48″	60′35″	3,56%
GA	**rec31**	50′45″	51′21″	51′30″	53′00″	1,18%
	rec33	51′54″	52′20″	52′29″	53′40″	0,83%
	rec35	53′47″	54′37″	54′39″	54′53″	1,55%
GRASP	**rec31**	50′45″	53′00″	53′40″	54′06″	4,43%
	rec33	51′54″	53′45″	54′01″	54′10″	3,56%
	rec35	53′47″	55′26″	56′00″	56′21″	3,07%

the procedure prosed by Feo and Resende (1995) during the construction of the algorithm and the block insertion procedure proposed by Allahverdi (2003) during the local search phase. For all problems, 0, 0.2, 0.4, 0.6, 0.8, and 1 were tested as parameter α in the GRASP algorithm and the best solutions obtained after ten repetitions were presented.

During the application of GA and SS, constraint precision was taken as 0.00001, and the convergence value was taken as 0.0001. In the models, the population size was taken as 300, the mutation ratio was taken as 0.15, the random seed was taken as 25, and the tolerance limit was taken as 0.01. The models were finished when no progress occurred after 60 seconds. The model was run 50 times for both methods.

Table 2 gives the findings from solving the test problems using SS, GA, and GRASP.

The best sequences obtained for rec31, rec33, and rec35 using SS, GA, and GRASP are given in Table 3.

Although the three methods used differed in the results of the test problems, they reached the same results in real-life problem. When the real-life problem is solved using SS, GA, and GRASP, the makespan time of all jobs was found to be 11830 seconds by all three methods. Two alternative arrays give the best solution with all methods. These series are as follows:

Table 3: Best Job Sequences of SS, GA, and GRASP for the Problems rec31-rec33-rec35

rec31	**SS:**	J02-J48-J16-J40-J49-J10-J39-J24-J11-J38-J23-J37-J06-J29-J36-J17-J41-J19-J45-J50-J08-J44-J21-J18-J32-J30-J46-J07-J34-J22-J35-J25-J28-J12-J31-J05-J14-J42-J04-J33-J26-J01-J27-J13-J09-J03-J47-J15-J43-J20
	GA:	J18-J16-J34-J05-J23-J48-J06-J46-J17-J08-J36-J49-J40-J35-J37-J10-J11-J38-J26-J24-J42-J31-J03-J04-J39-J02-J44-J41-J28-J15-J14-J29-J32-J30-J21-J09-J22-J12-J33-J07-J50-J25-J19-J45-J13-J20-J47-J43-J27-J01
	GRASP:	J18-J16-J06-J40-J23-J48-J14-J50-J37-J11-J49-J04-J39-J38-J46-J25-J10-J34-J31-J42-J09-J03-J41-J19-J17-J29-J47-J05-J15-J02-J32-J08-J44-J24-J12-J36-J30-J21-J26-J45-J22-J01-J35-J07-J28-J27-J13-J33-J43-J20.
rec33	**SS:**	J31-J07-J44-0J3-J39-J14-J47-J36-J40-J22-J04-J08-J10-J37-J19-J02-J18-J21-J45-J42-J20-J15-J27-J30-J48-J11-J05-J25-J32-J38-J26-J29-J46-J06-J43-J49-J41-J13-J01-J28-J23-J09-J33-J12-J50-J16-J34-J35-J24-J17
	GA:	J31-J7-J45-J14-J47-J36-J27-J34-J39-J3-J42-J22-J43-J40-J04-J41-J15-J1-J48-J32-J30-J29-J2-J25-J50-J18-J8-J46-J38-J10-J44-J11-J37-J21-J26-J6-J19-J23-J5-J35-J9-J28-J12-J13-J33-J20-J49-J16-J24-J17
	GRASP:	J31-J03-J42-J07-J37-J27-J34-J39-J36-J18-J48-J25-J47-J22-J38-J15-J46-J10-J44-J29-J43-J26-J21-J13-J04-J20-J05-J06-J32-J11-J08-J30-J49-J40-J41-J01-J12-J02-J35-J28-J24-J23-J50-J09-J33-J14-J19-J16-J45-J17
rec35	**SS:**	J13-J50-J40-J10-J38-J37-J42-J17-J36-J26-J12-J19-J39-J5-J14-J11-J22-J3-J46-J48-J47-J45-J25-J4-J21-J44-J49-J6-J27-J43-J2-J8-J35-J7-J9-J1-J15-J18-J41-J34-J33-J28-J23-J20-J32-J30-J16-J29-J24-J31
	GA:	13-J14-J40-J2-J39-J50-J42-J25-J12-J10-J3-J36-J29-J21-J9-J17-J23-J45-J4-J44-J19-J41-J26-J27-J6-J46-J5-J33-J20-J35-J47-J15-J8-J37-J11-J38-J43-J22-J16-J18-J34-J1-J30-J7-J48-J49-J32-J28-J24-J31
	GRASP:	J13-J2-J14-J29-J5-J47-J36-J40-J37-J38-J50-J42-J4-J26-J9-J46-J30-J22-J43-J10-J8-J33-J48-J3-J34-J39-J6-J41-J19-J23-J35-J20-J18-J21-J15-J12-J11-J27-J16-J1-J25-J32-J24-J17-J44-J45-J7-J31-J49-J28.

Table 4: Best Alternative Job Sequences of SS, GA, and GRASP for the Real-Life Problem

Real-Life Problem	**Alternative Sequence 1:**	J32-J14-J37-J27-J43-J23-J40-J33-J29-J19-J41-J18-J38-J48-J02-J17-J46-J30-J34-J45-J39-J24-J25-J4-J35-J3-J28-J10-J13-J44-J20-J16-J8-J5-J6-J26-J42-J12-J15-J47-J11-J7-J21-J31-J36-J1-J22-J9
	Alternative Sequence 2:	J32-J2-J12-J9-J3-J13-J31-J14-J29-J41-J37-J46-J26-J45-J11-J34-J39-J23-J20-J1-J15-J27-J19-J6-J42-J48-J4-J38-J24-J28-J21-J25-J30-J18-J33-J07-J43-J35-J40-J44-J05-J16-J17-J10-J47-J36-J22-J8

CONCLUSION

The use of meta-heuristics in scheduling within the manufacturing sector in Turkey is likely to have gained significant attention in recent years. As companies strive to improve their production processes, they are looking for effective scheduling methods that can help optimize their operations. Effective scheduling leads to improved productivity, increased customer satisfaction, better resource management, and reduced costs, making it an essential aspect of operations management and business success. As a result, meta-heuristics, with their ability to provide flexible, efficient, and high-quality solutions to scheduling problems, are becoming increasingly popular among Turkish manufacturing companies. This study addressed PFSP with a real-life problem of a company that adopted cellular manufacturing technologies. The PFSP, a widely researched topic in the field for many years, is recognized as an NP-hard problem. As a result, meta-heuristic techniques are often utilized to address this challenging issue. The PFSP was tackled using SS, GA, and GRASP, and the efficiency of these meta-heuristic methods was then compared to one another. Furthermore, to evaluate the performances of these methods, the test problems called rec31, rec33, and rec35 proposed by Reeves (1995) were solved since these test problems were closest to the real-life problem used in this study in terms of scale.

SS uses a set of reference solutions to guide the search process, GA uses genetic operations to evolve a population of solutions, and GRASP uses a greedy strategy combined with randomization to generate solutions incrementally. GA was the most successful method in solving all test problems. GRASP was more successful for rec31 and rec35 than SS; however, SS obtained the same result as GA for rec33, yielding a solution with only a 0.83% deviation from the optimal solution. The analysis of the methods' performances in solving the real problem shows that all methods yielded the same result because the problem included jobs with similar processing times that were categorized based on certain features. GRASP is deemed superior as it strikes a balance between exploring new solutions and utilizing the best solution discovered thus far, thereby increasing the likelihood of uncovering the optimal solution.

PFSPs are common and can be found in real-world production environments often. Therefore, optimizing the PFSP impacts production efficiency and makes them an important area of research and development. The findings demonstrate the potential benefits of adopting this approach and can serve as a valuable reference for other companies considering similar solutions.

In conclusion, this study revealed that successful results could be obtained using SS, GA, and GRASP to solve PFSP. In future studies, the success of the methods can be retested by taking longer-term data from the company. Also, this problem can be tested by changing the parameters of the methods and using them in a hybrid way, or other metaheuristic algorithms can be developed for PFSP solutions in future studies.

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Brand Foreignness and Anger Decrease Purchase Intentions of Ethnocentric Consumers for National Icon Products

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ABSTRACT

The marketing literature lacks a thorough understanding of how emotions change ethnocentric consumers' brand quality perceptions and purchase intentions when there are two different nationality signals about the product evaluated (i.e., product nationality signal vs brand nationality signal). To address this gap, we conducted an empirical study (mixed-design ANOVA) with ethnocentric consumers to test whether anger and sadness change purchasing intentions and perceptions of brand quality for fictitious brands across two different product types (national icon product vs non-national icon product). The regression analysis indicates that when ethnocentric consumers are induced to feel anger, their purchase intentions for national icon products decrease significantly when the product has a foreign brand image. Because incidental anger (i.e., the feeling of anger carried over from a situation unrelated to the decision at hand) triggers stereotypical reasoning, angry ethnocentric consumers seem to focus on the nationality image of the brand rather than the nationality image of the product class (i.e., national icon products signaling a nation's heritage). Our study displays the powerful impact of incidental emotions on ethnocentric consumers' judgment and decision-making for brands with foreign vs domestic images.

Keywords: Emotions and Decision Making, Ethnocentrism, National Icon Products, Purchase Intentions.

JEL Classification Codes: M30, D91, D12

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INTRODUCTION

When making product quality judgments and purchasing decisions, consumers consider many factors, such as a product's brand name and its origin (i.e., domestic vs foreign brands) (Mohan et al., 2018; Strizhakova & Coulter, 2015), and the product type involved (e.g., food vs luxury products) (Ger & Belk, 1996; Ger, 1999; Özsomer, 2012). Alongside these product-related concerns, consumers are affected by their feelings that are shaped by their shopping experiences as well as by their incidental emotions (George & Dane, 2016; Lerner, Li, Valdesolo, & Kassam, 2015; Pocheptsova et al., 2015; Schlosser, 2015; Szymkowiak et al., 2021). However, emotions can affect purchasing decisions differently depending on emotionally laden consumer characteristics such as ethnocentrism.

Ethnocentric consumers favor products of their nation as an emotional-political loyalty (Batra et al., 2000; Siamagka & Balabanis, 2015). How this emotional-political loyalty is subject to different emotional experiences seems to be underexplored in the marketing literature. To address this gap, we empirically tested how brand quality perceptions and purchase intentions of ethnocentric consumers toward foreign or domestic brand names change by-product iconicity (i.e., whether a product is a national icon or not) and by emotional states. Specific emotional conditions trigger discrete judgments, which lead to disparate decisions (Dunning et al., 2017; George & Dane, 2016; Lerner et al., 2015; So et al., 2015; Su et al., 2018). Here, we focus on the most commonly experienced negative emotions, namely anger and sadness, which are important to examine as two of the six universal and basic emotions (Ekman, 1992; Escadas et al., 2020).

When individuals are angry, they engage in heuristic information processing in which they become more reliant on stereotypes (Foo, 2011; Lerner et al., 2015; Small & Lerner, 2008; Su et al., 2018; Tiedens & Linton, 2001). We expected to observe this information processing pattern in ethnocentric consumers' judgments when they are angry. As such, we expected that ethnocentric consumers

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focus on a stereotype of a national icon product belonging to a domestic brand by connecting the perceived brand foreignness of a national icon product and a negative brand quality, which eventually leads to less purchase intention. In comparison, when consumers are sad, we expect that they process information systematically and become less dependent on stereotypes such that their bias against foreign brands decreases. Thus, it is expected that sadness would weaken the influence of stereotypical reasoning (which associates a national icon product with a domestic brand) on consumer judgment and decision-making (Bodenhausen et al.,2000; Clore et al., 2001; Ger, 1999; Lerner et al., 2015; Small & Lerner, 2008; Tiedens & Linton, 2001). Before reporting details of our study, we first outline the relevant literature as follows.

LITERATURE REVIEW AND HYPOTHESES

Perceived Brand Foreignness and Perceived Brand Quality

Perceived brand foreignness is a concept derived from the country of origin literature (Batra et al., 2000; Zhou, Yang, & Hui, 2010). Country of origin studies inquiries into consumer attitudes toward a product or a brand due to the originating country. In those studies, the 'country of origin effect' is accepted to shape consumer attitudes (Han, 2020; Herz & Diamantopoulos, 2017; Janda & Rao, 1997; Suh et al., 2016; C. K. Wang & Lamb, 1983; Wang & Heitmeyer, 2006). While the properties of a specific country cause the country-of-origin effect, the effect of perceived brand foreignness is not dependent on a particular country. The effect of perceived brand foreignness is different from the country-of-origin effect because it results from more general characteristics (i.e., whether the brand is perceived as foreign or domestic) (Askegaard & Ger, 1998). The critical point is consumers' perception matters rather than whether it is genuinely foreign or domestic (Askegaard & Ger, 1998; Batra et al., 2000; Samiee et al., 2005; Zhou et al., 2010).

Due to a complex global market and business environment, consumers may find themselves in a situation where they fail to detect the origin country of brands (Shimp et al., 2001; Zhou et al., 2010; Chen et al., 2020). In comparison, exploring the effect of perceived brand foreignness, which is the perception that a brand creates, can provide more meaningful results. Therefore, it is better to focus on the perceptions of consumers rather than the actual origin information. (Alden et al., 1999). Hence, "Perceived brand foreignness" (PBF) steps forth as a concept derived from the literature on the country of origin and can be defined as consumers' perception of whether a brand is foreign or domestic (Batra et al., 2000; Zhou et al., 2010). Foreignness is not limited to a specific country, as consumer perception is related to a brand's more general characteristics and can be explained through perceived brand foreignness. Whether a brand is foreign or domestic is a more general categorical division in the mind of consumers than that of the origin country-oriented division (Batra et al., 2000; Samiee et al., 2005; Zhou et al., 2010), which is narrow in terms of being restricted to merely one country (Askegaard & Ger, 1998; Han, 2020).

The attractiveness of foreign brands, which affects consumers in developing countries, gives them an advantage over domestic brands (Alden et al., 1999; Batra et al., 2000; Zhou et al., 2010). This advantage results from associating the foreign brand image with being superior and upscale and having higher status, wealth, and allure. The domestic brand image is associated with being downscale and inferior (Ger et al., 1993; Ger, 1999; Wang and Heitmeyer, 2006; Zhou. et al., 2010). Products of foreign brands are perceived to be of higher quality (Zhou et al., 2010). It is also illustrated that if a consumer in a developing country perceives a brand to be foreign, this positively impacts her/his attitudes toward the same brand (Batra et al., 2000; Sun et al., 2017). Hence, many domestic brands in developing countries come up with foreign names, symbols, and slogans to constitute a foreign (mainly Western) brand image (e.g., Lenovo in China) (Zhou et al., 2010).

The signaling theory explains the relationship between perceived brand foreignness and perceived brand quality. Due to the asymmetrical and imperfect information offered to consumers in the market environment, the brand attribute of foreignness becomes an indication of brand quality (Erdem & Swait, 1998; Erdem & Swait, 2004; Mandler, 2019). Hence, in developing countries, products of foreign brands have the image of higher quality, standards, and excellence (Zhou et al., 2010), as well as being identified with wealth, prestige, superiority, and higher status (Ger et al., 1993; Ger, 1999; Zhou et al., 2010). Foreign brands attract consumers of developing countries as they represent wealth, high quality, high status, and superiority. In line with the signaling theory, the brands perceived as foreign by consumers of developing countries enjoy higher quality perceptions (Ger et al., 1993; Ger 1999; Zhou et al., 2010).

Purchase Intention of Ethnocentric Consumers

One can construct a theoretical relationship between perceived brand quality and purchase intention by

adopting the accessibility-diagnosticity theory, which argues that an individual's decision making, with respect to an object, is based on information coming from the memory and on the adequacy of that information to stimulate inferences for decision making (Feldman & Lynch, 1988; Swoboda et al., 2012; Swoboda & Hirschmann, 2016; Laufer & Wang, 2018; Abdellah-Kilani & Zorai, 2019).

Based on the accessibility-diagnosticity theory, Swoboda and Hirschmann (2016) argue that "Perceived Brand Globalness" can be accepted as accessed information, which leads to decision-making for loyalty behavior through perceived value. Perception related to brand globalness (universality) is retrieved from the memory, and then this perception related to the brand is expected to be diagnostic in the determination of value. With the same logic, perceived brand quality can be considered information that one retrieves from memory; this perception of the brand is then expected to be diagnostic in the determination of the purchase intention of consumers (Feldman & Lynch, 1988; Swoboda et al., 2012; Swoboda & Hirschmann, 2016). From the literature above, we deduce that perceived brand quality increases the purchase intention of consumers.

Some consumers may favor domestic brands because of their ethnocentric concerns (Batra et al. 2000; Papdopoulos & Heslop, 1993). Domestic brands have become appealing because domestic brands make consumers feel close to their own culture. Domestic brands also inspire pride, originality, and prestige (Strizhakova & Coulter, 2015). Domestic brands can particularly benefit from this effect by using cultural resources to appeal to consumers' needs and desires (Ger, 1999; Swoboda et al., 2012).

From the perspective of social identity theory (Balabanis et al., 2019), ethnocentrism can be defined as perceiving one's own culture as favorable to others (Batra et al., 2000; Siamagka & Balabanis, 2015). In the context of consumption, it can be conceptualized as a concern of performing consumer behaviors that are in line with the interest of one's own country and higher quality perception of domestic products (Batra et al., 2000; Shimp & Sharma, 1987; Siamagka & Balabanis, 2015; Strizhakova & Coulter, 2015; Swoboda & Hirschmann, 2016; Watchravesringkan, 2011). The empowerment of nationalism, especially in developing countries, is another factor that can benefit domestic brands (Heinberg et al., 2016).

Empirical results from the studies of brand attitudes and ethnocentrism are inconsistent. Some studies demonstrate a negative relationship between perceived brand foreignness and the purchase intention of ethnocentric consumers. However, some illustrate no meaningful relationship or even a positive one, where an increase in brand foreignness increases purchase intention (Swoboda & Hirschmann, 2016). Some argue that domestic brand and product purchases are related more to consumers' characteristics (e.g., age, gender, and travel habits) (Nguyen et al., 2008; Strizhakova & Coulter, 2015). Another explanation of this inconsistency is that ethnocentrism effects vary depending on product type (Balabanis & Diamantopoulos, 2004; Balabanis et al., 2019).

Stemming from discussing the factors related to consumer ethnocentrism, we have two possible explanations for altering the brand foreignness effect. First, embarking on a product- type discourse, we focus on national icon products, defined as products reflecting the culture, traditions, and structure of a nation. We explain whether product iconicity interferes with ethnocentric consumers' quality perceptions and purchase intentions. We propose that when a foreign brand offers a national icon product, the quality perceptions of ethnocentric consumers decrease. We then direct our attention to the literature on decision-making and emotions by illustrating the role those incidental emotions take in the brand quality judgments and purchase intention decisions of ethnocentric consumers. As individuals alter behaviors and decisions due to incidental choices, we expect ethnocentric consumers to change their purchase-related decisions and behaviors when induced by incidental anger and sadness.

Factors Altering the Effect of Perceived Brand Foreignness

Holt (2003) argues that some brands perceived as 'national icons' can achieve success in the market and business through cultivating cultural relations with customers. These brands can communicate consumers' shared values and culture (Holt, 2003). Drawing on Holt's study, Özsomer (2012) defines "local iconness" as the degree to which a particular brand symbolizes local values, demands, and desires. She maintains that "perceptions of a brand being a good symbol of the country, embodying the local culture, and representing what the country is all about are included in the conceptual domain of local iconness." (Özsomer, 2012, p.73). Along the same line, some product types can be identified as local or national icons, meaning they reflect national history,

shared culture, and a common lifestyle. In their article Spielmann et al. define a "nationally-iconic product" as a collective memory of a nation (2020, p.390). Our study maintains that depending on the product iconicity, ethnocentric consumers' quality perception changes as brand foreignness changes. There is support in the literature: for instance, Mohan et al. (2018) mention that one can expect a particular product type to be domestic due to consumer tastes. Also, culture and history are embedded in some products; one can observe this in nations' consumption habits. Kravets (2012) provides a clear illustration of this through the identification of vodka with Russian culture and nationality. Moreover, in such culturally related products, one can assert that consumers have a higher quality perception of domestic brands. The food and organic fiber categories are examples of this (Hustvedt et al., 2013; Özsomer, 2012; Strizhakova & Coulter, 2015).

We propose that for ethnocentric consumers who prioritize their cultural connections, differentiation in perceived brand quality occurs as the product type changes from national icon to non-national icon. For those consumers, the degree of product iconicity determines the relationship between perceived brand foreignness and perceived brand quality. In other words, when ethnocentric consumers consider product type output of their national or cultural history and associate it with the shared lifestyle, they expect that product to belong to a domestic brand. They will perceive it as lower quality if the product is thought to belong to a foreign brand. Whereas, for product types classified as non-national icons, perceived brand foreignness has a decreasing effect on perceived brand quality, which eventually diminishes purchase intention.

H1a: Perceived brand quality of ethnocentric consumers differentiates depending on the perceived foreignness and the product iconicity

H1b: Purchase intention of ethnocentric consumers differentiates depending on the perceived foreignness and the product iconicity

H2a: Through the perceived brand quality of ethnocentric consumers, perceived brand foreignness has a positive indirect effect on purchase intention for the non-national icon products

H2b: Through the perceived brand quality of ethnocentric consumers, perceived brand foreignness has a negative indirect effect on purchase intention for the national icon products

The interaction of the product iconicity and perceived brand foreignness is expected to affect perceived brand quality because ethnocentric consumers evaluate the brand's quality depending on the combination of the brand's foreignness and product iconicity of the product. Then this is expected to be followed by the evaluation of their purchase intention.

The Effect of Emotions

According to many psychologists, most of the decisions we make are led by emotions (Lerner et al., 2015). This finding displays emotions' powerful influence on decision-making (Khatoon & Rehman, 2021; Lerner et al., 2015). As the psychology literature states, emotions are divided into integral emotions (which are related to the task at hand) and incidental emotions (which are not normatively associated with the task and the decision) (Lerner et al., 2015; Schlosser, 2015). These two categories of emotions constitute the immediate emotions one feels when making a decision (Dunning et al., 2017). It has been argued that incidental emotions are effective in decision-making for the short- and long-term in every aspect of our life (George & Dane, 2016; Schlosser, 2015).

Regarding emotions, judgments, and decision-making, two remarkable theoretical accounts stand out, the valence approach and the appraisal tendency framework (ATF). The valence approach (global positive-negative effect), which argues that feelings with the same valence lead to similar decision-making, has been widely accepted (Bogazzi et al., 2016; Desteno et al., 2014; Lerner & Keltner, 2000; Mukhopadhyay et al., 2018; Troilo et al., 2014). According to this approach, all positive emotions promote similar judgments, most likely positive; all negative emotions give rise to pessimistic judgments (DeSteno et al., 2000; Escadas et al., 2020; Lerner & Keltner, 2000). However, the appraisal tendency framework (ATF) argues that, contrary to the valence-based approach, emotions of the same valence (positive or negative value) are crucially different (Lerner et al., 2015). By linking appraisal processes (which are associated with particular emotions) to different choice outcomes, ATF suggests that specific emotions lead to discrete decision-making behaviors (Lerner et al., 2015; So et al., 2015; Su et al., 2018). It is also known that consumers make different judgments and choices under distinct emotions and on the grounds of the appraisal tendency framework, within and across the valences (Han et al., 2007; So et al., 2015; Su et al., 2018). We argue that consumers' emotions interfere with the impact of consumers' brand foreignness perceptions and purchase intentions.

We chose anger and sadness as the emotions to experiment with because they are two of the six universal emotions and, despite having the same valence, their impact on individuals is expected to be different (Ekman, 1992; Foo, 2011; Lerner et al., 2015; Small & Lerner, 2008; So et al., 2015; Su et al., 2018; Tiedens & Linton, 2001).

H3a: Perceived brand quality of ethnocentric consumers differentiates depending on the perceived foreignness and the incidental emotions of anger and sadness

H3b: Purchase intention of ethnocentric consumers differentiates depending on the perceived foreignness and the incidental emotions of anger and sadness

Smith and Ellsworth (1985) posit that each emotion has different appraisal dimensions with distinct patterns related to certainty, pleasantness, attentional activity, control, anticipated effort, and responsibility. Each emotion has a core appraisal theme, which gives rise to specific outcomes (Han et al., 2007; Kemper & Lazarus, 1992). Depending on appraisal dimensions and core appraisal themes, all emotions have a certain appraisal tendency (Han et al., 2007; Lerner & Keltner, 2000; So et al., 2015). Specific appraisal tendencies lead to certain content and depth of thoughts that cause individual judgments and decisions (Han et al., 2007; So et al., 2015). Depth of thought or information processing is associated with the certainty dimension of emotions (Tiedens & Linton, 2001). Hence, the certainty dimension is decisive in terms of whether the information processing type is either heuristic or systematic (Lerner et al., 2015). When the certainty level of individuals is low, they engage in systematic processing.

On the contrary, individuals with a high certainty level practice heuristic processing based on cues. In cases where stereotypes exist, the high certainty level dimension of emotion appraisals promotes confirmation of the stereotype (Tiedens & Linton, 2001). Because during information processing, stereotypes which are accepted norms, function as heuristic cues and offer a foundation for a member of a social group to engage in quick responses or mental shortcuts concerning particular properties of an outgroup (Bodenhausen, Kramer, & Siisser, 1994; Chen et al., 2020; Davvetas & Halkias, 2019). During this process, the in-group vs outgroup status of brand images affects consumer stereotypes. Accordingly, consumers form their stereotypical expectations about cultural products. The reason is that symbolic values are crucial for manifesting stereotypes that form views and beliefs (Askegaard & Ger, 1998). Considering these, when examining the effect of two universal emotions on consumer decision- making, differentiation becomes apparent (although their impacts were initially thought to be the same due to being of the same valence).

Individuals who are subject to incidental anger become more confident about their initial preferences and less confident about new information (Agrawal et al., 2013; George & Dane, 2016). Connected with the appraisal dimension of anger, one can observe a high level of certainty in those individuals (Lerner et al., 2015; So et al., 2015; Su et al., 2018; Tiedens & Linton, 2001). Through the meta-level sense, they begin to be more confident in their judgments and think they do not need extra information. Also, their engagement in information scrutiny decreases (Small & Lerner, 2008). In that case, individuals with incidental anger, due to a high certainty level, engage in heuristic processing and depend on stereotypes more than those in a neutral state (Clore et al., 2001; Tiedens & Linton, 2001). Anger empowers the tendency to reassure the individuals' perspectives (Clore et al., 2001). In the context of our study, 'the stereotypic expectation', which is to be confirmed (Ger et al., 1999), is that a domestic brand would offer a national icon product. Therefore, the high perceived brand foreignness of a national icon product serves as a cue. One would expect consumers under the influence of anger to rely on this cue and consider the product lower quality. As a result, we expect ethnocentric consumers with incidental anger to be negatively affected by the perceived brand foreignness of a national icon product; this promotes further negative product quality of brand perceptions and thus decreases their purchase intentions.

H4a: When a brand is perceived as foreign, its interaction with anger has a decreasing indirect effect on the purchase intention of ethnocentric consumers for national icon products

Sadness is related to a low level of certainty and creates a meta-sense of caution due to this lower confidence level. Under the influence of sadness, individuals process information deeper before arriving at a judgment (Small & Lerner, 2008). Their decision-making strategies about the information they are processing become more detail-oriented (Bodenhausen et al., 2000). Factors other than brand foreignness and product iconicity guide the judgment procedure. Consumers' stereotype attenuates in the sense that consumers do not expect (or expect less) a national icon product belonging to a domestic brand. Thus, heuristic cues become less influential in decision-making. In that case, individuals with incidental sadness, due to a low certainty level, engage in systematic processing (Tiedens & Linton, 2001). As a result of higher

information scrutiny (Small & Lerner, 2008), the perceived brand foreignness of a national icon product type serves as a cue, which is expected to have a reduced effect on consumers because of the influence of sadness. Hence, we expect those ethnocentric consumers to be influenced less by the effect of a national icon's perceived brand foreignness; this weakens negative perceptions and increases purchase intention.

H4b: When a brand is perceived as foreign, its interaction with sadness has an indirect effect, which increases purchase intention for ethnocentric national icon products.

METHODOLOGY

Research Design

This research has an independent variable of perceived brand foreignness (X), a dependent variable (Y) of purchase intention of ethnocentric consumers, a mediator variable (M) of perceived brand quality, and a moderator variable of the emotions (W) of sadness, anger, and neutral state (which is a control group). The experiment is done with two different product types (a national icon product and a non-national icon product). Both the unit of observation and the unit of analysis are individuals who are Turkish ethnocentric consumers.

First, 154 participants were assigned to three emotion induction conditions: anger, sadness, and neutral (control), with 45 participants in anger, 54 participants in sadness, and 45 participants in the control group. The participants were told to answer questions related to the national icon product and the non-national icon product, and brands with foreign and domestic images for each condition.

Then we conducted simple and moderated mediation analyses to present a causal and conditional link among the variables.

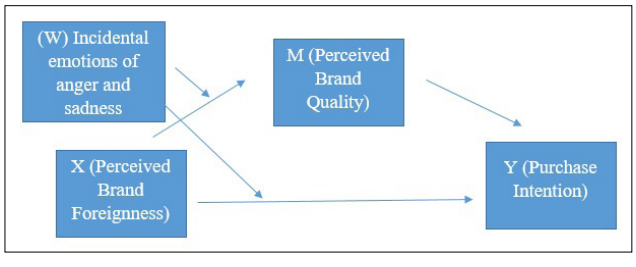

Figure 1. Conceptual Diagram

Sample

Following our unit of observation, the sample is comprised of Turkish ethnocentric consumers. Initially, we used convenience sampling to reach Turkish consumers. 301 individuals responded to the survey questionnaire. Through purposive sampling, we selected respondents who have the characteristics of Turkish ethnocentric consumers. The appropriateness of these characteristics is evaluated based on the questions adapted from Batra et al. (2000) and Shimp and Sharma (1987). Out of 301, only 154 respondents fit the criterion.

Procedure and Material

Pre-study: Selection of Product as National Icon

Following the measures of Batra et al. (2000) and Steenkamp et al. (2003), 19 Turkish participants were subjected to an open-ended online survey to report the products they consider to be national icons. After the open-ended survey, a closed-ended survey questionnaire was conducted with 17 Turkish participants in which they selected a national and a non-national icon product. They received 10 item surveys; the surveys reveal that the rug was chosen as the national icon product, and the computer was chosen as the non-national product. The surveys were originally in Turkish and translated later into English.

Main Study

Once the products were selected, we prepared the survey questionnaire for the main study in Qualtrics. We included demographic questions of gender, age, education level, and profession. We also provided consumer ethnocentrism with a 3-item 7-point Likert scale, which is the adaptation of the CETSCALE of Shimp and Sharma (1987). Without giving country of origin details but hinting at foreignness or localness through brand story and name (De Meulenaer et al., 2015), we introduced two rugs brands Hypnos and Piyan, and two brands of computers, C- Novus and Tektem. Then we provided a 3-item 7-point Likert scale of perceived brand foreignness (PBF) adapted from Batra et al. (2000).

Table 1: Brand Matrix

	National Icon	Non-national Icon
Foreign	Hypnos	C-Novus
Domestic	Piyan	Tektem

Table 2: Perceived Brand Foreignness Point of Brands

	PBFHypnos	PBFPiyan	PBFCNovus	PBFTektem
Valid	301	300	301	298
Missing	1	2	1	4
Mean	4.049	2.708	5.060	2.620
Std. Deviation	1.422	1.203	1.386	1.150

For Hypnos 301, Piyan 300, C-Novus 301, and Tektem 298, participants provided perceived brand foreignness points.

Following the procedures of Wingenbach et al. (2019) and Lerner et al. (2003), we then carried out emotion induction. Participants were presented with a vignette and a picture that would presumably put them into one of the three emotional conditions (incidental anger, incidental sadness, and control). They were asked about the level of sadness and anger they felt on a 7-point Likert scale. Adapting from Yoo and Donthu (2001), we employ the 7-point scale to measure the participants' perceived brand quality and purchase intention for each brand.

Control Variables

We control for several variables, either during experimentation or analyses. In the experiment, participants were informed about four brands' products and were given information about price and accessibility. We use similar wording regarding accessibility and price across brands to control for these two variables: product price and product accessibility (APPENDIX C). We have these control variables to ensure a brand's product was not chosen over another out of product's lower price or easier access to the product.". During ANOVA and OLS regression analysis, the gender, age, education level, and professions of participants were controlled as covariates.

Data Analysis

Initially, we checked if the introduced brands were perceived as expected (either foreign or domestic) by analyzing respondents' PBF points. If the PBF was over 3.5 (out of 7), we accepted it as foreign, and if not, we considered it domestic (It is because the mean of the sample in terms of ethnocentrism score is approximately 3.5). We only incorporated respondents who were classified as ethnocentric consumers (with ethnocentrism point above 3.5).

In the first step, we conducted a 3×2×2 ANOVA to test the effect of PBF in interaction with emotional states and product type on the mediator, which is perceived brand quality (PBQ). Then we did the same analysis for the dependent variable, purchase intention (PI). There are three emotions between the groups: anger, sadness, and control. Participants were assigned to either anger, sadness, or the control group. For experimental manipulation to be successful, points given to feeling sadness should be higher than those for feeling anger in the sadness group, and the points given to feeling sadness should be lower than those for feeling anger in the anger group; neither sadness nor anger should be felt in the control group. For product type, there are two categories: national icon and non-national icon. All participants were subjected to questions concerning the national icon product (rug) and the non-national icon product (computer). There are two PBFs within the groups: foreign and domestic. Based on PBF points,

Hypnos and C-Novus are perceived as foreign, while Piyan and Tektem are considered domestic (as we expected). Likewise, all respondents were provided with questions related to domestic and foreign brands.

We selected the respondents who scored above 3.5 on the average ethnocentrism scale to participate in the experiment. With the minimum point of 3.67 and the maximum point of 7, 154 individuals fulfill the criterion.

Table 3: 3×2×2 Mixed Design with Repeated Measures for the Last Two Factors

		Brand Perception (Within-Repeated Measures)		Product Type (Within-Repeated Measures)	
		Foreign	**Domestic**	**National Icon**	**Non-national Icon**
Number of Experiment Participants (Between)	**Control**	45	45	45	45
	Anger	45	45	45	45
	Sadness	54	54	54	54

Table 4: Descriptive Statistics of Participants

	Consumer Ethnocentrism
Valid	154
Missing	0
Mean	5.067
Std. Deviation	0.990
Minimum	3.667
Maximum	7.000

Secondly, we ran OLS regressions using the conditional process analysis with simple mediation for each of the brands, one by one, using Model 4 from Hayes (2018). In this model, PBF is the independent variable (X), PBQ is the mediator (M), and PI is the dependent variable (Y).

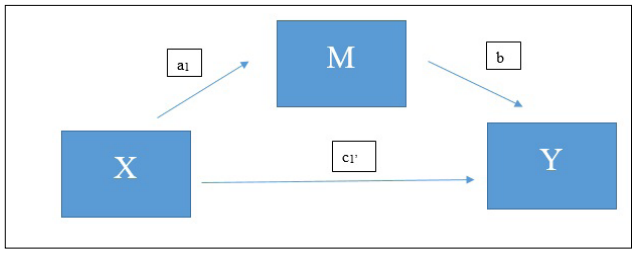

Figure 2. Statistical Diagram of Model 4

In the next step, we undertook the OLS regression of moderated mediation with Model 8 (Hayes, 2018). We kept all the variables of Model 4 the same while adding emotional state as the moderator (W). To analyze the changes in effect across emotions, we carried out this procedure for the brand Hypnos. As hypotheses 4a and 4b encompass the brand that is perceived as foreign (on average) and has a national icon product, only Hypnos is the subject of this last analysis.

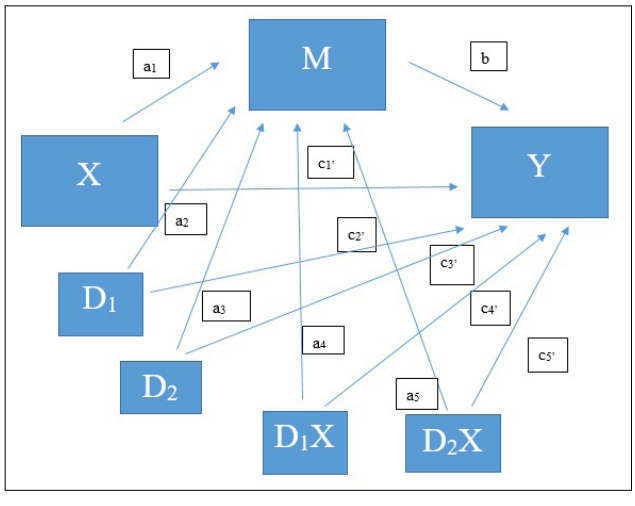

Figure 3. Statistical Diagram of Model 8

RESULTS

Out of 154, 144 participants were successfully manipulated during the experiments, with a group distribution as follows: 45 in control, 54 in sadness, and 45 in anger. The manipulation of 10 participants was not successful because they didn't feel as we expected them to. As a result, they didn't partake in the experimental groups.

Table 5: Distribution of Participants Across Groups

	Emotional State Groups			
	Control (1)	Sadness (2)	Anger (3)	NaN
Valid	45	54	45	0
Missing	0	0	0	10

We conducted 3×2×2 ANOVA to test the effect of PBF in interaction with emotional state and product type on PBQ and PI. As the results display, the product type's interaction effect and perceived brand foreignness on perceived brand quality are statistically significant on perceived brand quality ($p<0.001$). Thus, our findings confirm H1a. Also, the interaction effect of product type and perceived brand foreignness on purchase intention is statistically significant ($p<0.01$). Therefore, our findings confirm H1b as well.

In the same manner, the results illustrate that the interaction effect of emotional conditions (experimental condition) and perceived brand foreignness is statistically significant on perceived brand quality ($p<0.01$). Hence, our findings confirm H3a. Moreover, the interaction effect of the emotional condition (experimental condition) and perceived brand foreignness on purchase intention is statistically significant ($p<0.001$). Therefore, our findings confirm H3b.

For Hypnos, the indirect effect of perceived brand foreignness is statically insignificant ($p>0.5$). Likewise, it is nonsignificant for Piyan ($p>0.5$). Therefore, our findings cannot confirm H2a (through the perceived brand quality of ethnocentric consumers, perceived brand foreignness has a negative indirect effect on purchase intention for the national icon products).

For C-Novus and Tektem, perceived brand foreignness's indirect effect is statistically insignificant ($p>0.5$). Therefore, our findings cannot confirm H2b.

For Hypnos, the conditional indirect interaction effect of perceived brand foreignness and anger is statistically significant because the confidence interval does not

Table 6: Within Subject Effect on Purchase Intention

	Sum of Squares	df	Mean Square	F	p
Product Type	1.253	1	1.253	1.412	0.237
Product Type ✻ Emotional State	1.804	2	0.902	1.017	0.365
Product Type ✻ Gender	2.381	1	2.381	2.683	0.104
Product Type ✻ Age	2.728	1	2.728	3.075	0.082
Product Type ✻ Education	0.448	1	0.448	0.505	0.479
Product Type ✻ Job	0.405	1	0.405	0.456	0.501
Residual	119.776	135	0.887		
Brand Foreignness	12.302	1	12.302	4.543	0.035
	126.535	2	63.267	23.366	< .001
Brand Foreignness ✻ Gender	7.949	1	7.949	2.936	0.089
Brand Foreignness ✻ Age	23.924	1	23.924	8.835	0.003
Brand Foreignness ✻ Education	1.537	1	1.537	0.568	0.452
Brand Foreignness ✻ Job	22.117	1	22.117	8.168	0.005
Residual	365.540	135	2.708		
Product Type ✻ Brand Foreignness	13.966	1	13.966	7.593	0.007
Product Type ✻ Brand Foreignness ✻ Emotional State	0.282	2	0.141	0.077	0.926
Product Type ✻ Brand Foreignness ✻ Gender	2.908	1	2.908	1.581	0.211
Product Type ✻ Brand Foreignness ✻ Age	0.002	1	0.002	9.278e -4	0.976
Product Type ✻ Brand Foreignness ✻ Education	3.372	1	3.372	1.833	0.178
Product Type ✻ Brand Foreignness ✻ Job	1.704	1	1.704	0.927	0.337
Residual	248.299	135	1.839		

Table 7: Within Subject Effects on Perceived Brand Quality

	Sum of Squares	df	Mean Square	F	p
Product Type	0.867	1	0.867	0.818	0.367
Product Type ✻ Emotional State	6.860	2	3.430	3.237	0.042
Product Type ✻ Gender	1.603	1	1.603	1.512	0.221
Product Type ✻ Age	3.749	1	3.749	3.538	0.062
Product Type ✻ Education	3.225	1	3.225	3.044	0.083
Product Type ✻ Job	0.149	1	0.149	0.140	0.709
Residual	145.174	137	1.060		
Brand Foreignness	1.906	1	1.906	1.188	0.278
Brand Foreignness ✻ Emotional State	75.499	2	37.750	23.542	< .001
Brand Foreignness ✻ Gender	0.808	1	0.808	0.504	0.479
Brand Foreignness ✻ Age	11.893	1	11.893	7.417	0.007
Brand Foreignness ✻ Education	0.956	1	0.956	0.596	0.441
Brand Foreignness ✻ Job	6.691	1	6.691	4.173	0.043
Residual	219.680	137	1.604		
Product Type ✻ Brand Foreignness	25.820	1	25.820	20.012	< .001
Product Type ✻ Brand Foreignness ✻ Emotional State	13.359	2	6.680	5.177	0.007
Product Type ✻ Brand Foreignness ✻ Gender	15.029	1	15.029	11.648	< .001
Product Type ✻ Brand Foreignness ✻ Age	0.392	1	0.392	0.304	0.582
Product Type ✻ Brand Foreignness ✻ Education	8.090	1	8.090	6.270	0.013
Product Type ✻ Brand Foreignness ✻ Job	0.617	1	0.617	0.478	0.491
Residual	176.768	137	1.290		

Table 8: Points Estimates from OLS Regression for Brand Hypnos

Model 4	coeff	se	t	p	LLCI	ULCI
Constant	.8821	.8002	1.1024	.2721	-.6993	2.4635
PBFHypnos	-.0950	.0681	-1.3948	.1652	-.2297	.0396
PBQHypnos	.7809	.0673	11.6051	.0000	.6479	.9138
Gender	-.1108	.2033	-.5448	.5867	-.5126	.2910
Age	-.0376	.0779	-.4826	.6301	-.1916	.1164
Education	.0324	.1136	.2855	.7757	-.1921	.2570
Job	.0216	.0460	.4700	.6391	-.0693	.1125

Table 9: Points Estimates from OLS Regression for Brand Piyan

Model 4	coeff	se	t	p	LLCI	ULCI
Constant	1.4012	.8295	1.6892	.0933	-.2384	3.0408
PBFPiyan	-.0277	.0803	-.3446	.7309	-.1865	.1311
PBQPiyan	.8431	.0655	12.8758	.0000	.7137	.9726
Gender	-.0932	.2060	-.4524	.6517	-.5004	.3140
Age	.0621	.0770	.8068	.4211	-.0900	.2143
Education	.0245	.1151	.2128	.8318	-.2031	.2521
Job	-.1127	.0458	-2.4610	.0150	-.2032	-.0222

Table 10: Points Estimates from OLS Regression for Brand C-Novus

Model 4	coeff	se	t	p	LLCI	ULCI
constant	-.3615	.6814	-.5306	.5965	-1.7081	.9850
PBFCNovus	.0072	.0605	.1196	.9050	-.1123	.1268
PBQCNovus	.9346	.0502	18.6094	.0000	.8354	1.0339
Gender	.1610	.1487	1.0825	.2808	-.1329	.4550
Age	-.0765	.0578	-1.3228	.1879	-.1907	.0378
Education	.0456	.0872	.5231	.6017	-.1267	.2180
Job	.0039	.0344	.1141	.9093	-.0640	.0719

include 0. Furthermore, it has a decreasing effect of -0.2530. Thus, our findings confirm H4a.

For Hypnos, the indirect interaction effect of perceived brand foreignness and sadness is statistically significant, as the confidence interval does include 0. Therefore, our findings cannot confirm H4b.

Based on the analysis, for Hypnos, the first model has an R of 0.5579 and R^2 of 0.3112, which explains the variation in perceived brand foreignness by 31%.

The second model has an R of 0.7718 and R^2 of 0.5956, which explains the variation in purchase intention by 59%.

An important point that deserves attention is the positive direct effect of perceived brand quality on purchase intention for the national icon product and the non-national icon product. It is statistically significant in

Table 11: Points Estimates from OLS Regression for Brand Tektem

Model 4	coeff	se	t	p	LLCI	ULCI
constant	.8386	.5476	1.5315	.1278	-.2436	1.9209
PBFTektem	.0423	.0650	.6510	.5161	-.0861	.1707
PBQTektem	.9980	.0528	18.9023	.0000	.8937	1.1024
Gender	-.2055	.1511	-1.3599	.1759	-.5040	.0931
Age	-.0581	.0563	-1.0309	.3043	-.1694	.0532
Education	-.0345	.0827	-.4176	.6769	-.1980	.1289
Job	-.0602	.0330	-1.8248	.0701	-.1254	.0050

Table 12: The Indirect Effect of Moderator on Purchase Intention through PBQ (Hypnos)

Emotional State	Effect	BootSE	BootLLCI	BootULCI
1(Control)	.2163	.1400	-.0803	.4655
2(Sadness)	.0349	.0905	-.1434	.2166
3(Anger)	-.2530	.0901	-.4388	-.0889

Table 13: Model 8 Summary for The Brand Hypnos When the Outcome Variable is Perceived Brand Quality

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.558[a]	.311	.265	1.321	.311	6.727	9	134	.000

Table 14: Model 8 Summary for The Hypnos When the Outcome Variable Is Purchase Intention

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.772[a]	.596	.565	1.09510	.596	19.588	10	133	.000

all of the models ($p<0.001$).

DISCUSSION

Our study empirically analyzes the effect of incidental emotions on the purchase intention of ethnocentric consumers depending on product iconicity (i.e., whether a product is a national icon or not). Our results indicate that under the influence of incidental anger, ethnocentric consumers' purchase intention for national icon products decreases significantly when they consider the brand foreign. As incidental anger activates stereotypical reasoning, angry ethnocentric consumers concentrate on brand image instead of product iconicity. Our study reveals the influential effect of incidental emotions on the ethnocentric consumer decision making

Theoretical Implications

Signaling theory can explain the relationship between perceptions of brand foreignness and brand quality, but this relationship varies depending on the ethnocentric consumerism in developing countries (Papdopoulos & Heslop, 1993; Erdem & Swait, 1998, 2004; Batra et al., 2000; Zhou et al., 2010). Beyond that, this explanatory power only finds its meaning if the concept of national icon products (Holt, 2003; Özsomer, 2012; Spielmann et al., 2020) is introduced to interact with the brand's

foreignness. The results display that what foreignness symbolizes and signals about brand quality in developing countries differs for ethnocentric consumers when the national iconness of a product interacts. Thus, our findings are in line with the signaling theory.

The signaling theory explains the relationship between perceived brand foreignness and perceived brand quality (Papdopoulos & Heslop, 1993; Erdem & Swait, 1998, 2004; Batra et al., 2000; Zhou et al., 2010). Similarly, the accessibility-diagnosticity theory explains the relationship between perceived brand quality and purchase intention (Abdellah-Kilani & Zorai, 2019; Feldman & Lynch, 1988; Laufer & Wang, 2018; Swoboda & Hirschmann, 2016; Swoboda et al., 2012). In other words, when these two theories go hand in hand, they can provide a link between perceived brand foreignness and purchase intention, which can add value to the concept of perceived brand foreignness and its effects. Our findings support this link by displaying that foreignness signals quality for the national icon product when ethnocentric consumers are incidentally angry. Under every condition, brand quality becomes accessible (as well as diagnostic) for purchase-related decisions.

This research is indicative of the validity of the appraisal tendency framework (Lerner et al., 2015) in the field of consumer behavior. One of the manifestations of the appraisal tendency framework in consumer judgments is the differentiation in brand quality perception when incidental emotions and brand foreignness perception interact. The results exhibit the difference in purchase intention decisions among anger-induced, sadness-induced, and neutrally kept ethnocentric consumers due to differences in their certainty level (Lerner et al., 2015; Small & Lerner, 2008; So et al., 2015; Tiedens & Linton, 2001). The framework states that anger-induced individuals tend to rely on stereotypes (Bodenhausen et al., 1994; Clore et al., 2001; Ger et al., 1999; Lerner et al., 2015; Small & Lerner, 2008; Tiedens & Linton, 2001) when they make brand judgments and purchase decisions.

According to social identity theory, ethnocentric consumers should associate buying from foreign brands with an outgroup behavior, while they should associate buying from a domestic friend with an in-group behavior (Balabanis et al., 2019; Batra et al., 2000; Shimp & Sharma, 1987; Siamagka & Balabanis, 2015; Strizhakova & Coulter, 2015; Swoboda & Hirschmann, 2016). In contrast with the social identity theory, this study illustrates those individuals with consumer ethnocentrism do not always embrace in-group behaviors. Some ethnocentric consumers do not disapprove of foreign brands because of their emotional conditions. Their lack of disapproval originates from the differences in emotional (which are incidental) conditions that ethnocentric consumers experience. As a result, we can discuss that our findings contradict the social identity theory.

Managerial Implications

It is clear that there is no increasing effect of perceived brand foreignness on perceived brand quality for ethnocentric consumers, especially when it comes to national icon products. Furthermore, under certain conditions (when ethnocentric consumers are angry), perceived brand foreignness decreases brand quality perceptions. Thus, it may be a safe option for brand managers to create a domestic brand image in a developing country if they target that country's ethnocentric consumers. This option is not necessary for branding non-national icon products but strongly advisable for branding national icon products.

One of the most important managerial implications of this study is the illustration of the role that emotions play in the consumption context based on the appraisal tendency framework (Lerner et al., 2015). As this research's scope embodies consumers with ethnocentric concerns, we can suggest that the managers of companies that target those consumers should acknowledge the determining effect of incidental emotions (Schlosser, 2015; Siamagka & Balabanis, 2015). Particularly if a company markets a national icon product of a particular nation but is a foreign actor for that nation, incidental emotion's influence becomes significant. In this case, ethnocentric consumers have a decreased purchase intention for the brand when they are induced with anger because of stereotypic expectations of consumers that act as cues for purchase decisions (Bodenhausen et al., 1994; Clore et al., 2001; Ger et al., 1999; Tiedens & Linton, 2001). The results demonstrate that anger-induced consumers are less likely to buy a national icon product offered by a foreign company because they become more dependent on their stereotypes due to an increase in the certainty dimension of appraisals (Clore et al., 2001; Lerner et al., 2015; Tiedens & Linton, 2001). Thus, it would be logical for managers of those companies to adopt policies and implementations to create anger-free environments, specifically if they want to win ethnocentric consumers' hearts.

Another significant managerial implication is how ethnocentric consumers regard brand quality. The results illustrate that in all of the models, brand quality perceptions are highly correlated with the purchase

intention decisions of participants (Bou-Llusar et al., 2001; Saleem et al., & Ahmed, 2015; Sweeney et al., 1999). For managers, apprehending the drivers of perceived brand quality is of vital importance. It confirms previous studies in a way that once managers ensure that quality perception is enhanced, it is reasonable to expect that the purchase intention of consumers would increase.

LIMITATIONS

Just like any other research, this research is not without its limitations due to time and convenience concerns. Our sample is small in number. Furthermore, although we employed purposive sampling according to an ethnocentrism scale, the initial sampling is still based on convenience. Therefore, our ethnocentric consumer sample does not comprise individuals with merely primary education or no education at all. Similarly, there is no blue-collar worker in our participant group. Thus, our results cannot be generalized to the whole population of Turkish ethnocentric consumers. It would be ideal to conduct this research with a larger sample that includes a broader range of demographics.

Another limitation is that the experimental conditions were restricted in this research. During the experiment, an actual laboratory environment could provide a position of higher command over participants' engagement in the process. Future research can investigate consumers' brand or product property judgments and purchase intention decisions when characteristics other than consumers' ethnocentrism are the case. Also, the role of emotions — whether incidental or integrated — is worth attention. Furthermore, carrying out similar research in other developing countries would offer us a valuable opportunity to juxtapose the results. Comparing the emotion-laden decision-making processes of consumers of a developed country with consumers of a developing country would be very interesting.

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Potable Water Quality Prediction Using Artificial Intelligence and Machine Learning Algorithms for Better Sustainability

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ABSTRACT

Water is one of the most important resources for human life and health. Global climate change, industrialization and urbanization pose serious dangers to existing water resources. Water quality has traditionally been predicted by expensive, time-consuming laboratory and statistical analysis. However, machine learning algorithms can be applied to determine the water quality index in real time efficiently and quickly. With this motivation, a dataset obtained from the Kaggle website was used to classify water quality in this research. Some features were found to be empty in the data set. Traditional methods (drop, mean imputation) and regression method were applied for null values. After the null values were completed, RF, Adaboost and XGBoost were applied for binary classification. Gridsearch and Randomsearch methods have been applied in hyper parameter optimization. Among all the algorithms used, the SXH hybrid method created with the Support Vector Regression (SVR) and XGBoost methods showed the best classification performance with 99.4% accuracy and F1-score. Comparison of our results with previous similar studies showed that our SVR XGboost Hybrid (SXH) model had the best performance ratio (Accuracy, F1-score). The performance of our proposed model is proof that hybrid machine learning methods can provide an innovative perspective on potable water quality.

Keywords: Water Quality Index, Machine Learning, Classification, Imputation Methods, Regression.

JEL Classification Codes: C38, Q25, Q56

Referencing Style: APA 7

INTRODUCTION

Water is the primary resource for all human, animal, and plant life. Although its primary use was potable water, it was also used for industry, agriculture, and commerce. One of the essential elements for maintaining human life is water. Water is necessary for the continuation of life events in our bodies. It is also the primary energy source and provides life force by producing electrical and magnetic energy in every body cell. Some elements and compounds in potable water are necessary for the human body, provided they are not more than necessary. Because they are the elements that make up the structure of cells, the basic unit of living things. The biological solvent effect of water ensures that vitamins and minerals are transported and dissolved in the body. It also plays a role in regulating body temperature, functioning of the kidneys, and cleansing the body. Access to potable water is essential to prevent various water-borne diseases. The fact that the earth is covered with 71% water gives the appearance that there is plenty of water in the world, but the rate of potable water is very low. Only 1.2% can be used as potable water (National Geographic, 2022).

Unsafe potable water causes more than 1.5 million deaths from diarrhea each year, mostly infants and young children (WHO, UNICEF, World Bank, 2022). Due to its vital, economic, and strategic importance, water continues its potential to be the most discussed topic of today and the near future. Globalization, global climate change, industrialization, and large amounts of domestic waste seriously threaten existing water resources. Another issue in the water use of the sectors is the pollution of the existing water potential. Fresh water, which has already become limited and valuable, is irreversibly polluted due to not treating industrial and domestic wastes. Obtaining clean water due to purification from contaminated water requires great costs. Potable water refers to water suitable for human consumption. It should be in a structure that will not endanger human health, and that is not contrary to the working principles of metabolism. After being collected from rivers, lakes, and wells, potable water is presented to the consumer through various processes.

According to the WHO (2022), water producers are responsible for ensuring the safety and quality of their products. The US Environmental Protection Agency

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(EPA) establishes rules and guidelines for a wide range of contaminants, such as chemicals and bacteria that can cause disease, that is present in public drinking water supplies. It sets legal limits for more than 90 pollutants in potable water. Potable water quality rules guarantee that consumers can access reliable, sufficient, and secure drinkable water. With industrialization and urbanization, it is one of the primary responsibilities of city managers to deliver healthy potable water to citizens. Water quality refers to the standards for water's chemical, physical and biological properties (Liou, 2004). The abundance and complexity of the variables that define water quality make it difficult to measure and calculate water quality. Therefore, water quality indexes have been created to assess the acceptability of water for various uses. This idea compares the appropriate standards and the water quality measure. Non-water professionals can easily understand the results of the water quality index (WQI), which presents a significant amount of water quality data in a single figure (Abed et al., 2022). The water quality index combines different parameter values in different units and sizes into a single dimensionless number with the help of different aggregation functions, sub-indexes, and weighting factors.

Traditional testing has numerous flaws, but we must overcome them if we are to ensure that human water is safe and aquatic ecosystems are stable. The laboratory test can measure multiple parameters and give accurate results, but the processes are very long. Artificial intelligence (AI) approaches are becoming more and more common for accurately and quickly detecting and monitoring water quality in real time. Unlike traditional models, AI models offer better solutions for nonlinear problems. AI has many uses in different fields. AI technology is frequently used in many business areas, such as medicine, health, education, military, agriculture, economy, finance, automotive, telecommunications, mining, media, banking, and many more. However, due to their unique characteristics, it is difficult to research the quality of different water types (seawater, groundwater, fresh water, etc.). Machine learning (ML) methods, a sub-branch of AI, are seen as an effective tool to overcome these difficulties (Zhu et al., 2022).

One of the problems that have a significant impact on performance when using ML methods is missing data. Before using the data for ML models, making decisions about missing values is necessary. Missing data refers to the lack of observations in the data set, which is expected but cannot be recorded. Missing values in real-world data can occur for a number of reasons, such as unsaved observations and corrupted data. Work on missing data must be done in advance because ML algorithms do not accept data with missing values. Also, completely ignoring missing values can lead to biased results. Ignoring missing values can become a minimum-size dataset where ML applications will be meaningless. Missing data is considered insignificant when it makes up less than 1% of the total data. Up to 5% of a rate is regarded as manageable. However, rates above the 5% cutoff and close to 15% call for diverse treatment strategies. Filling in the missing value is one of the primary methods. Mean value imputation or regression imputation can be used to fill in the missing value. There are also modern techniques, such as deep learning and expectation approaches. Studies also use hybrid methods (Zhang et al., 2020; Rani et al., 2021).

The rest of this article is divided into the following sections: First, a literature review was conducted, and related studies were presented. Then, the material and method are described. Next, the recommended hybrid model is presented in Chapter Proposed Hybrid Model. The final section presents results, comparisons, and discussion.

RELATED WORK

Most studies in the literature use traditional laboratory analyses and data analysis to measure the quality of water. Some recent studies have determined water potability with ML methods. AI, ML, and deep learning methods are used on very different data sets in various fields. A machine may mimic human behavior thanks to AI technology. A subfield of AI called ML enables computers to learn from past data without explicit programming automatically. Deep learning is an AI technique that trains computers to analyze data in a way similar to how the human brain does it.

Consumers' health can be adversely affected by the quality of potable water. Potable water quality is mainly affected by the quality of the extracted water and its processing, distribution, and preservation processes before it reaches the consumer. Therefore, effective and rapid potable water quality assessment approaches gain importance when economic developments, technological developments, and the health of the increasing population are considered. Using AI and ML algorithms for potable water quality prediction can lead to a more sustainable approach to managing water resources. By providing real-time monitoring, early detection, and optimized treatment options, these algorithms can help ensure the availability of safe and clean water for communities worldwide.

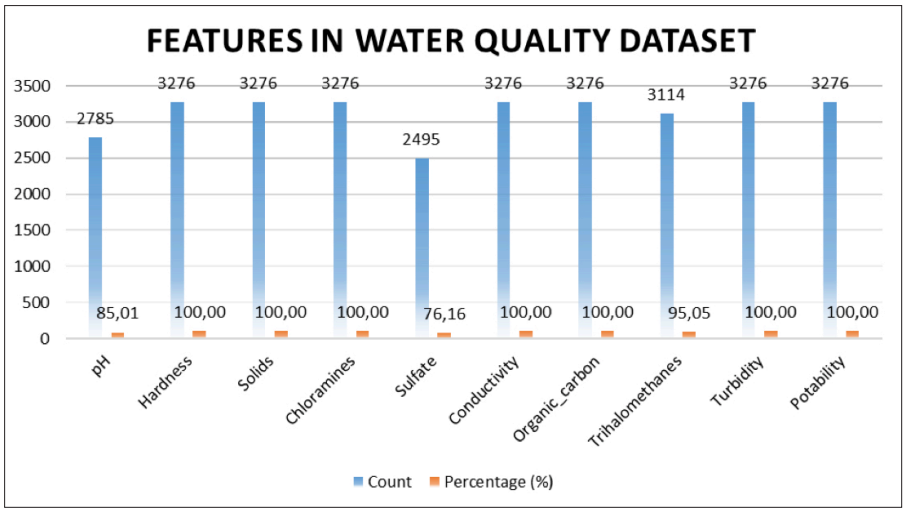

Figure 1. Distribution of features in the water quality dataset

Chafloque et al. (2021) used a neural network-based algorithm to attempt to predict if water is fit for human use. The model they used achieved a 70% accuracy rate. Their study ignored null values by removing them from the data set. In another study using different ML methods to estimate water drinkability, the k-nearest neighbor and support vector machines LASSO LARS and stochastic gradient descent gave the best results according to different evaluation parameters. The study excluded null values from the data set (Kaddoura, 2022). In another study using the same data set, ML methods J48, Naive Bayes, and multi-layer percepton (MLP) were used to predict water quality. They filled null values with mean and median. MLP gave the highest accuracy (Abuzir and Abuzir, 2022).

Xin and Mou (2022) stated that sulfate, pH, solids, and hardness are the most critical factors in predicting water quality. The ML methods that give the best results in their work are XGBoost, CatBoost, and LGBM, respectively. Fen et al. (2021) obtained 75.83% overall prediction accuracy with the decision trees algorithm. Using ML methods, Patel et al. (2022) achieved 81% accuracy with Random Forest and Gradient Boost. They used the mean method for null values.

Azrour et al. (2022) developed a model that can predict the water quality index and, subsequently, the water quality class. The neural networks predicted the water quality class with an accuracy exceeding 85%. Dilmi and Ladjal (2022), using LSTM, one of the deep learning methods, used different feature extraction techniques to improve classification quality. They found an accuracy rate of 99.72% in the study.

Ahmed et al. (2019) tested different ML algorithms using four parameters: temperature, turbidity, pH, and total dissolved solids. MLP stood out as the best method, with 85% accuracy. Aldhyani et al. (2020) state seven important parameters, such as conductivity, pH, and nitrate, in the data set containing 1679 samples. Support Vector Machines gave better results than KNN and Naive Bayes algorithm with the highest accuracy rate of 97%.

MATERIALS AND METHODS

This section describes the materials (dataset), hardware, and software tools used in our proposed hybrid ML model and the methods applied to fill in the missing value and the binary classification method.

Description of Dataset Used in Our Work

The search for a suitable dataset for this research started with reading similar studies from the past, browsing the internet, and reviewing many other scientific sources. In the first investigation, we collected several datasets containing water quality parameters and started to analyze them. Finally, we selected the dataset "Water Quality" from the Kaggle website for water quality estimation, which was then used to train and test the model (Kadiwal, 2022). We chose the dataset to include important parameters used in water quality measurement. The dataset contains a total of 3276 data.

Figure 1 presents the distribution of the features in the dataset. Of the ten key features presented in Figure 1, 9 are for water properties, and one is for the "potability" of water. The "potability" value is either 0 or 1. 0 represents non-potable water, and 1 represents potable water.

The pH value is a unit of measurement expressing the acidity or alkalinity of any water. Water hardness is usually the amount of calcium and magnesium dissolved in the water. Total Dissolved Solids (TDS) include minerals, cations, anions, heavy metal ions, and small amounts of organic matter dissolved in water and cannot be retained by simple filtration methods such as sand filters. The higher the TDS in the water, the more foreign matter there is. Chloramines are formed by adding ammonia to chlorine during drinking water treatment. Sulphate is one of the most important lines that rain dissolves. The high isolation powers in our water can be detrimental when combined with shield and army, the two most common hardness components. Conductivity is a property that determines the purity of water. The lower the conductivity of the water, the fewer the ions in it. Organic carbon in spring water comes from natural and artificial sources, including decaying organic matter. Drinking water is safe for ingestion by humans. Its value is 0 or 1.

WQI is measured according to various parameters of water. Water quality index calculation methodology is listed as follows (Brown et al., 1972).

1. Collecting data on various physicochemical water quality parameters

2. Calculation of the proportionality constant "K" ("si" is the standard value of the nth parameter)

$$K = (1/(1/\sum_{n=1}^{n}(s_n)) \quad (1)$$

3. Calculate the quality grade for the nth parameter (qn) with n.

$$q_n=100\ \{(v_n-v_{io})/(s_n-v_{io})\} \quad (2)$$

4. Calculation of weight of units for parameters

$$W_n=(k/s_n) \quad (3)$$

5. Water Quality Index Calculation Formula

$$WQI = \frac{\sum_{i=0}^{n} qi*wi}{\sum_{i=0}^{n} wi} \quad (4)$$

In the proposed model, water quality measurement is assessed using ten critical water quality indicators from the preferred dataset. Reference levels of the water quality index are classified by the World Health Organisation (WHO). According to (Brown et al., 1972), the index level must be less than 50 for water to be potable.

The figure 2 presents the data of 1,998 for non-potable waters and 1,278 for potable waters in the dataset. The figure shows that the data set is unbalanced.

The dataset contains a high proportion of features with missing values. Figure 3 shows the distribution of missing values for the three features. Missing values were approximately 15% for "pH," 24% for "Sulphate," and 5% for "Trihalomethanes" property.

Data Preprocessing

As part of data preprocessing, non-numeric data is converted to numeric numbers. In addition, the duplicate data is deleted, and only the necessary data is kept. In data preprocessing, NULL values are primarily detected. The algorithm must be able to function without any missing data because null values signify missing data. The method can also produce more accurate results by substituting null values. As observed in Figure 3's graphic, the values for "pH," "Sulphate," and "Trihalomethanes" are NULL.

After processing the missing data, non-numeric entries in the data set were converted to numeric values. The next stage of data preparation is data normalization. The normalization method, a standard scaler, was used to place the data in the range [0, 1] (Kaushik et al., 2019; Graf et al., 2022). After the normalization step, the (0,1) data are transformed into a TensorFlow, labeled for features and classification. Following the TensorFlow step, the input and output parameters of the learning model are defined. Finally, the data set is divided into two subsets as training and testing.

Briefly, our data preprocessing consists of the following stages:

- Storing and checking the data set in computer memory
- Detection and processing of missing data
- Conversion of nominal data to numerical data
- Normalize data using the standard scaler
- Subdivision into subsets for the Water Quality dataset:
    - o Training set: 2,620
    - o Test set. 656

The training and test data sets are separated by 80% and 20%, respectively.

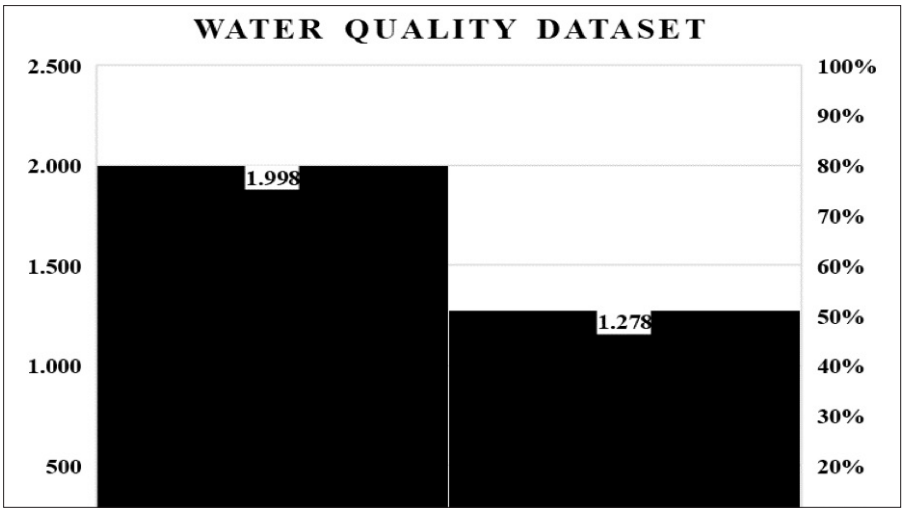

Figure 2. Classification of the potability of the water in the data set used

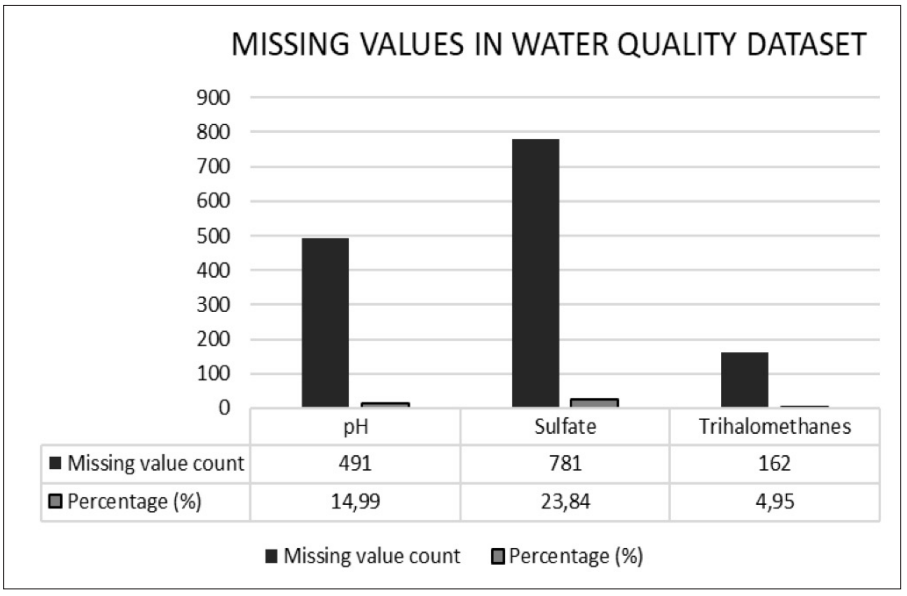

Figure 3. Distribution of missing values in the data set used

Feature Engineering and Importance

Feature engineering is applied to handle missing data and improve model prediction accuracy. The correlation matrix method was used to identify the connections between the features.

Table 1 presents the correlations representing the relationships between the features in the dataset. As a first step in feature engineering, the missing values of the three features in Figure 3 were determined. Then, a correlation matrix was created for each feature with missing values in these features. Finally, the importance scores of the features in the dataset were obtained.

Table 2 shows the significance scores of the features of the Random forest and XGBoost algorithms in the data set. When the table is examined in detail, the importance degrees of the "Sulfan" and "pH" features are in the first two places in both methods.

Prediction of Missing Values Using Support Vector Regression (SVR)

Water quality is sensitive data; it may be insufficient to impute water data using other methods of imputing missing values (e.g., mode, mean, median). Therefore, there is a need for an innovative method for filling in missing values. In the first step of our proposed method, missing features were detected. These features are; "pH," "Sulfate," and "Trihalomethanes." Next, the features with positive correlation were determined in the correlation matrix of the features in Table 2.

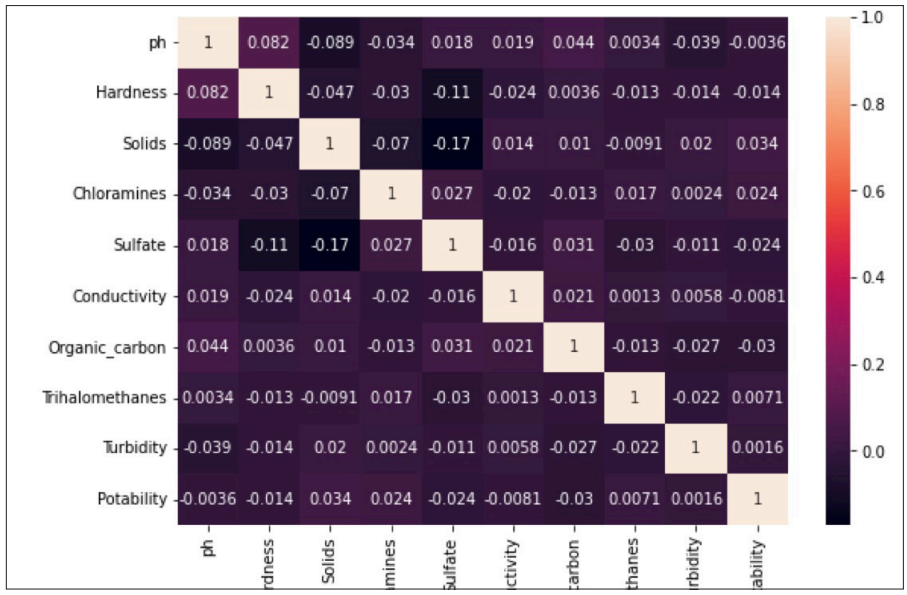

Table 1. Correlation matrix of Water Quality attributes

Table 2. Significance scores of water quality dataset attributes

Feature(s)	Random Forest Feature importance (%)	XGBoost Feature importance (%)
Sulfate	26.8	13.8
pH	20.9	13.6
Chloramines	13.4	13.1
Hardness	10.5	12.5
Solids (TDS)	8.9	12.7
Trihalomethanes	5.6	8.1
Conductivity	4.9	9.1
Turbidity	4.6	8.3
Organic Carbon	4.5	8.9

Positively correlated features;

- For "pH": ['Hardness,''sulfate,''Conductivity,' 'Organic_carbon,''Trihalomethanes]
- For "Sulphate": ['pH, 'Organic_carbon,' 'Chloramines']
- For "Trihalomethanes": ['Chloramines,' 'Conductivity']

Figure 4 shows the step-by-step process of filling in the missing values. The steps in the sequence were repeated until all columns were filled.

Binary Classification

In this stage, ML methods were trained for binary classification to distinguish between potable and non-potable water conditions in the water quality dataset.

The proposed classification method architecture for measuring potable water quality is shown in Figure 5. The classification architecture in the figure is designed by using hyperparameters (n_estimators, max_depth, etc.) of the learning model to obtain the best results. Hyperparameters have been adjusted for best results.

A supervised learning method was adopted in the research. The water quality dataset labels potable water as potable (1) or non-potable (0). Our learning model is first trained with the training set, then binary classification prediction is performed with the test data.

PROPOSED HYBRID MODEL (SVR+XGBOOST)

ML algorithms have been proposed for the classification model of potable water quality. In this direction, the main objective of the study is to predict the intended labelled data with the best performance by training the data in

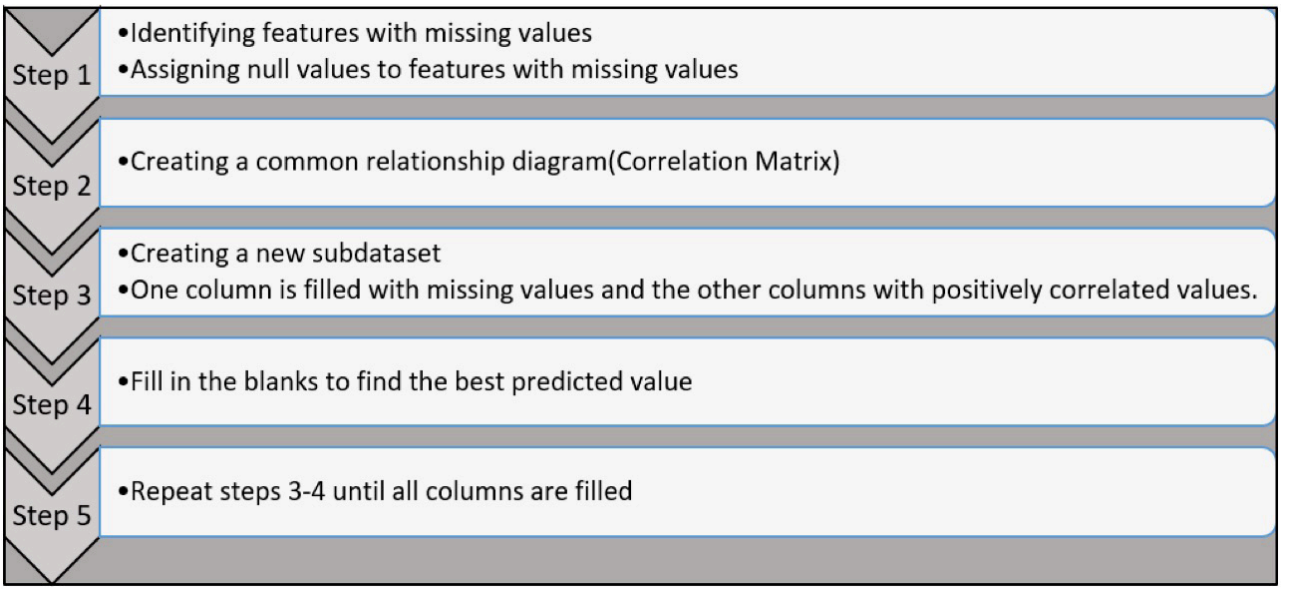

Figure 4. The steps followed in the proposed approach to fill in the missing value

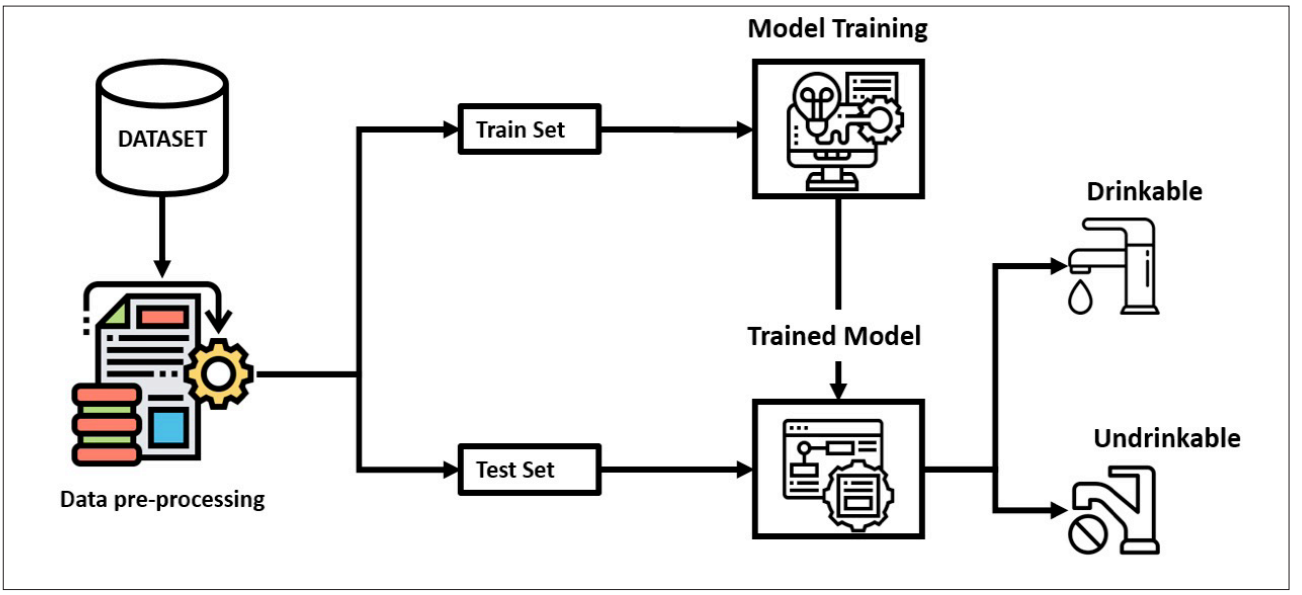

Figure 5. Classification architecture for potable water

the training set to recognise input-output mappings. Inferential functions are then produced after that. These functions then translate the new unlabeled data into the correct class in a subsequent stage (testing process) (Kaushik et al., 2019; Graf et al., 2022).

Vapnik presented the current fundamental SVM method in the early 1990s (Vapnik, 1998). Support vector machines (SVMs) assess classification and regression analysis data. SVMs are algorithms developed for supervised learning. It contributes to the learning model by analyzing large amounts of data to find relationships between data and detecting relationship states. Finding the ideal hyperplane with the smallest distance to all data points is the goal of SVM regression. As previously noted, SVM can be used for various issues, including classification, clustering, and regression issues. For the estimation of water quality and parameters, successful results have been obtained in previous studies using the support vector regression algorithm (Wang et al., 2020; Wang et al., 2011). Within the scope of our study, support vector regression method was applied to fill the missing parameters in the water quality data set. The Grid Search method is adopted as the hyperparameter for support vector regression parameters. Grid search parameters are set as follows.

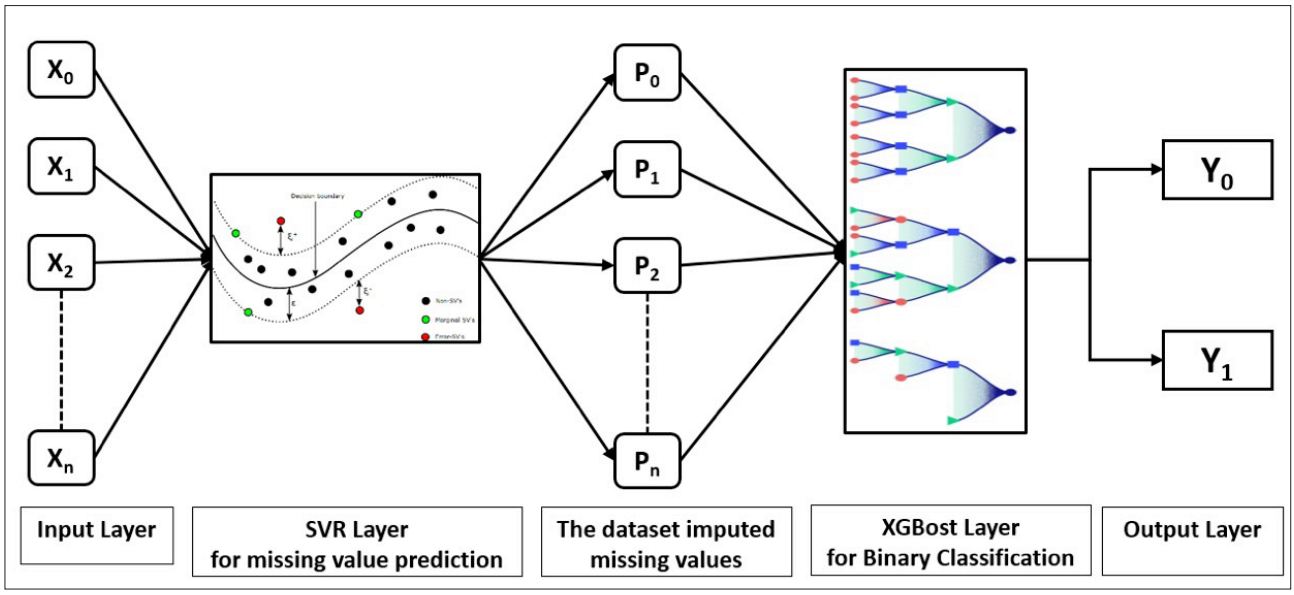

Figure 6. Proposed model architecture

• kernel('sigmoid','linear','poly')

• degree (1,7,9,2)

• gamma ('scale', auto')

• C (1.2,1.3,1.4,1.7

The best parameters for the SVR model:

- kernel: 'poly'
- degree: 2
- gamma: 'auto'
- C: 1.2

Gradient Boost Machines (GBM), one of the most effective algorithms for supervised learning, is implemented in XGBoost (XGB), one of its variants. Additionally, it can be used to address issues regarding regression and classification. The XGB algorithm does well in many ML challenges. For various predictive modeling use cases, logistic regression modeling appeared to be the best approach. However, as time went on, it lost out in the literature to XGBoost. Despite its strong algorithm adaptability, it learns thanks to parallel and distributed computing quickly and provides expert memory use. In order to make the final prediction choice, XGBoost uses a number of different models to provide an output, making it an ensemble learning technique. In the decision process of the classification and training model architecture for the detection of potable water quality, a detailed methodological survey of studies in the literature was performed. Our potable water hybrid model was chosen after comparisons with single algorithm models (Kaddoura, 2022; Chafloque et al., 2021) compared to previous hybrid models based on superior performance results (Zhang et al., 2020; Rani et al., 2021). SXH consists of 5 layers, as shown in Figure 6: Input, SVR, Missing Value, XGBoost, and Output layers. SVR algorithm is used for the estimation of missing values. XGBoost algorithm was used for classification.

Briefly, the stages of our proposed SXH model are as follows:

1. Ten inputs ($X_{0,}$ ... X_n) in the water quality dataset;
2. Estimation of missing values in the SVR layer (P_0);
3. Preparation of the new dataset with the predicted values for the input of the XGBoost layer;
4. Classification in the XGBoost layer;
5. Modeling of decision transmission (potability, non-potable) to the output layer (Y_0, ... Y_n).

Hyperparameter tuning of the proposed model has been accomplished through random search and grid search, the programmer's heuristic, and previous experiments and literature reports (Xie et al., 2019).

The random search and grid search parameters of the proposed model are listed below:

• n_estimators: (400 ,800,1000)

• learning_rate (0.5,1)

• max_depth': range (1, 11, 2)

Table 3. Random forest confusion matrix for Grid search hyperparameter tuning

Missing value imputation method (s)		Predicted (1)	Predicted (0)
DROP	Actually (1)	197	34
	Actually (0)	100	72
MEAN	Actually (1)	382	30
	Actually (0)	97	174
REGRESSION	Actually (1)	387	25
	Actually (0)	39	205

Table 4. AdaBoost confusion matrix for Grid search hyperparameter tuning

Missing value imputation method (s)		Predicted (1)	Predicted (0)
DROP	Actually (1)	190	41
	Actually (0)	126	46
MEAN	Actually (1)	396	16
	Actually (0)	151	93
REGRESSION	Actually (1)	404	8
	Actually (0)	23	221

The best parameters for the model:

Random search for: (400, 1, 1)

For Grid search: (1000, 0.5, 1)

RESULTS AND COMPARISON OF PREVIOUS WORK

This section will first define the performance measures for the suggested models. Second, filling in missing values and the results of our binary classification models will be presented. Then the performances of the models will be compared. Finally, our results will be compared with previous water quality studies using different methods. As in previous studies, four popular measures were used to evaluate performances. These are accuracy (1), precision (2), recall (3), and f1 score (4). In addition, the Confusion Matrix table, which presents the summary of the estimation results in a classification problem, is used.

RESULTS

After applying the dataset to each of the Random Forest, AdaBoost, and SXH algorithms, confusion matrices (Tables 3-5) were generated.

When Table 3 is examined in detail, the complexity matrix is seen according to the imputation methods of 3 different missing values. According to Table 3, the management obtained the highest REGRESSION missed value imputation using the RF model, the potable water samples (1), and predicted potable water samples with 387. On the other hand, the closest value to REGRESSION with 382 was obtained by the MEAN missing value method.

When Table 4 is examined, the imputation methods assign the missing values, and the predicted potable water samples using the AdaBoost model were obtained by the REGRESSION imputation method as 404. The value close to the highest value was obtained from the MEAN missing value imputation method with 396.

Table 5 presents the results of the proposed SXH method for estimating potable water quality. According

Table 5. SXH confusion matrix for Grid search hyperparameter tuning

Missing value imputation method (s)		Predicted (1)	Predicted (0)
DROP	Actually (1)	162	69
	Actually (0)	84	88
MEAN	Actually (1)	375	37
	Actually (0)	97	147
REGRESSION	Actually (1)	412	0
	Actually (0)	3	241

Table 6. Random forest results for binary classification

Missing value imputation method (s)	Category	Accuracy (%)	Precision (%)	Recall (%)	F1-score (%)
DROP	Model	66,74938	67,01052	66,74938	64,88053
	Potable	79,82196	66,32997	85,28139	74,62121
	Non-Potable	57,35608	67,92453	41,86047	51,79856
MEAN	Model	81,40556	81,94947	81,40556	80,79328
	Potable	90,25974	79,74948	92,71845	85,74635
	Non-Potable	74,13333	85,29412	64,20664	73,26316
REGRESSION	Model	**90,24390**	**90,20731**	**90,24390**	**90,18132**
	Potable	92,21184	90,84507	93,93204	92,36277
	Non-Potable	88,35821	89,13043	84,01639	86,49789

to Table 5, potable water samples (1) and predicted with the proposed SXH model obtained the highest predictive value with a score of 412. All potable water samples were predicted to be true with the proposed model. However, non-potable(0) 3 water samples were predicted as potable. Results from the tests are shown in Table 6, Table 7, and Table 8, respectively. The tables present the classification metrics obtained from each ML method.

When Table 6 is examined in detail, it is seen that the highest performance for the RF model is obtained with the REGRESSION method, one of the null value filling methods. The accuracy and F1-score results obtained with the REGRESSION method were 90.24% and 90.18%, respectively. With the MEAN method closest to this performance, accuracy and F1-Score scores of 81.40% and 80.79% were obtained, respectively.

When Table 7 is examined, the highest performance for the Adaboost model was obtained with the REGRESSION method, one of the null-filling methods. The accuracy and F1-score obtained by the REGRESSION method were 95.27% and 95.24%, respectively. On the other hand, the accuracy results of MEAN and DROP imputation methods showed poor performance at 74.54% and 58.56%, respectively.

When Table 8 is examined in detail, the highest performance for the SXH model was obtained with the REGRESSION method, one of the null-filling methods. The accuracy obtained with the REGRESSION method and the F1-score score of 99.54% was obtained. RF and AdaBoost results are presented in Table 6 and Table 7. The proposed SXH results in Table 8 outperformed the results of the RF models in Table 6 and the AdaBoost models in Table 7. These performance results are the main reasons we recommend the SXH method.

Random search and Grid search hyperparameter results are presented in Table 9. When the table is examined in

Table 7. Adaboost results for binary classification

Missing value imputation method (s)	Category	Accuracy (%)	Precision (%)	Recall (%)	F1-score (%)
DROP	Model	58,56079	57,03100	58,56079	54,98061
	Potable	74,21384	60,12658	82,25108	69,46984
	Non-Potable	48,36066	52,87356	26,74419	35,52124
MEAN	Model	74,54268	77,20280	74,54268	71,46662
	Potable	93,85797	72,39488	96,11650	82,58603
	Non-Potable	61,82048	85,32110	38,11475	52,69122
REGRESSION	Model	**95,27439**	**95,31767**	**95,27439**	**95,24170**
	Potable	97,50390	94,61358	98,05825	96,30513
	Non-Potable	93,14456	96,50655	90,57377	93,44609

Table 8. SXH results for binary classification

Missing value imputation method (s)	Category	Accuracy (%)	Precision (%)	Recall (%)	F1-score (%)
DROP	Model	62,03474	61,66987	62,03474	61,76621
	Potable	64,43299	65,85366	70,12987	67,92453
	Non-Potable	59,80861	56,05096	51,16279	53,49544
MEAN	Model	79,57317	79,61361	79,57317	78,83460
	Potable	87,58389	79,44915	91,01942	84,84163
	Non-Potable	72,90503	79,89130	60,24590	68,69159
REGRESSION	**Model**	**99,54268**	**99,54599**	**99,54268**	**99,54210**
	Potable	100,00000	99,27711	100,00000	99,63724
	Non-Potable	99,08953	100,00000	98,77049	99,38144

detail, the results obtained with the Grid search method showed better performance than those obtained with Random Search in all accuracy, Precision, Recall, and F1-score metrics. For this reason, the Grid Search method has been adopted in our proposed model.

Outcomes from Our SXH Model Compared to Earlier Works

This section presents a table comparing our SXH model with previous drinking water quality studies using ML methods, considering accuracy and F1-score parameters. According to the results obtained, it was determined that the use of SXH outperformed RF and Adaboost in this study.

In Table 10, comparisons of the results of our hybrid method with other studies using the "Water Quality" data set we used within the scope of the study are presented. The table is detailed by Fen et al. (2021); by deleting the missing values from the data set, they obtained 86.67% and 85.78% accuracy and F1-score, respectively, with the Extra trees classifier method. Filling in the missing values with the mean value, Patel et al. (2022) achieved an acceptable accuracy rate of approximately 80% with RF and F1-score. Other studies performed poorly, staying below 80% accuracy.

In the hybrid method we recommend, it is seen that the accuracy and F1-score score of 99.64% is approximately

Table 9. Comparison of results of hyperparameter methods

Method(s)	Model(s)	Accuracy (%)	Precision (%)	Recall (%)	F1-score (%)
Random Search	Our Proposed -SXH	99,39024	99,39611	99,39024	99,38920
Grid Search	Our Proposed -SXH	99,54268	99,54599	99,54268	99,54210

Table 10. Comparison Table of Our SXH Model Results with Previous Works

Author(s)	**Proposed Model**	**Accuracy (%)**	**F1-Score (%)**
Kaddoura, 2022	ANN	-	63.90
Chafloque et al., 2021	Neural Network	69.00	-
Abuzir and Abuzir, 2022	Multi-layer perceptron (MLP)	-	75.90
Xin and Mou, 2022	XGBoost	81.51	80.78
Fen et al., 2021	Extratrees classifier	86.67	85.78
Patel et al., 2022	Random Forest	81.00	81.50
Our Proposed	SXH	**99.54**	**99.54**

14% better than the highest study. This success of our study was realized with the effect of the null value regression and binary classification method we used.

CONCLUSION

As a human right, safe and clean potable water and health protection are vital for fully enjoying the right to life. However, a number of pollutants reduce the quality of drinkable water. Water quality indices are approaches that simplify the expression of potable water status. In this way, it enables individuals and institutions not experts in water quality to obtain information about the water quality status and use this data comfortably, quickly, and efficiently. Predicting potable water quality is an essential aspect of ensuring its sustainability. AI and ML algorithms can be powerful tools for this task.

This study presents a new hybrid model that predicts the drinking water quality index. First, the performance of the methods that fill in the missing values in the data set and then the performance of the classification algorithms are measured. Finally, a hybrid model was created with a combination of algorithms that gave the best results.

The SXH model we used in the study performed best in all binary potable water classifications according to accuracy and F1-score values. Our SXH model was also compared with other potable water prediction models using various methods. By comparison, the accuracy performance of our proposed model was found to outperform the closest run by about 13%. It also performed about 14% better than the most in the other performance metric, the F1-score. The results show that the hybrid method is a very successful model for potable water estimation. It is aimed to apply the method we propose for further studies to a different data set that includes other parameters used in measuring water quality. In addition, water analysis organizations or companies can apply our proposed hybrid model to the data they have obtained to determine potable water quality.

In the administration of water resources, ecological restoration and establishment of mechanisms that will rearrange water consumption according to industry, agriculture, and drinking water needs are important. In this framework, existing and planned projects have to be reviewed.

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Systematic Review of Radicalization through Social Media

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ABSTRACT

The purpose of this study is to synthesize the literature relating to radicalization on social media, a space with enhanced concerns about nurturing propaganda and conspiracies for violent extremism. Through the systematic review of 82 peer-reviewed studies related to radicalization through social media published in scholarly journals, this paper evidence the growth of robust studies on the usage of social media for radicalization. Nonetheless, the current work hardly discusses radicalization issues through social media and reveals an increasing trend of publication from 2017 with a major contribution from the USA, Germany, and England. The thematic analysis indicated determinants of radicalization and the mitigation measures for the deradicalization of content on social media. However, the knowledge gap persists to understand the effects of radicalization in the different regional settings and further framing of content specific to target populations. Individuals must have critical social media literacy to counteract the rising radicalization through social media. Individual users' political interests are key factors in their radicalization such as citizens losing faith in the government and political parties. Active rather than passive searchers of violent radical material are more likely to engage in political violence. The results indicate that further research using experimental design, grounded theory, and pilot interventions may be relevant to suggest a solution to mitigate radicalization on social media.

Keywords: Social Media, Radicalization, Deradicalization, Violent Extremism.

JEL Classification Codes: D72, D74

Referencing Style: APA 7

INTRODUCTION

Social conflicts emerge when people are persuaded by different groups of diverse opinions and are trapped in the violent narratives of endorsing an opinion as the right one (Morselli et al., 2020). Social media platforms have offered platforms where people of diverse backgrounds and worldviews can share their opinions in an open and unstructured way, which has revolutionized the channels for extremist groups to radicalize the masses (Gallacher et al., 2021; Ul Rehman et al., 2021). There are various studies in recent times trying to identify extremist content online, particularly on social media platforms, to spread hate speech and radicalize the masses for perpetuating violence (Marcks & Pawelz, 2020; Gallacher et al., 2021). But Marcks & Pawelz (2020) found little effort toward the identification of violent drivers. They found far-right ideologies such as anti-immigration rhetoric as dominant techniques to radically frame their content on social media to normalize the violence against the self-perceived threats of their identity and nationalism.

Since moral intuitions are central to defining human behavior, extremist groups target people's moral intuitions to propagate their ideologies for radicalization and violent extremism (Hopp et al., 2021). ISIS used violent narrative stories appealing to the emotions and desires of potential supporters and recruits to connect with their moral institutions for the justification of violence to impose extreme ideologies (Kruglova et al., 2020). The group heavily utilized visual stories through social media platforms to promote their violent narratives and propagate recruitment.

Fake news and disinformation floating around social media platforms mislead the public, especially youth, to influence the public narratives, manipulate their behaviors, and urge them to support certain political ideologies while opposing others (Akram et al., 2022). Young people, especially between the ages of 15 to 24, are highly vulnerable to being radicalized amidst their higher chances of exposure to hateful and extremist content online (Costello et al., 2020). Schmuck & Tribastone (2020) exposed 143 young Muslims, aged 18 to 37 years, to anti-Islamic right-wing populist social media content,

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and found increased perceived discrimination among them. They further found the young Muslims' non-violent collective action to improve their social status with democratic approaches. The counter-violent extremism efforts are shifting from on the ground to online as the extremists have been increasingly using social media spaces to propagate their ideologies to radicalize the masses (Aziz & Beydoun, 2020). Social media helps the continuity of connection among protesters even after the protest cycle ends which were mobilized and coordinated through social media (Lee et al., 2020). YouTube is the most common and major social media platform among far-right learning users whose viewership peaked in 2017 when Donald Trump started his tenure as U.S. President (Munger & Phillips, 2020).

Though there has been a significant amount of research on radicalization and its different aspects, there is still a lack of consensus on the standardized definition of radicalization (Neumann, 2013). Doosje et al. (2016) view radicalization as a "process through which people become increasingly motivated to use violent means against members of an out-group or symbolic targets to achieve behavioral change and political goals". McCauley & Moskalenko (2008) identified three levels of radicalization leading toward violence. Radicalization at the individual level results from personal victimization, political grievance, and joining a radical group; radicalization at the group level occurs when extremity shifts in a like-minded group, extreme cohesion happens under isolation or threat, competition for power; and mass radicalization results from conflict with an outgroup as jujitsu politics, hate, and martyrdom. The radicalization process involves behavior (action) and action (aims and perceptions) which do not necessarily depend on each other and do not always result in violent acts but push individuals on the margins of violence (Porta & LaFree (2012). Social media has become an effective tool to radicalize people with a promise of friendship, acceptance, and social networks as users often do not realize when they landed on a radical conversation on their social media feed. For example, Al-Qaida and its affiliates heavily rely on social media to manipulate the grievances of (Muslim) youth and radicalize them for violent extremism under the cover of giving a purpose to their life (Thompson, 2011).

Growing research has been conducted on social media. However, there has been little effort put into compiling the results of radicalization research related to social media platforms. There is a lack of a systematic literature evaluation to describe what is already available or what might be addressed in the future to overcome the challenges of radicalization on social media. By undertaking rigorous descriptive and thematic analysis to emphasize how many facets of radicalization on social media have been researched and discussed over time, this research aims to complement earlier studies and synthesizes their findings. The motivation of this research is to encourage scholarly work with its possible extension to enhance understanding of radicalization, suggest models for deradicalization, and ways for monitoring, reporting, and preventing radicalization. Using an informetric analysis and bibliometric approach, this study summarized numerous ways for countering radicalization on social media as recommended by authors in the published studies. The purpose of the study is to review a wide range of topics from the perspective of social psychology, political psychology, religion, and related disciplines, where social media has been misused as a hub of radicalization by individuals or groups pursuing to expand their propaganda and ideologies.

The structure of this study is as follows: first, radicalization is defined in terms of social media context; second, research methods opt for this study elaborates with bibliometric analysis technique; third, bibliometric analysis and discussion presents key findings from the synthesis of literature; lastly, trends in research are mentioned, and gaps for future research have been explored.

Theoretical Support for Radicalization Through Social Media

Theory may be used to point the way for delving into difficult issues. In terms of evaluating the concept of radicalization, theoretical support is established from social movement theory which is among the most viable theoretical frameworks for explaining radicalization approaches and violent extremism (Gunning, 2009). A *social movement is defined by McCarthy and Zald (1977) that "A set of opinions and beliefs in a population, which represents preferences for changing some elements of the social structure and/or reward distribution of a society."* The notion is that the movements developed as a result of irrational collective behavior occurring under stressful environmental conditions. Individuals would "join" a movement as a result of their passive submission to these enormous societal pressures. Members of the movement act as "reasonable prospectors" while looking to attract others (Brady, 1999). Movements diagnose issues and assign blame, propose remedies, methods, and tactics (prognostic framing), and provide motivating frames to persuade potential members to become involved (Dalgaard-Nielsen, 2008). In addition to that, some

other integrated theories were used to deal with violent radicalization and extremism such as *General Aggression Model (DeWall et al., 2011) and Situational Action Theory* (Wikstrom et al., 2012). These theories can also moderately explain radicalization through moral attitudes, individual propensities, situational influences, and self-control. Hence, there is a need to develop a strong rationale for the formation of the theory of radicalization keeping because of multiple aspects.

Radicalization is *defined* as changes in belief, attitudes, and behavior toward the extremist, requiring violence and sacrifice (McCauley & Moskalenko, 2008). Online radicalization is not the same as online propaganda. Online propaganda spreads disinformation, whereas online radicalization misleads individuals by using their political or religious views (US Department of Justice, 2018). There is no commonly accepted theory of radicalization due to the multiplicity of occurrences and the many disciplinary backgrounds of scholars. Whereas group participation has a strong impact that depicts examples of so-called "self-radicalization" (Meloy & Genzman, 2016). Although several terms of radicalization have been postulated, the processes that may start with ideological interest and progress through group membership to violent action are neither predictable nor consistent (Jensen et al., 2016; Borum, 2011). Social learning, deprivation experience, intolerance of ambiguity, group dynamics, social bonding, identity development, and mental health concerns appear to be particularly significant from a psychological standpoint.

METHODS AND MATERIALS

The purpose of this study is to synthesize the literature related to radicalization through social media. It discusses the link between social media platforms such as Facebook, Twitter, and YouTube, with radicalization and violent extremism. The systematic literature review approach supports developing themes, trends, and feebleness to identify gaps and further research areas (Petticrew & Roberts, 2008; Wright et al., 2007). This approach is widely considered in various fields for the systematic review of the literature (Clark & Creswell, 2015). The systematic literature review was conducted using the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA) (Moher et al., 2009). It supports finding, selecting, and evaluating relevant research on the researched topic and developing the problem's solution using the PRISMA technique as mentioned in Figure 1.

In the first step, scholarly journals were identified using the Web of Science (WoS) Core Collection Database. The rationale for selecting the WoS database is based on two reasons. First, it has a broad international scope of the bibliography. It grew to be the most prominent bibliographic data source for journal selection, research appraisal, bibliometric analysis, and other activities throughout time (Li et al., 2018; Pranckutė, 2021). For more than 40 years, WoS was the first source of bibliographic records until Elsevier introduced Scopus in 2004 (Baas et al., 2020). Secondly, WoS is a selective and multidisciplinary database comprised of several organized and specialized indexes in terms of subject matters for research. Hence, the key component of WoS is based on the core collections (Pranckutė, 2021).

Social media platforms have become a source of news and information (Rhodes & Akram, 2022). An advanced search tool was used to identify the research studies by using search terms "social media with inclusion of Twitter, Facebook, Instagram and YouTube" with "radicalization". The search terms filter was set to title and abstract with three indexes namely "Science Citation Index Expanded", "Social Sciences Citation Index", and "Arts and Humanities Citation Index" from 2005 to May 2021. We chose to start from 2005 as Facebook was launched a year before (2004) and Twitter has launched a year after (2006), the two platforms most widely being used for news stories and being misused for influencing the narratives. Inclusion criteria were set to peer-reviewed articles published in the English language.

In the second step, 82 research studies were identified from the database. All the studies were reviewed thoroughly to evaluate whether they meet the inclusion and exclusion criteria (Table 1). Hence, no study was excluded as all 82 articles met the inclusion criteria for the systematic review of radicalization on social media.

In the third step, informatic analysis with bibliometric techniques was performed on selected articles using VOSviewer software version 1.6.16 (www.vosviewer.com) (Van Eck & Waltman, 2010). Authorship, geographical affiliation, time, sources, and institutions are all included in the bibliometric analysis of selected studies. It includes the scientific mapping and display of datasets that have been extracted for a systematic review (Van Eck & Waltman, 2010). Three types of bibliometric analyses were performed: a) co-citation of cited sources, b) co-occurrence of keywords and c) citation of countries. A similar approach to bibliometric analysis has been applied

Table 1. Inclusion and Exclusion Criteria

No.	Included	Excluded
1	Articles published in peer-reviewed journals from indexes: Science Citation Index Expanded", "Social Sciences Citation Index" and "Arts and Humanities Citation Index"	Non-peer-reviewed articles, Conference proceedings, magazines, news reports, dissertations
2	Articles with a focus domain on radicalization and social media	Articles with focus on radicalization but skip segment of social media
3	Articles discuss radicalization through popular social media platforms namely: Facebook, Twitter, Instagram, and YouTube.	Articles with a focus on radicalization and print media
4	Articles in English	Articles in other languages (Chinese, Spanish, etc.)
5	Articles in the field of "Arts and Humanities, Social Science and Technology"	Articles belong to Arts fields such as "Music, Medical, Language, and History"

in the studies using systemic review methodology (Wang et al., 2019; Naeem et al., 2020; Borges-Tiago et al., 2020). In addition, thematic analysis was conducted using qualitative analysis and data management software NVivo version 12.

In the fourth step, the results were extracted and presented in the discussion section. Critical social media literacy was compared to understand the differences in content acceptability, voice multiplication, radicalization dissemination tendencies, and denial or acceptance arguments. A thorough content analysis was carried out. Later, recommendations are offered to improve people's critical social media literacy to combat radicalization content on social media. It also includes potential research topics for the future which include, but are not limited to, radical framing of content on social media, cognitive inability to let propagandas and conspiracies influence perceptions of social media users, factors of sociopolitical psychology nurturing the radical attitudes offline, and search for common grounds to protect freedoms of expression while countering hateful and radical content online.

Relevance of Bibliometric Analysis

Researchers can use bibliometric reviews to acquire insight into a particular field of study. The research interactions in the specific topic may also be quantified using bibliometric analysis. As a result, this bibliometric review will provide quantitative insights to scholars in the field of radicalization through social media. Gaikwad et al. (2020) have considered the bibliometric analysis of online extremism research. The authors investigated the trends of publications on the issue of radicalization through social media using Clarivate Analytics as a main source of data. The authors assert and conclude that radicalization is not yet a distinct field of inquiry. However, it could be aligned with social media as this is the main medium of interaction among people. Keeping this in view, the bibliometric review mainly focuses on computational techniques for analyzing radicalization through social media. Social media has grown in importance as a weapon for spreading radicalization and violent extremism as a result of its ever-increasing use. The computational classification approach to deal with radicalization through social media is growing as a field of research that requires attention to properly assess, identify, and reduce the adverse impacts.

BIBLIOMETRIC ANALYSIS

Lee & Su (2010) stated that keywords depict the basic content of the research papers and describe knowledge areas within a specific domain. Given this methodology, 82 selected articles were imported into the VOSviewer software using .txt format to produce a keywords network. It shows a precise picture that elaborates on patterns and connections of words with each other (Van Eck & Waltman, 2014). Web of Science provides two types of keywords: one is mentioned by authors in the article and others are keyword plus that is extracted from the title and abstract of the articles. According to Lee & Su (2010), keyword plus indicates new themes with a co-occurrence network. To examine published papers, normalization using fractional counting was used as per the recommendation of Van Eck & Waltman

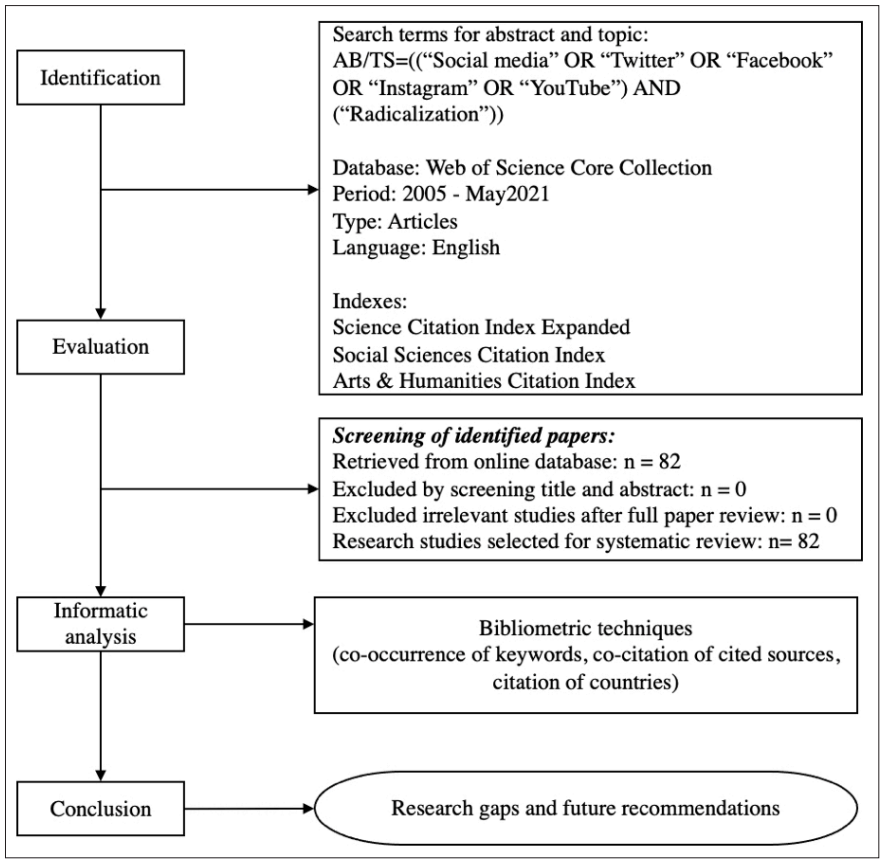

Figure 1. PRISMA chart for *Systematic Review*

Table 2. Occurrence of Keywords

No.	Keyword	Occurrences	Total link strength
1	Radicalization	39	78
2	Social media	19	47
3	Internet	13	39
4	Terrorism	16	38
5	Media	15	28
6	Extremism	12	27
7	Collective action	5	16
8	Islamic State	6	16
9	ISIS	5	15
10	Twitter	6	14

(2014). VOSviewer software supports to creation co-occurrence map that depends on the bibliographic data. Considering the inherent limitation of mapping tools, the co-occurrence of keywords was run through the Web of Science .txt file only. The occurrence of keywords and the total link strength are shown in Table 1. As the output is in the form of a cluster diagram, it shows the distance between nodes as a function of their proximity.

Moreover, font size presents the level of concentration on the particular domain (Van Eck & Waltman, 2014).

To generate a map, the requirement for co-occurrence keywords was set for a minimum of two times, resulting in 89 keywords appearing within eight clusters that met the minimal level. The criterion selection has a big impact on the results. The lesser amount would result in several meaningless keywords. The larger the number, the fewer the keywords, making analysis more difficult.

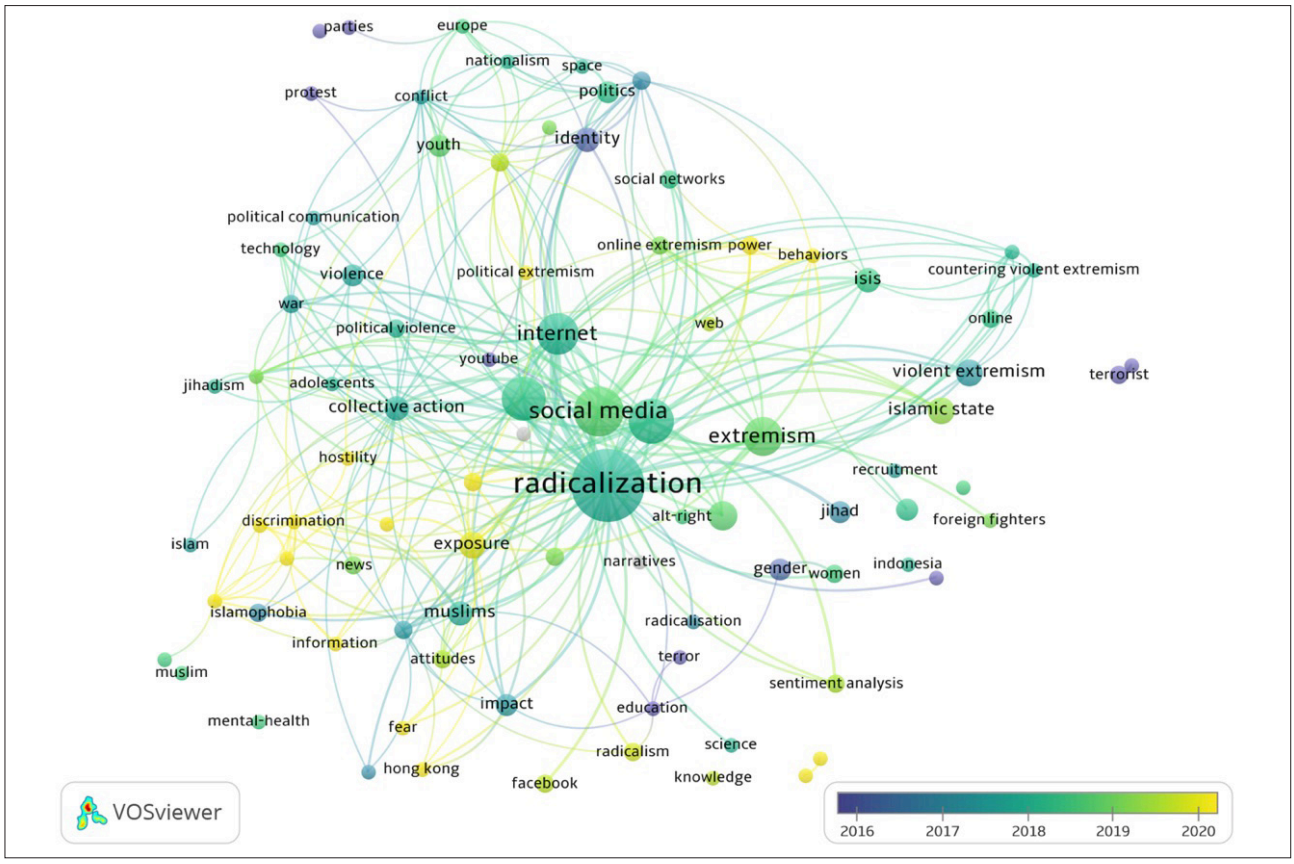

Figure 2. Co-occurrence network of all keywords

Figure 2 shows the bibliometric mapping from 2016 to 2020 based on all term co-occurrences and a temporal scale. When scores were determined on average normalized citations, the network depiction was based on the strength of links. The word font size denotes the number of times a keyword appears; the higher the size, the more influential the phrases are. The most recurring keywords were "radicalization" followed by "social media", "internet", "extremism", "collective action", "violence" and "Islamophobia". It indicates a clear connection between radicalization through social media. As most of the studies pointed out the issue of religion (Gagnon, 2019; Baugut & Neumann, 2020a), politics (Baumann et al., 2020), extremism (Davies, 2014; Cohen, 2016), and social media protest (Lee et al., 2020). Conspiracy theories and propaganda increasingly use social media to radicalize people by influencing their perceptions, attitudes, and abilities.

Figure 3 reflects the stronger association of radicalization towards the keywords of "terrorism" and "social media", followed by "extremism". It denotes that the radicalization resulting from social media content or activity may lead to acts of extremism and terrorism. The other factors pouring into the radicalization through social media are identity crisis, sense of community or belonging, islamophobia, and propaganda. The keywords of exposure, attitudes, and sentiments reflect the psychological aspects of radicalization through social media activity and content.

Figure 4 shows citation analysis by giving a weighted degree of cited documents. The full counting was used in creating a bibliographic map with a minimum of one citation and 64 met the thresholds. The thickness of links reflects the level of linkage among articles, while the size of nodes denotes a highly cited item. The various color intensities depict the strength of relationships based on multiple citations. It indicates citations from 2016 to 2020 with significant growth in research from 2018 on radicalization-related issues through social media.

Figure 5 shows a country analysis based on author affiliation and the location of research produced on radicalization and social media. This data is gathered to direct scholars, policymakers, solution providers, and seekers to address the issues on different platforms. Van Eck & Waltman (2014) advocate creating a bibliometric map and displaying the link strength to achieve this. The big node and font indicate that countries have contributed more research on radicalization and social media. The USA appears to be the most influential node

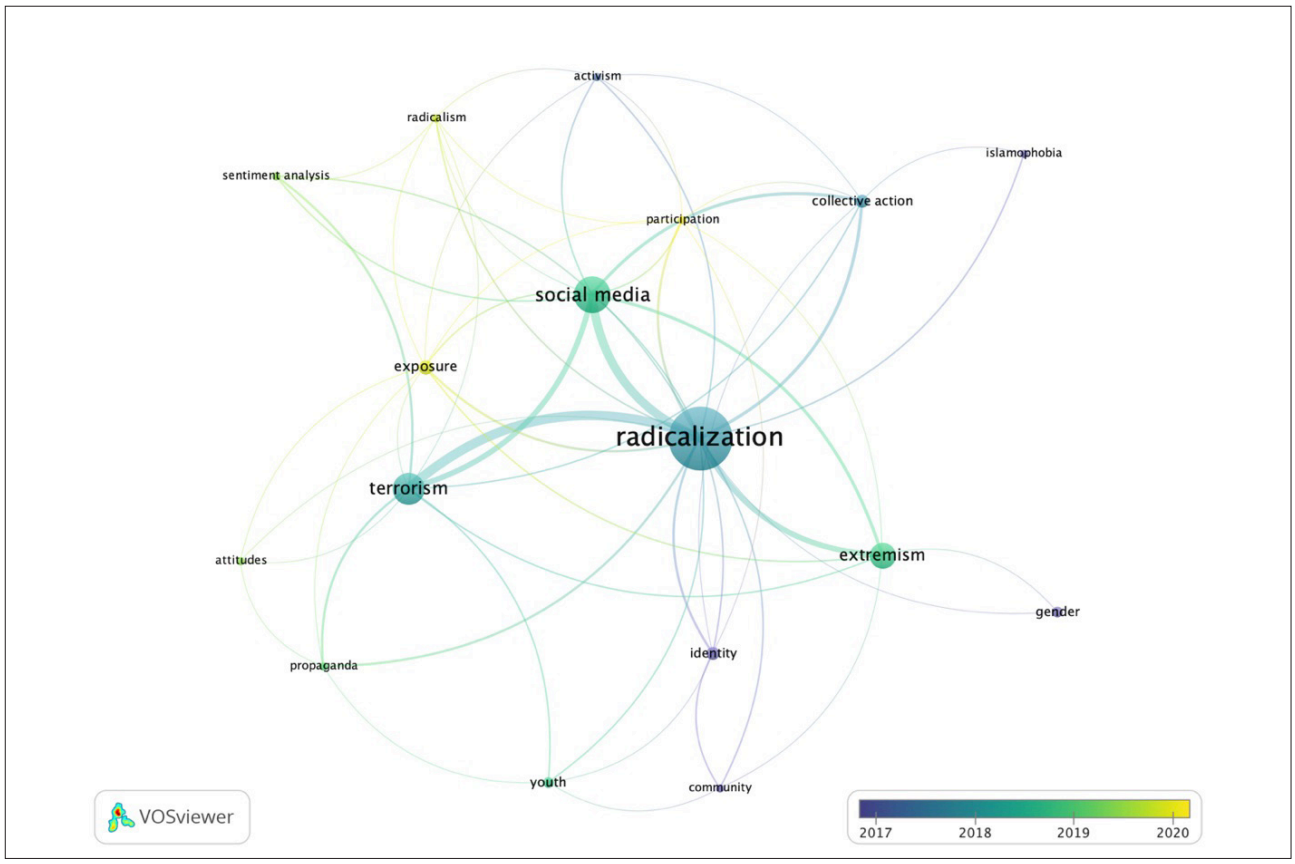

Figure 3. Co-occurrence network of keywords specific to social sciences

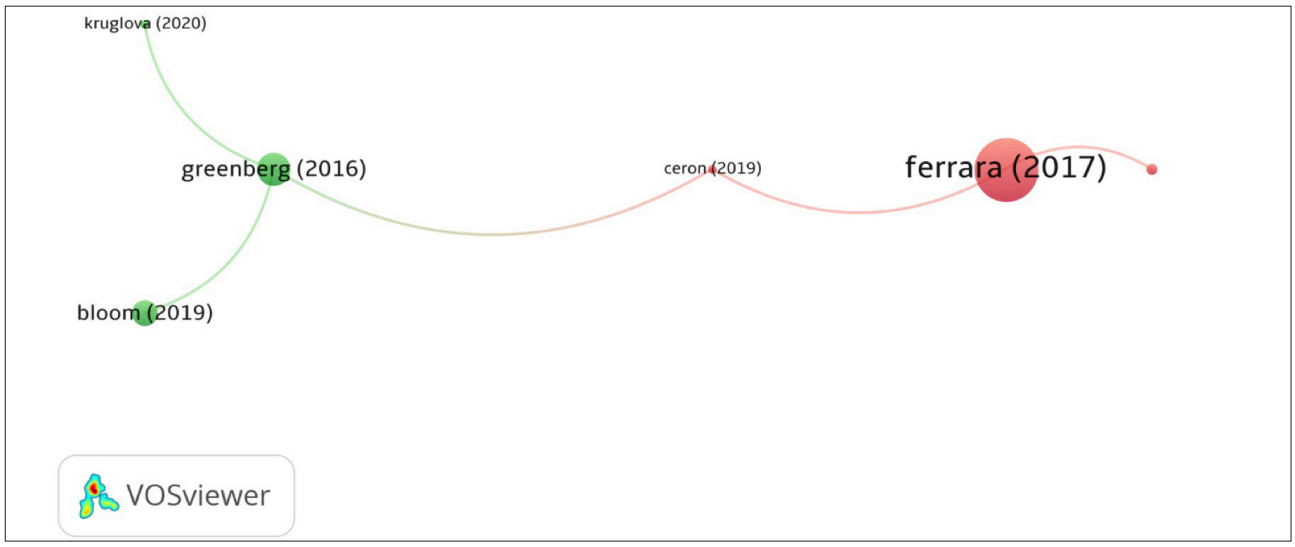

Figure 4. Co-citation analysis

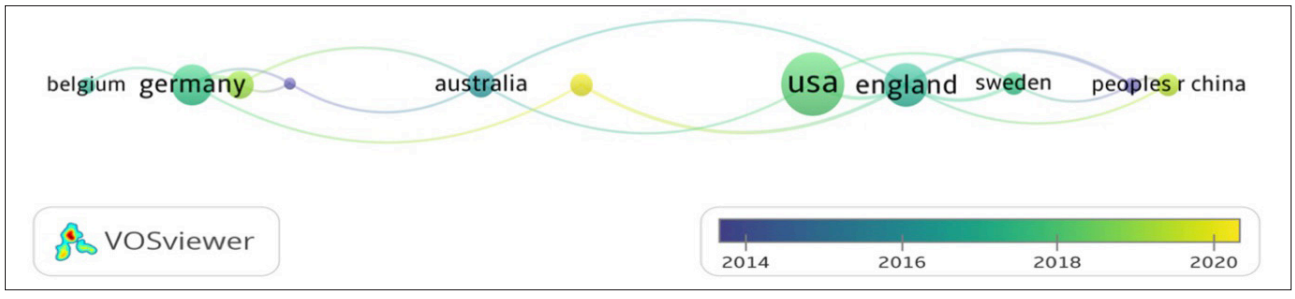

Figure 5. Country analysis subject to authors association and research produced

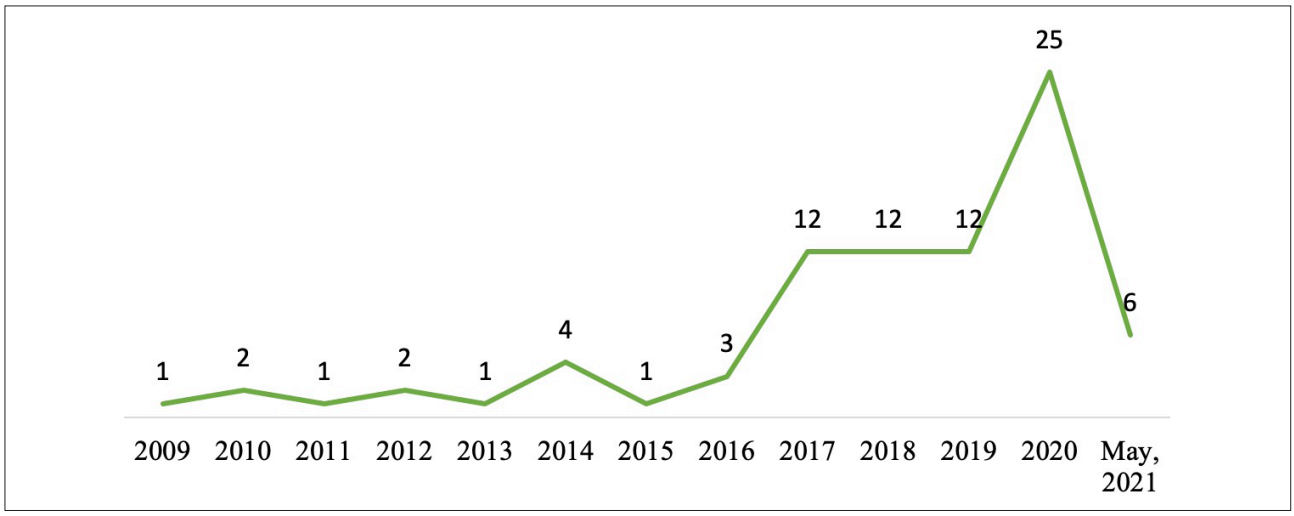

Figure 6. The yearly trend of published articles

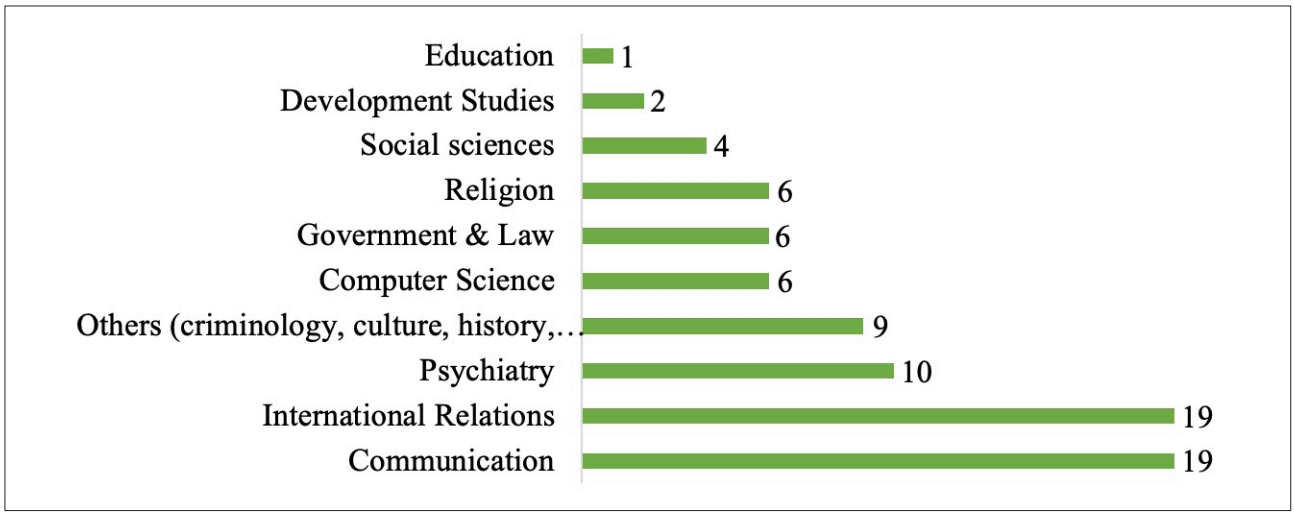

Figure 7. Article published as per WoS categories

with its more significant role in advancing radicalization research. A strong link occurred between the USA and England, Australia, Germany, and Sweden for collaboration on radicalization research.

Figure 6 depicts the yearly publication trend in radicalization on social media from 2009 to May 2021. However, a database search was performed from 2005 to May 2021. From 2017 onwards, it shows increasing trends. However, research on radicalization still needs to be investigated from multiple aspects. Figure 6 depicts articles published as per Web of Science categories. Most of the articles are related to the communication and international relation field. Table 2 depicts a list of the top 10 journals where most of the articles were published, Terrorism and Political Violence journal comes first. Table 3 shows a list of the top 10 most cited articles, Githens-Mazer & Lambert (2010) secured 61 citations as per the WoS database. Table 4 shows a sample of 15 articles out of 82 published on radicalization on social media. The articles with a major focus on radicalization were selected purposefully.

The radicalization through social media platforms received the increasing focus of research from 2017 when many political incidents in the global spectrum were associated with social media. Examples of such incidents include the usage of Facebook to spread hatred against Rohingya Muslims in Myanmar which led to their genocide (Stevenson, 2018), the change of the political landscape through social media amidst the Presidential elections in 2018 (Gualtieri, 2021), and increased use of social media such as WhatsApp to carry out the mob violence by cow vigilantes in India (Akram et al., 2021).

Table 3. *List of top 10 journals where articles published*

No.	Name of journals	Total papers published out of 82
1	Terrorism and Political Violence	7
2	Studies in Conflict & Terrorism	6
3	International Journal of Communication	4
4	Annals of the American Academy of Political and Social Science	2
5	Chinese Journal of Communication	2
6	Information Communication & Society	2
7	International Journal of Conflict and Violence	2
8	New Media & Society	2
9	Political Communication	2
10	Psychiatry Psychology and Law	2

Table 4. List of top 10 most cited articles

No.	Authors	Title of the article	Year	Citation by WoS	WoS categories	Journal
1	Githens-Mazer, J; Lambert, R	Why conventional wisdom on radicalization fails: the persistence of a failed discourse	2010	61	International Relations	International Affairs
2	Conway, M	Determining the role of the internet in violent extremism and terrorism: Six suggestions for progressing research	2017	52	International Relations; Government & Law	Studies in Conflict & Terrorism
3	Bondes, M; Schucher, G	Derailed emotions: The transformation of claims and targets during the Wenzhou online incident	2014	33	Communication; Sociology	Information Communication & Society
4	Porter, LE; Kebbell, MR	Radicalization in Australia: Examining Australia's convicted terrorists	2011	29	Criminology & Penology; Government & Law; Psychiatry; Psychology	Psychiatry Psychology and Law
5	Ferrara, E	Contagion dynamics of extremist propaganda in social networks	2017	27	Computer Science	Information Sciences
6	Zeitzoff, T	How social media is changing conflict	2017	21	International Relations; Government & Law	Journal of Conflict Resolution
7	Rudner, M	Electronic Jihad: The internet as Al Qaeda's catalyst for global terror	2017	21	International Relations; Government & Law	Studies in Conflict & Terrorism
8	Reynolds, SC; Hafez, MM	Social network analysis of German foreign fighters in Syria and Iraq	2019	18	International Relations; Government & Law	Terrorism and Political Violence
9	Post, JM	When hatred is bred in the bone: the social psychology of terrorism	2010	17	Neurosciences & Neurology; Psychiatry	Psychiatric and Neurologic Aspects of War
10	Bhui, K; Ibrahim, Y	Marketing the radical: Symbolic communication and persuasive technologies in jihadist websites	2013	16	Anthropology; Psychiatry	Transcultural Psychiatry

Table 5. Sample of 10 articles out of 82 and their key findings

No.	Authors	Title of the article	Year	Key Findings
1	Andersson, L	What's left of the radical left online? Absence of communication, political vision, and community in autonomist web milieus in Sweden	2018	This article argues to reevaluate the findings of the Swedish Media Council and establishes the case that propaganda and conspiracies on social media do have a role in youth radicalization.
2	Bastug, MF; Douai, A; Akca, D	Exploring the demand side of online radicalization: Evidence from the Canadian context	2020	It confirmed the role of social media to radicalize extremists who were already convicted of extremism in the Canadian courts.
3	Baugut, P; Neumann, K	Describing perceptions of media influence among radicalized individuals: The case of Jihadists and non-violent Islamists	2020a	Individuals get radicalized both by news media and social media, as the sense of deprivation and political alienation play a role in radicalization.
4	Ferrara, E	Contagion dynamics of extremist propaganda in social networks	2017	After analyzing the online activity of 25,000 social media users, this article investigated the dynamics of radicalization for ISIS support on social media.
5	Greenberg, KJ	Counter-radicalization via the internet	2016	Based on various ways the terrorist groups radicalize youth on social media, policies must focus on the internet to identify and counter such activity online.
6	Huttermann, J	Neighborhood effects on Jihadist radicalization in Germany? Some case-based remarks	2018	The living space and peers play a lead role to radicalize youth as such experiences significantly influence perceptions and worldviews.
7	Jones, E	The reception of broadcast terrorism: recruitment and radicalization	2017	Internet – broadly, and social media – specifically have become the tools of terrorist groups like ISIS to radicalize people even to give up their life for terrorist activity.
8	Mythen, G; Walklate, S; Peatfield, EJ	Assembling and deconstructing radicalization in PREVENT: A case of policy-based evidence-making?	2017	Religious ideology blended with political grievances adds up to the radicalization of violent extremism.
9	Pedersen, W; Vestel, V; Bakken, A	At risk for radicalization and jihadism? A population-based study of Norwegian adolescents	2018	Poor schooling and misconduct attitudes among teens build their liking of radicalization and political violence.
10	Ul Rehman, Z; Abbas, S; Khan, MA; Mustafa, G; Fayyaz, H; Hanif, M; Saeed, MA	Understanding the language of ISIS: An empirical approach to detect radical content on Twitter using machine learning	2021	After discussing the radicalization process on social media platforms, this article suggests an expanded list of terms to be labeled as radical content online.

DISCUSSION

It was found that the reviewed papers mainly discussed two major aspects of radicalization through social media: determinants of radicalism on social media, and mitigation measures to deradicalize the social media space. This systematic review has found that radicalization through social media spread due to psycho-political factors, personal experiences or aspirations, anti-social or rebellious attitudes or personalities, and freely available radical content like games, videos, and images floating around social media.

Determinants of Radicalism on Social Media

Psychological Factors

Social media platforms have been massively used by extremist groups to influence individual cognitions to radicalize them by flooding extremist content online

(Ul Rehman et al., 2021). Such content on social media facilitates extremist groups to propagate extremist agendas, perpetuate psychological warfare, and recruit radicalized individuals for direct or indirect violence. Internet or social media addiction and fear of missing out on the feeds are psychological factors pushing users at higher risks of encountering radical content online and being persuaded to violence to justify their worldviews (Tang et al., 2020). Internet addiction causes depression which influences the individuals' cognition and creates space for radical political attitudes (Tang et al., 2020). Extended interaction with social media often brings negative psychological changes such as radicalization (Smith et al., 2020).

Since human beings seek a sense of belonging and connectedness, individuals with social exclusions or individuals at risk of being excluded are prone to radicalization (Renström et al., 2020). Such individuals tend to spend more time online which enhances the probability of encountering hate speech for radicalization. Identity formation and self-realization are processed at the adolescent age (Nienierza et al., 2019). Adolescent youth spend a significant amount of time on social media which potentially plays a role in their identity formation. There is limited evidence-based research on the frequency of adolescents encountering extremist content online, their ability to identify the extremist content online, and the intensity of their being radicalized. Nuraniyah (2018) has studied the factors urging women to join terrorist groups like ISIS and found that most of the women joined the group on their own. The factors urging women to join ISIS were grievances from family, society, and economic conditions which directed them to seek religious satisfaction. Since women with less social exposure spend more time on social media and ISIS was heavily using social media misusing religious notions for violent extremism, the women anticipated acceptance and empowerment for joining ISIS.

Political Factors

Windsor (2020) views that individual, social, and political dynamics facilitate the process of radicalization amidst computer-generated communication tools such as social media platforms. The usage and typology of language on social media or other online accounts reveal the process and steps of being radicalized if someone is engaged in extremism or terrorism activity. Costello et al. (2020) also confirmed more engagement with social media to advocate for political opinions online pose higher chances of exposure to hate speech and being radicalized. Baugut & Neumann (2020b) found a direct influence of online propaganda and news media on the radicalization of Islamist prisoners and former Islamists in Austria and Germany. Their cognition was radicalized through propaganda blaming non-Muslims and Western politics as being responsible for Muslims' sufferings. Such online propaganda urged Islamists even to justify the use of violence.

Based on the analysis of publicly non-affiliate but jihad-advocating social media accounts, Boko et al. (2021) found that radicalization content on those accounts was derived from emotionally sensitive intense crisis constructs or simplistic solutions to personalized issues. Radicalization posts on those social media accounts were not trying to convince the readers but polarizing certain narratives. Islamic State used the natural, biological, and supernatural force metaphors to recruit women to serve as brides of their fighters (Jackson, 2019). Social media platforms like Twitter offers confrontation space to the politically opposite groups to promote extreme hostilities online which have significant chances of violent confrontation if such groups meet in-person (Klein, 2019). The 2017 Unite the Right rally in Charlottesville, Virginia, United States, is such an example.

Art and Games for Radicalization

There has been a significant increase in the usage of social media platforms to post hateful material, comment on violent speech, and even post videos to radicalize and propagate violent extremism (Sharif et al., 2019). Though the production of extremists and terrorists championing games have been declined since the 2000s, such production still has significant prevalence and social media has become a handy tool for wider circulation and youth engagement (Robinson & Whittaker, 2020). Grosholz & Pieri (2020) analyzed 337 white power songs from seven white power bands in the U.S. and found that such music mobilizes for extreme violence and vigilante justice considering threats from immigration, Jewish-controlled media, and liberalism. The authors recognize that extremism in the U.S. has not received much scholarly attention due to its dominant nature of nonviolence.

Defiance of Mainstream Structures

Modern terrorist groups heavily rely on the internet to spread their propaganda and recruitment purposes (Araque & Iglesias, 2020). Extremists use social media for various purposes ranging from propagating their extremist ideologies to recruitment (Ganesh & Bright,

2020). Such wide-ranging usage of social media by extremists depicts regulatory flaws for governments, civil society, and even the social media service providers such as Facebook and Twitter. The radicalized individuals live in a bubble that news media cannot influence but has a strong effect on the public including political governments and people serving in the judiciary (Baugut & Neumann, 2020b). Such perceptions often represent radicalization which results from their evidence-less allegations of the media being propaganda machines. The confrontation between opposition groups on online platforms like social media is directly associated with violence if those groups face each other in person (Gallacher et al., 2021). Due to the unstructured nature of communication on the internet including social media, the opposite groups with different narratives or political views have a higher probability of violent confrontation if they face each other in person. Unstructured communication plays a significant role in radicalization for violent extremism.

Trends in Online Radicalization

Though there have been an increase in counter-violent extremism (CVE) campaigns to curb threats of online propaganda and radicalization, there is limited evidence to measure the effectiveness of CVE online campaigns (Monaci, 2017). Law enforcement is also shifting to online spaces (Aziz & Beydoun, 2020). Since laws are not coping with rapidly changing trends and the utilization of social media platforms, their undefined policing of social media may restrict the freedom of expression, particularly for marginalized groups. The virtual extremist landscape has been changed from password protections and static portals to dynamic websites, videos, and on handy public social media platforms like Facebook and YouTube (Winter et al., 2020). Bloom et al. (2019) found the major role of Telegram in the recruitment of ISIS fighters and further coordination for terror attacks in Europe as Telegram has comparatively fewer measures established to monitor and down the content related to extremism and terrorism.

Radicalization Happens at 'Onlife Spaces'

Valentini et al. (2020) argue that radicalization happens in 'on-life spaces', because of an individual's online interactions with conspiracy theories or disinformed propaganda and offline experiences of viewing one's life. Social media algorithms track their users' offline activities to feed in relevant content, often unauthentic. When Reynolds & Hafez (2019) studied the reasons for Westerners joining civil conflicts like ISIS, they found both the in-person and online factors in radicalization and mobilization for violent extremism. For Reynolds and Hafez, interpersonal ties and peer-to-peer networks were the major factors for German foreign fighters to join ISIS and social media also played a role in spreading the word. Ceron et al. (2019) identified that the geographic locations originating more content on social media in support of ISIS had more trends of foreign fighters joining ISIS.

Mitigation Measures for Deradicalization on Social Media

Understanding Radicalization Tactics Online

Bouko et al. (2021) argue for understanding the methods and tactics of extremists' communication on social media, in addition to what they communicate, which will help to identify the psychological traits of those being radicalized. Since individuals prefer to learn and adapt behaviors that they observe visually as an example, counter-violent extremism interventions need to focus on such visual strategies to influence radical narratives and perceptions (Grady et al., 2021). Robinson & Whittaker (2020) highlight the videogames, often available on different social media platforms, being used to propagate violent narratives. Such games build in the violent roles of players and assess to influence the persons' psychological traits for admiring and engaging in violence. Munger & Phillips (2020) urge us to understand the dynamics right-wing video game developers utilize in their production for like-minded consumers. The counter-narrative efforts could understand the victimhood factors of extremists which urge them to justify and engage in violent extremism (Marcks & Pawelz, 2020).

Detecting Radical Content on Social Media

Ul Rehman et al. (2021) identified four areas to identify or detect violent narratives on social media platforms. The development of a new dataset of the latest terms related to radicalization, cross-analysis of new and previous such datasets to cope with altered narratives of extremist groups, building the capacity of social media teams, and identifying the ways of radical or extremist words usage on social media. The regular update of keywords or search directories, including terms from religious texts, could help identify extremist content on social media in real-time which may help the authorities to respond with counter-extremism approaches employed per situation. Araque & Iglesias (2020) also urge for an updated dataset to detect the radicalization content on social media which targets the emotional and cognitive grounds of an individual.

Strategic communication with moderated or focused content may help not only to detect radical content online but the strategies of content delivery and engagement with the target audience can also be exposed and then countered (Ganesh & Bright, 2020). For example, the counter-extremism interventions may want to identify the online content blaming the mainstream media platforms as biased or propaganda machines as this notion is one of the justifications radical groups tend to invite people to follow their channels on social media (Baugut & Neumann, 2020a). Derbas et al. (2020) talked about SafApp, a technological tool that helps identify radical and extremism online particularly on social media platforms.

Adaptability to Counter Radicalization

Since radicalization results from extremist groups' integrated propagation through online radical content and offline interactions or communication, both spaces must be considered in counter-extremism interventions (Kumar, 2017; Valentini et al., 2020). Social media companies could embed the adaptable and latest technological systems to detect, track, and curb the spread of radicalization content on their platforms. The counter-terrorism or counter-extremism measures need to adopt focused strategies specific to the targeted audience such as women and youth (Nuraniyah, 2018). It requires understanding the content and strategies extremist groups employ to brainwash their audience for radicalization and violent extremism.

Due to the instant and significant increase in radical and extremist content online amidst intensified hate speech and conspiracies online, many countries have drafted and implemented laws to tackle radicalized content (Niemi et al., 2018). Since radical content and hate speech online have become a real threat to the countries' national security, some countries have adopted different educational programs to prepare their citizens to detect and deal with radical content online without being radicalized. Hence, national educational strategies and syllabi are needed to consider threats of radicalization and strategize their content and its delivery accordingly.

Utilizing Religion and Spirituality

Schmidt (2021) outlined the example of Nahdlatul Ulama in Indonesia which tend to challenge the radical interpretation of the Quran, and the identification of radicalization content on social media to act as an antidote against radicalism. Further, the counter-extremism strategies may consider the ethical notion to devise their strategies, since extremist groups often try to radicalize individuals for violent extremism by targeting their religious and ethical values or behavior (Hopp et al., 2021). Cherblanc & Tremblay (2019) argued for the integration of spirituality in efforts of prevention or countering violent extremism into the public school system of Quebec, Canada. Since spirituality is the human trait being targeted by extremist groups to mobilize their support in public narratives, the positive side of the similar concept of spirituality can prevent school children from being radicalized but focus on development and just learning. Based on this review and discussion, the authors of this paper define radicalization through social media as "the activity process or content on social media deliberately influencing others' political, religious, or social views to establish, expand, or strengthen radical ideologies or groups online and in-person".

CONCLUSION

Concerns about the radicalization on social media have grown significantly as the number of internet user have increased rapidly. Social media platforms were launched to provide internet users with social networking experiences online. However, it is being misused for narrative building, conspiracies, and propaganda by political and religious groups. The synthesis of the literature indicated that political interests are crucial factors in the radicalization of individuals through social media platforms and radicalization increases when citizens lack trust in government and political parties. Such lack of trust is framed to name the mainstream media as agents of corrupt governments and groups which urge people to follow current affairs on social media platforms. Radical and extremist groups tend to fill in the online space of social networks with radical content aligned with trending stories or news to grab the public attention toward their end goal of radicalization for violent extremism. The increased interaction and time of users on social media platforms increase the chances of radical victimization. When people's life experiences of prejudice, inequality, oppression, or lack of opportunity are multiplied with hateful and radical content online, they tend to justify extreme and violent behaviors of being accepted in society. The extremists establish their narratives, proxies, and propaganda by spreading hoaxes and rumors about community-interest events or news.

This review paper will serve as a resource for academic scholars and practitioners with summarized findings extracted from the WoS core collection database. The figures and tables in the bibliometric analysis present the key themes and timelines of radicalization through social

media platforms which will guide the policymakers to identify the year radicalization took off spreading through social media and further themes or areas researchers focused upon. It will invite them to take policy actions. This article will also be a good resource for academic scholars working on radicalization issues through social media to cite it and further snowball to the additional resources through its rich list of references. This study is limited to the published articles indexed in one database, i.e., Web of Science, which may have not covered all the literature published on the issues of radicalization through social media. Though there could be more relevant literature, this study chose one database which directs the focus of this review to be more systematic. Furthermore, there can be some updates or changes in the search algorithm of the Web of Science in the future which may generate different results.

To combat the growing radicalization through social media, individuals must have critical social media literacy. This review raised certain questions such as, what factors enable radicalization on social media? What would be some effective countermeasures to prevent radicalization on social media? What personality traits allow the acceptance of radical content from social media? Given that, it opens new research avenues to explore and empirically measure factors causing radicalization on social media at the intersection of sociopolitical psychology. The results indicate that further research using experimental design, expanded coverage for case studies, context-specific grounded theories, and pilot intervention may be relevant to suggest a possible solution to mitigate radicalization through social media. Apart from understanding the process of radicalization through social media, there is a need for extensive research on techniques and methods the extremist or terrorist groups in different regions employ to gauge the attitudes and personalities of social media users as potential targets of their radicalization propaganda online.

Conflict of Interest

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Asymmetry in Return and Volatility Spillovers Between Stock and Bond Markets in Turkey

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ABSTRACT

This study analyzes the asymmetric volatility spillovers in the stock and bond (S&B) markets in Borsa Istanbul during 2003-2019. Financial crises have increased the importance of the transition between the S&B markets. Apart from the full period, the 2008 financial crisis period is examined separately to see the effects of the spillovers during the crisis period. First, asymmetric volatility tests with the sign bias test were performed. Then, to find out whether S&B market volatility wwas asymmetric, we investigated with the GJR-GARCH model. Finally, asymmetric volatility was examined between the two markets test with the VARMA-AGARCH model. According to the asymmetric volatility test results, negative volatility asymmetry existed in the bond market for the full period. Asymmetric volatility was positive in both market during the crisis time. Return spillovers from the stock market to bond market for the full period. It was the opposite direction during the crisis period. Volatility spillover was bidirectional between the stock market and the bond market. However, during the global crisis period, volatility spillover was bidirectional from the stock market to the bond market

Keywords: Asymmetric Volatility Spillovers, Borsa Istanbul, VARMA-AGARCH.

JEL Classification Codes: G11, G12, C32

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INTRODUCTION

Stocks and bonds (S&B) are the most crucial products of the financial markets. Therefore, the S&B markets have a critical impact on investment decisions because of the size of funds collected. The bond market investor is better suited to the risk-averse investor profile, and the stock market investor takes risks. Because bonds - even if there are relative differences between their types - carry lower risk than stocks. This results in different risk-return balances for S&B investors. Bond investors have lower risk and thus return expectations, whereas stock investors have higher expectations.

Volatility is also a crucial factor in investment decisions. When stock prices expose to distinct changes, such as the financial crisis and technological change, volatility increases. Equilibrium prices taken from asset pricing models affect volatility changes. Therefore, investors closely follow volatility. Spillovers modeling and estimation in financial markets are also critical for researchers. Volatility spillovers among markets are also effective in asset pricing and investment decisions. Spillovers affect the creation of information contagion and integration among S&B markets (Zhang et al., 2013: 214).

Fundamental macroeconomic indicators, such as GDP, unemployment rate, exchange rate, money supply and VIX, use stock market analysis (Chen et al., 1986; Fama and French, 1989; Fama, 1990; Schwert, 1990; Lee, 1992; Bekaert and Hoerova, 2014). Dean et al. (2010: 272) argue that the volatility spillovers among the S&B markets have not occurred suddenly or completely. Macroeconomic news on the stock market, which causes unanticipated prices to drop in bond prices, will be that high-interest rates will slow down economic growth, and stock cash flows will decrease. This will cause share prices to fall. In such a case, the spillovers are from the bond markets to the stock market. The lower correlation between S&B connection is important for strong diversification. S&B correlation, while having a positive relationship with inflation risk, investors make extra efforts to diversify their investment risk (Li, 2002: 27). In this study, we will

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examine only stocks and bonds in terms of the internal dynamics of financial markets, not from a macroeconomic perspective. Our focus is on the interaction between S&B markets.

We investigate the return and volatility spillovers in the S&B markets of Borsa Istanbul. We attempt to reveal the behavior of S&B investors, who have different attitudes towards risk, especially in Borsa Istanbul. Therefore, this study is one of the leading articles investigating asymmetric volatility spillovers between Turkish S&B markets.

Investors behave differently during extreme volatility periods compared to more stable situations. Therefore, the 2008 Global Financial Crisis has been analyzed separately in this study. How do these two types of investors behave in a crisis period? Has the crisis a critical position in the behavior of investors and market spillovers? We are also investigating the answers to these questions. The search for answers to these questions is the motivation.

Other parts of the present study are as follows. The theoretical framework is established in Section 2. Section 3 reviews the studies that examine Borsa Istanbul volatility and symmetric, asymmetric and volatility spillovers models. The present study has performed analysis for two different periods: the full and the global crisis periods. The method is explained in section 5. First, volatility asymmetry is a test for the asymmetry diagnostic proposed by Engle and Ng (1993). Then, the effects of positive and negative news on volatility will be investigated by Glosten Jagannathan Runkle Generalized Autoregressive Conditional Heteroskedasticity (GJR-GARCH) model. Finally, asymmetric return and volatility spillovers between S&B markets returns will be analyzed by Vector Autoregressive Moving Average-Asymmetric Generalized Autoregressive Conditional Heteroskedasticity (VARMA-AGARCH) model. It provides the conclusion in Section 6. In the conclusion part, we will compare the crisis period findings and the whole period findings. Thus, this study will show whether the behavior of the investors in the S&B markets has changed in times of crisis.

THEORY

Investors do not have inadequate information about the return and risk factors between stocks and bonds. The incomplete research on the connection among interest rates, bond prices and the failure to faith that bonds are less risky as regards stocks are the source of this inadequate information (Jung et al., 2007: 411).

Bond investors and stock investors are different in terms of risk-taking behavior. Cash flows expected from bond investments contain less uncertainty than stocks. In addition, since stocks represent equity, they include both the possibility of profit and loss, whereas bonds represent a debit with certain long-term conditions and agree upon in advance. Thus, based on the structural differences between the two investments, investor expectations and behavior of both investments may change.

Investors are reviewing their investment decisions more frequently to take measures against both S&B risks in times of high uncertainty in the stock markets. The volatility of the stock market has a critical position in understanding the negative correlation periods between the stock and the bond (Connoly et al., 2005: 189). The stock market excess return extremely harmonizes with the bond market excess return (Shiller and Beltratti, 1992: 44). Variables used to estimate excess bond returns can also estimate excess stocks returns (Campbell and Ammer, 1993: 32). The reason for the change in the correlation sign between S&B markets is causality. Correlation does not mean causality. However, most investors feel that the causality from the bond prices to the stock prices is positive (a decline in stock prices also reduces stock discount rates) and from the stock prices to the bond prices is negative (Ilmanen, 2003: 55). Although it is nontrivial to specify the dimension to which these economic factors affect, correlation into the negative field can benefit measurement fundamental dynamics (Baele et al., 2010). Many papers present a significantly negative link between bond yields and equity prices (Gök and Çankal, 2020: 301)

The perspective of the asset exchange approach is that stocks and bonds are in competition. The emergence of information shapes the perception of investors for classifying assets. The news that bonds are more preferred than stocks encourage investors to purchase bonds and sell stocks; however, news that stocks are the most preferred means of exchange of stocks. This effect is symmetrical. In addition, it mostly relates bond price changes to general economic conditions, while stock price changes are mainly because of corrections related to company valuation. This behavior is the original evaluation of news (Dean et al. 2010: 273). According to Campbell and Vuoteenaho (2004), expected cash flows and discount rates shocks (news) should be tested separately. The news about positive cash flow raises stock value but decreases when discount rates increase. However, the sudden increase in the discount rate shows

that expected returns will be superior. Koutmos (1999) states that prices capture bad news faster than good news, and this means asymmetric price correction.

According to King and Wadhwani (1990), financial contagion is an error that may occur in one market and may affect other markets. Volatility transmission is more likely if the news is bad. Bad news can come from all sides and there may be an asymmetry in the signs of shocks (Bae et al., 2003). Fleming et al. (1998: 136) assume that in the change's behavior in the hedging demand, traders consider the correlation between different markets. This enables portfolio diversification to reduce the risk of speculative profits between markets. In addition, strong volatility occurs between markets because of the change in expectations in different markets. This is important in terms of risk and return-based asset allocation and risk management strategies that change.

Dean et al. (2010) conclude that the bond and stock spillovers effects are strong in Australia and spillovers effect reduces stock returns with bond market bad news. The good news in the stock market is spillovers to the reduce bond return. The volatility of the bond market does not affect stock market variables. Zhang et al. (2013) have revealed that mutual volatility spillovers emerge between the stock and the bond markets in Brazil, South Africa and France, one-way spillovers from the bond to the equity in the US, the U.K., and Germany.

LITERATURE

The literature section comprises two parts. The first part examines the studies regarding volatility in Borsa Istanbul. The second part contains symmetric volatility models, asymmetric volatility models, and volatility spillovers models.

Volatility in Borsa Istanbul (BIST)

Yavan and Aybar (1998) investigated volatility analysis in Borsa Istanbul using Generalized Autoregressive Conditional Heteroskedasticity in Mean (1,1) (GARCH-M (1,1)), Exponential Generalized Autoregressive Conditional Heteroskedasticity in Mean (1,1) (EGARCH-M (1,1)) and Threshold Generalized Autoregressive Conditional Heteroskedasticity in Mean (1,1) (TGARCHM (1,1)) models with daily returns between 1986-1996. To our knowledge, there is no evidence that negative news about negative asymmetry causes more volatility than positive news. The effect of the news is symmetrical. However, another study conducted in the same year, using the GARCH and EGARCH models with the monthly data between 1989-1996 for the volatility analysis in Borsa Istanbul provides evidence that negative news leads to more volatility than positive news (Okay, 1998). In addition, Akar (2005) investigates the asymmetric effect of volatility with daily data for the Istanbul 100 Index between 1990-2004 and observes that negative deviations cause more volatility than positive deviations in the study use the TAR-GARCH model. Payaslıoğlu (2001) estimates volatility in Borsa Istanbul 100 Index with daily data between 1990 and 2000 using GARCH-M, EGARCH-M and TGARCH-M models, and asymmetry cannot emerge. Doğanay (2003) concluded that using conditional methods to model the variability of Government debt securities index (GDS) returns and predict variances for the next day in a volatility study conducted with GARCH and EWMA model in Borsa Istanbul GDS Indexes.

Mazıbaş (2004) uses GARCH, EGARCH, GJR-GARCH, A-GARCH and C-GARCH methods for volatility modeling in Borsa Istanbul's main Indexes (Compound, Finance, Service and Industrial). In this study, which uses daily, weekly, and monthly data between 1997-2004, there is an asymmetric effect. With weekly and monthly data, the models provide more satisfactory results and the models are insufficient in daily data.

Özçiçek (2005) investigates the volatile connection between the exchange rate (USD/TL exchange rate) and stock indexes (BIST100, Financial, Industrial and Services). The asymmetric effect is stronger when stock indexes decrease or the exchange rate increases (negative news). Soytaş and Oran (2011) examine the effect of volatility spillovers between the Borsa Istanbul 100 Index and the Borsa Istanbul Electricity Index and oil prices. Using the Granger causality test developed by Cheung and Ng, they find the causality connection between the variance of world oil market returns and the electricity index, but this is not valid for Borsa Istanbul. Tokat (2013) uses the BEKK (Baba, Engle, Kraft and Kroner)-MGARCH model between gold, foreign exchange (USD/TL exchange rate) and Borsa Istanbul 100 Index. The shocks in the foreign exchange market impact the gold market and Borsa Istanbul exhibits a volatility structure independent of other variables.

Yıldız (2016) applies TGARCH, GARCH-M, EGARCH, PARCH and CGARCH methods for the symmetric and asymmetric volatility analysis of the Borsa Istanbul sub-indexes, Services, Financial and Industrial indexes. According to the results of the EGARCH and TGARCH model, negative news in all three indexes has more impact on volatility than positive news. The most successful model for BIST Industrial and BIST Financial indexes is the TGARCH model, and for the BIST Service index, it is the CGARCH model.

Demirgil et al. (2015) applied Vector Autoregressive Moving Average (VARMA), the E-GARCH and BEKK models on the mean for asymmetric volatility estimation between oil prices and the industrial production index. Their findings Show that the changes in oil prices affect industrial production asymmetrically. Cihangir and Uğurlu (2017) conducted asymmetric volatility research in the Borsa Istanbul gold market using Asymmetric Power ARCH (APARCH), Threshold ARCH (TARCH) and EGARCH models. The best explanation for gold return volatility is the APARCH model, and the effect of good news is more effective on volatility than the effect of bad news. Baykut and Kula (2018) investigate the volatility structure in the Borsa Istanbul 50 Index by symmetrically ARCH and GARCH, asymmetrically PARCH, EGARCH and TGARCH models. They select the most appropriate model for Borsa Istanbul 50 index as the GARCH (2.1) model and the heaviest model. Tüzemen and Köseoğlu (2018) examine the effect of asymmetric volatility between the VAR-EGARCH model and the oil markets and Borsa Istanbul sector indexes. The asymmetric volatility diffusion effect exists in all sectors except the mining sector. Gunay (2019) tests whether the volatility of Borsa Istanbul is affected by credit default swaps, asset swaps and zero-volatility spreads with the Markov Regime Switching VAR model. Kaya and Soybilen (2019) investigate the asymmetrical effects of production, interest rate and exchange rate on stock prices in Borsa İstanbul. The exchange rate and the industrial production index have asymmetric effects on Turkish stock prices both in the long run and the short run, but the interest rate has only long-run asymmetric effects.

Ekinci and Gençyürek (2021) examine return and volatility spillover between Borsa Istanbul Sector Indices using the time-varying VAR (TVP-VAR) model. The industry and finance sectors are in the leading position to shock and volatility spillover. Technology, Tourism, Transportation, Food and Retail-Trade sectors are lagging. Gürbüz and Şahbaz (2022) apply wavelet analysis for the volatility spillover effect between derivative markets and spot markets in Borsa İstanbul. Spot markets are influenced by the previous volatilities of derivatives markets, as well as their own previous volatilities.

Symmetric Volatility Models, Asymmetric Volatility Models, And Volatility Spillovers Models

Engle's (1982) ARCH and Bollerslev's (1986) GARCH are the models for conditional volatility modeling of S&B returns. The conditional mean and the conditional variance can be calculated synchronously in the ARCH model. The GARCH model includes the lagged values of conditional variance in the conditional variance equation. Conditional variance is in the mean equation of ARCH Mean (ARCH-M) and GARCH Mean (GARCH-M) models developed by Engle et al. (1987). Thus, the conditional variance affects the mean and the risk premium that changes according to the time considered. The effect of positive and negative news is supposed to be identical in these models. Therefore, these models are symmetric models.

Nelson (1991) developed the exponential GARCH (EGARCH) model, which assumes that the positive and negative shock (asymmetry) that may do in the series have a different effect on the estimation of volatility. EGARCH supports Black's (1976) leverage effect (negative news in volatility estimation is more effective than positive news). The logarithmic of conditional variance in the EGARCH model provides information about asymmetric information, and the use of standardized error terms gives information about the magnitude of the shock. The threshold ARCH (TARCH or GJR) model asymmetrically predicts the effect of negative and positive news using a dummy variable (Glosten et al. 1993). Ding et al. (1993) developed an asymmetric power ARCH (PARCH) model that contains the parameter that shows the most asymmetric effect directly on the data. Another model that measures the asymmetric effect is the TGARCH model developed by Zakoian (1994).

The symmetric and asymmetric models described above are univariate. Multivariate models have an important role in modeling co-movement. Simultaneous dependencies increase the importance of multivariate modeling. Bollerslev et al.'s (1988) Vector GARCH (VEC-GARCH) model, Bollerslev's (1990) constant conditional correlation model (CCC-GARCH), Engle and Kroner's (1995) BEKK model, Engle's (2002) dynamic conditional correlation (DCC-GARCH) model, Ling and McAller's (2003) vector ARMA GARCH (VARMA-GARCH) model and McAlleer et al. 's (2009) ARMA AGARCH (VARMA-AGARCH) model are some of the multivariate models. In this study, first, asymmetric volatility in S&B markets will be tested with a univariate GJR-GARCH (1,1) model. Then, the asymmetric return and volatility spillovers between the two markets will be analyzed by the multivariate VARMA-AGARCH (1,1) model.

Chan et al. (2005) investigate the patent growth rate in the USA from Canada, France, Germany and Japan by Constant Conditional Correlation (CCC), VARMA-GARCH and VARMA-AGARCH methods to measure technological capacity. The conditional variances

of the patent growth rate of the four countries are interconnected. This result shows global factors affect the technological capacity of the USA. Chang et al. (2010) use CCC, Vector ARMA-GARCH and Vector ARMA-Asymmetric GARCH (VARMA-AGARCH) methods for the volatility spillovers, asymmetry and hedging estimation in oil markets. Volatility spillovers and asymmetric effects emerge from West Texas (WTI) and Brent markets to Dubai and Tapis (Asia-Pacific) markets. Chang et al. (2011) apply CCC, Dynamic Conditional Correlation (DCC), and VARMA-GARCH methods for volatility spillovers on spot and futures, rubber markets in Bangkok, Singapore, Tokyo and Osaka in Asian markets. There is the effect of volatility spillovers between spot and futures markets. Chang et al. (2013) investigate the volatility spillovers between the WTI and Brent oil markets and the FTSE100, NYSE, Dow Jones and S & P500 stock markets. They use CCC, VARMA-GARCH and VARMA-AGARCH methods. They present a mini-proof for the volatility spillovers among oil and stock markets according to asymmetric methods. In addition, the VARMA-AGARCH method is superior to other methods in showing the asymmetric reaction of negative and positive shocks on conditional variance.

Dean et al. (2010) use asymmetric BEKK and asymmetric DCC models to examine the asymmetric return and volatility spillovers between Australian S&B markets. The spillovers between the S&B markets is strongly asymmetrical. In return volatility, bad news in bond markets affects lower stock returns, while good news in stock markets leads to lower bond returns. However, bond market volatility is effect stock market news. Hung (2020) conducted research for the conditional correlations and spillovers of volatilities across Hungary, Poland, the Czech Republic, Romania and Croatia with CCC, DCC and BEKK model. The volatility spillover among these markets is significant.

Jin (2015) examines the spillovers of asymmetric returns and volatilities among the interbank and barter treasury bills markets in China using the VARMA-AGARCH method, one of the multivariate GARCH models. The spillovers of return emerge from two conditions: the shock sign (good or bad news) and the source of the shock (market type). In volatility asymmetry, the negative shocks in the treasury bills clearing market have a higher effect than the positive ones. There are volatility spillovers from the treasury bills clearing market to the interbank market. Hakim and McAlleer (2010) investigate spread and volatility spillovers in New Zealand, Singapore, the US, Australia and Japan with VARMA-GARCH in bonds, equity and foreign exchange markets. All markets affect all other markets in terms of magnitude spillovers. While it reaches the same findings in volatility spillovers, the US is a market that strongly influences other markets, even if the volatility is not dominant. In addition, volatility spillovers from the exchange rate markets to the S&B markets and from the S&B markets to the exchange rate market. They observe the asymmetric effect in eight of the 20 cases they have examined. Allen et al. (2013) examine the effect of volatility spillovers from the Chinese stock market to the Australia, Hong Kong, Singapore and Japan and US markets using GARCH, VARMA-GARCH and VARMA-AGARCH methods. The VARMA-AGARCH model has different consequences than the other two models in the volatility calculation, and they have similar results to the VARMA-GARCH. Volatility spillovers effect from the Chinese stock market to other markets.

Tule et al. (2017) examine the effect of asymmetric volatility propagation of oil shocks in the Nigerian bond market using the VARMA-AGARCH method. There is a volatility transfer between Nigeria's bond market and Brent and WTI oil markets. In particular, the decline in oil prices after 2014 increased the costs of oil producer Nigeria in energy production and led the government to borrow more on the bond market. This increased the volatility propagation effect. Tule et al. (2018) also investigate the volatility between the Nigerian Nair-dollar exchange rate and the Nigerian Stock Exchange stock market index by the VARMA-AGARCH model. This study concludes that capital inflows and the existence of the Nigerian Stock Exchange affect the Nigerian Naira-Dollar exchange rate. Given the unidirectional and breaking points from the Nigerian Stock Exchange to the Naira-Dollar exchange rate in the long term, there is a mutual volatility spillovers effect in the long term. Moreover, the fall in oil prices in 2014 and beyond had a significant effect on the Naira-Dollar exchange rate. Zeng et al. (2021) investigate the effects of volatility spillover in European Union carbon financial markets using the BEKK-GARCH model. They find an asymmetric volatility spillover between the European Union allowance (EUA) and certified emissions reduction (CER) markets. The return and volatility spillover are also examined in the cryptocurrency markets. Koutmos (2018) examines the return and volatility spillover among 18 main cryptocurrencies using variance decomposition and vector autoregression methods. Between 2015

and 2018, Bitcoin is identified as the most dominant cryptocurrency among all cryptocurrencies in terms of return and volatility spillover. The return and volatility spillover increase over time. Katsiampa et al. (2019) examine the volatility spillover between Bitcoin, Ether and Litecoin between 2015 and 2018 using the BEKK-MGARCH model. Past shocks and volatility of cryptocurrencies affect its current conditional variance. There is a bidirectional volatility spillover among all cryptocurrencies. Kumar and Anandarao (2019) investigated the volatility spillover among Bitcoin, Ethereum, Ripple and Litecoin between 2015-2018 using DCC-IGARCH and wavelet models. The volatility of cryptocurrencies can be explained by their fluctuations. The correlation structure between cryptocurrencies is weak during market collapses, especially in Bitcoin prices.

Part 2 of the literature review summarizes the following. Different Multivariate GARCH models, which are symmetric and asymmetric, propose to show volatility. These include Bollerslev et al. (1988) VECH model, Bollerslev's (1990) CCORR model, Engle and Kroner's (1995) BEKK model, Engle's (2002) DCC model and Ling and McAleer's (2003) VARMA-GARCH model and Hoti et al. (2002) and McAleer, Hoti and Chan's (2009) VARMA-Asymmetric GARCH (VARMA-AGARCH) model stands out. The VARMA-AGARCH model captures the asymmetry of the volatility response to the news.

Summarizing the literature section, VARMA-AGARCH model uses for stock markets, bond markets, foreign exchange markets, oil markets, and futures markets to volatility spillovers between markets. The two-variable models of Hoti et al. (2002) and McAleer et al. (2009) are important in terms of complexity and predictability.

Asymmetric return and volatility spillover have been examined in many studies. VARMA AGARCH is better than other methods for analyze the asymmetric effect. TGARCH and EGARCH models are generally used in studies related to Turkey. Demirgil et al. (2015) also focus on macroeconomic data. In this study, we aim to fill the research gap in the literature by investigating the asymmetric spillovers effect between S&B markets in Turkey. Therefore, this model is more appropriate for this study. It also provides powerful results that negative return shocks affect volatility more than positive shocks. VARMA-Asymmetric GARCH (VARMA-AGARCH) model is proper for analyzing the volatility spillovers.

DATA[1]

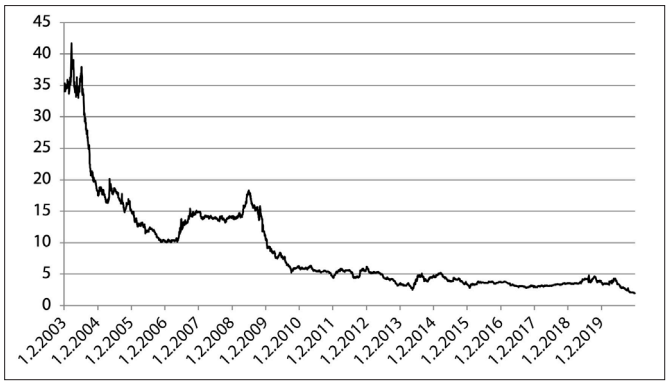
Borsa Istanbul Stock Exchange Index (BIST100) and Active Bond Index returns (BR) are between 01.02.2003 and 12.31.2019, including 4220 daily observations. Data are dollar-based to adjust seasonal effects. Besides the full period, this study covers the crisis period between 2008 and 2010. Active Bond Index is an index created by the Finnet database. We calculate this index based on the bond where the highest supply and demand meet the highest trading volume. We accept the bond return with the highest trading volume as the indicator of the bond market. We calculate BIST 100 Index and bond market return series with the formula $\log\left(\frac{index_t}{index_{t-1}}\right)$.

Graph 1 reflects the BIST100 index. The first period is the bullish market from the beginning of 2003 to the end of 2005. The second period is a fluctuating market from 2006 to the end of 2012; the third period dominates by the bear market from the beginning of 2013 until the end of 2019. The downward trend in the bond index is shown in Graph. 2, which remained relatively stagnant from 2005 to the 2008 Financial Crisis, followed by a steady course of lower levels in the 2008 Financial Crisis. Graph. 2 also shows that the bond index decreased continuously without slowing down from the beginning of the data set from 2003 to mid-2006. The index increased from mid-2006 until the emergence of the global crisis and implementation of the crisis measures from the global and national economic context., Because of the measures taken in 2009, the index declined rapidly. Despite the decrease in the tendency, the decrease continued in the following periods.

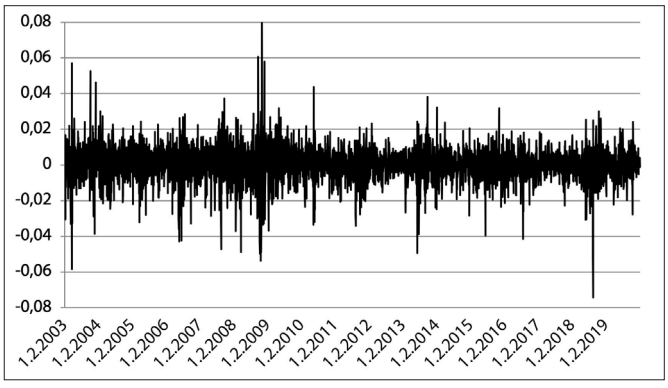
Graph. 3 shows the return on Borsa Ist anbul in the next few years in the 2001 Crisis, the volatility cluster in the 2008 Financial Crisis, and the years 2013-2014 when Gezi Park events took placeIt is possible to conclude that the volatility cluster is quite frequent, in the return of BIST 100. It has been found that high returns and low returns take place. Graph. 4 shows a volatility cluster in bond returns during the review period. Bond yield volatility increased again after mid-2018. It shows that bond spillovers release in a larger range than a normal distribution. Periods of high returns should not be followed by low returns for normal distribution. Returns should have moved in a narrower range. When S&B returns are compared, the volatility cluster of stock returns is higher and spillovers occur on a larger scale as expected.

[1] The data collected from the database. According to the current legislation, there is no need for an Ethics Committee Approval Document for the research conducted in the database.

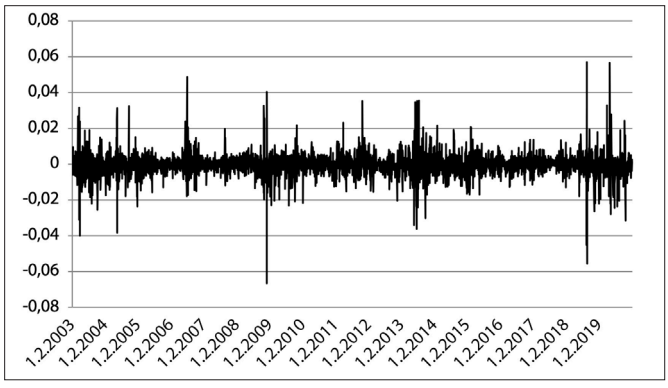
Graphic 1. BIST100 Index (Daily)



Graphic 2. Bond Index (Daily)



Graphic 3. BIST100 Return (Daily)



Graphic 4. Bond Index Return (Daily)

METHODOLOGY

First, we perform unit root tests of return series to keep away from spurious regression. In the investigation of stationary, the extended series Dickey-Fuller (ADF (1979)), Philip Perron (PP (1988)) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS (1992)) unit root tests are used. After the stationary test, the existence of serial correlation and ARCH effect return series are analyzed. For this purpose, Ljung and Box's (1978) Q test and ARCH-LM (1982) test are applied. In the third stage, the asymmetric structure of the volatility in the returns is investigated by the asymmetry diagnostic tests by Engle and Ng (1993). The diagnostic indicators presented for the determination of asymmetry volatility are calculated by the following regression equations:

$\varepsilon_{i,t-1}$ is the error term of the data in t-1. $S_{i,t-1}$ is a dummy variable that takes the value of if it is $\varepsilon_{i,t-1}$ < 0, 1, if not 0. $S^{+}_{i,t-1}$ is a dummy variables that takes the value of if it is $\varepsilon_{i,t-1}$> 0, 1, if not 0. In the first three asymmetry tests given above, the test value t and the statistical significance of the parameter b are reported. Joint asymmetry test on equation number four, the value and statistical significance of the F test for the test that b_1 b_2 and b_3 are all zero are reported (Patterson, 2000: 729).

The Sign Bias Test examines the positive and negative innovation (shocks) effect on volatility. The Negative Bias Test investigates the cause of big and small negative innovation, and the Positive Bias Test is for big and small positive innovation, the Joint symmetry Test inventigates both the magnitude and the volatility of the signal.

Sign Bias $$\varepsilon^2_{i,t} = \alpha + bS^{-}_{\mathrm{i},t-1} + u_{i,t} \quad (1)$$

Negative Size Bias $$\varepsilon^2_{i,t} = \alpha + bS^{-}_{i,t-1}\varepsilon_{i,t-1} + u_{i,t} \quad (2)$$

Positive Size Bias $$\varepsilon^2_{i,t} = \alpha + bS^{+}_{i,t-1}\varepsilon_{i,t-1} + u_{i,t} \quad (3)$$

Joint $$\varepsilon^2_{i,t} = \alpha + b_1S^{-}_{\mathrm{i},t-1} + b_2S^{-}_{i,t-1}\varepsilon_{i,t-1} + b_3S^{+}_{i,t-1}\varepsilon_{i,t-1} + u_{i,t} \quad (4)$$

In the fourth stage, the GJR-GARCH model has been preferred for the asymmetric volatility of the S&B market returns series, whose volatility is asymmetrical. The volatility equation GJR-GARCH (1993) model is given below:

$$y_t = \omega_0 + \omega_1 y_{t-1} + \varepsilon_t \quad (5)$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta h_{t-1} + \gamma\,[(\varepsilon_{t-1}^2)(I_{t-1})] \quad (6)$$

$$I_t = \begin{cases} 0, \epsilon_t \geq 0 \\ 1, \epsilon_t < 0 \end{cases} \quad (7)$$

Equation 5 is the mean equation. In equation 6, I_t as an indicator that separates positive and negative shocks (good and bad news) of equal magnitude. Since conditional variance h_t is positive, it is expected that and $\alpha_0 > 0$, $\alpha_1 \geq 0$ and $\alpha_1 + \beta < 1$. In addition, α_1 represents the persistence of short-term positive shocks (good news) and $\alpha_1 + \gamma$ means the persistence of short-term negative shocks (bad news). The duration of the shock is computed as the number of operation days with the half-life formula $\left(\frac{ln(0.5)}{\ln(\alpha_1+\beta)}\right)$.

In the last stage, asymmetric return and volatility spillovers between S&B markets returns are analyzed by VARMA-AGARCH analysis. The VARMA-AGARCH analysis method is preferred because it can capture the effects of spillovers and volatility spillovers between stock market returns and the bond market return series. First, we form conditional mean return equations for S&B markets returns. It presents conditional return equations, which are shown below.

$$r_{S,t} = \mu_S + \emptyset_S r_{S,t-1} + \theta_S^+ r_{B,t-1}^+ + \theta_S^- r_{B,t-1}^- + \varepsilon_{S,t} \quad (8)$$

$$r_{B,t} = \mu_B + \emptyset_B r_{B,t-1} + \theta_B^+ r_{S,t-1}^+ + \theta_B^- r_{S,t-1}^- + \varepsilon_{B,t} \quad (9)$$

$$\varepsilon_t \left| F_{t-1} = \begin{bmatrix} \varepsilon_{S,t} \\ \varepsilon_{B,t} \end{bmatrix} = D_t \eta_t \right. \quad (10)$$

Inequations8and9, i=S, B for $r_{i,t-1}^+ = \max(0, r_{i,t-1})$, $r_{i,t-1}^- = \min(0, r_{i,t-1})$ and $r_{S,t}$ ve $r_{B,t}$ give the stock market and the bond market return at time t, respectively. ε_t is the error term. Furthermore, in equation 10, η_t is independent and identically distributed, $F_{(t-1)}$ is the available historical information vector at the time t-1. $D_t = diag(h_S^{0,5} h_B^{0,5})$ and h_S and hB show the conditional variances of stock market return and bond market return at time t, respectively.

The return at time t-1 in a market gives the information set of that market's return at time t. The lagged returns of another market may also affect the conditional return of one market. The coefficients determine the asymmetry of the return spillovers θ^+ and θ^- in the return sequence of positive and negative lags in the return equations. If θ^+ or θ^- parameter coefficients are statistically significant, it is judged that there is a return spillovers and if $\theta^+ \neq \theta^-$ the spillovers effect is asymmetric. In terms of the magnitude of the coefficients, θ^+ and θ^- it can be argued that investors in one market use potential information from another market. Their lagged returns are included in the equations.

VARMA-AGARCH transfers the conditional variances of both markets and captures the effects of time-varying conditional correlations. The VARMA - AGARCH model conditional variances are below:

$$h_{S,t} = \omega_S + \alpha_{S,1}\varepsilon_{S,t-1}^2 + \alpha_{S,2}\varepsilon_{B,t-1}^2 + \beta_{S,1}h_{S,t-1} + \beta_{S,2}h_{B,t-1} + \gamma_S\left(\varepsilon_{S,t-1}^2 \times (\varepsilon_{S,t-1}^2 < 0)\right) \quad (11)$$

$$h_{B,t} = \omega_B + \alpha_{B,1}\varepsilon_{B,t-1}^2 + \alpha_{B,2}\varepsilon_{S,t-1}^2 + \beta_{B,1}h_{B,t-1} + \beta_{B,2}h_{S,t-1} + \gamma_B\left(\varepsilon_{B,t-1}^2 \times (\varepsilon_{B,t-1}^2 < 0)\right) \quad (12)$$

In equations 11 and 12, $\alpha_{S,1}$ and $\alpha_{B,1}$ represent the connection between the volatility of a market and its positive lag, in short, the ARCH effect. $\beta_{S,1}$ and $\beta_{B,1}$ measure the GARCH effect. $\alpha_{S,2}$, $\alpha_{B,2}$, $\beta_{S,2}$ and $\beta_{B,1}$ show the volatility spillovers between the stock market and bond market. γ_s and γ_B represent the asymmetry volatility between the volatility of a market and its own negative lag.

EMPIRICAL RESULTS

Table 1 shows descriptive indicators for return and volatility asymmetry of Borsa Istanbul Return (S) and Bond Return (B).

Mean, median and standard deviation findings show the risk-return comparison of the two markets. In full period, the unconditional mean, standard deviation and median show the stock market has much more returns and volatility than the bond market. The mean return in the stock market is higher than the bond market; its standard deviation is higher. Thus, it determines that the risk is high in the market with high returns. It also suggests that the stock market performed better during the periods when the S&B markets return is positive and negative, respectively. The bond market performed better during the periods when the stock market return was negative and the bond market returns was positive. The bond market performed better during the periods when the S&B markets returns are negative.

Table 2 shows the model descriptive statistics of the S&B markets returns report. The mean returns of BIST 100 (S) are positive, while the bond (B) return is negative.

Table 1. Unconditional and Conditional Returns Descriptive Statistics

	Mean (%)		Standard Dev. (%)		Median (%)		Correlations
	S	B	S	B	S	B	
Full Period	0.013	-0.001	0.955	0.620	0.012	-0.029	-0.052
S>0, B>0	0.673	0.349	0.619	0.451	0.541	0.220	0.163
S>0, B<0	0.691	-0.414	0.646	0.482	0.530	-0.268	-0.263
S<0, B>0	-0.713	0.414	0.726	0.502	-0.510	0.257	-0.277
S<0, B<0	-0.628	-0.391	0.776	0.442	-0.498	-0.270	0.145

Table 2. Variables Statistics

	S	B
Descriptive Statistics		
Median	0.000116	-0.000291
Mean	0.000134	-0.000001
Standard Dev.	0.009555	0.006203
Min.	-0.074311	-0.066605
Max.	0.082776	0.056977
Observations	4220	4220
Distribution Statistics		
Skewness	-0.356482	0.182917
Kurtosis	9.177929	17.94541
Jarque-Bera	6800.375**	39298.36**
Unit Root Tests		
ADF	-60.045**	-60.192**
PP	-608.025**	-60.737**
KPSS	0.739	0.118
ARCH Effect Tests		
Q (5)	27.287**	30.277**
Q (10)	45.735**	45.058**
Q^2 (5)	409.49**	593.48**
Q^2 (10)	689.02**	709.46**
ARCH Test	175.217**	284.707**
Asymmetry Tests		
Sign Bias	3.872**	0.158
Negative Size Bias	-12.585**	-10.961**
Positive Size Bias	0.551**	11.972**
Joint	50.115**	119.401**

**, * indicate significance values of 1% and 5%, respectively.

A similar finding is the subject of the median. The unit root tests of ADF (1979), PP (1988) and KPSS (1992), which frequently use in stock analysis and bond market returns series, test for the stationary show that S&B market return series are stationary. Engle's (1982) ARCH-LM test to research the ARCH effect is used to test the S&B markets returns series and to show that the ARCH effect is present in the series. In addition, Ljung-Box's (1978) Q test observes that there is a series correlation in both return and return square series. Thus, conditional heteroscedasticity is the model in volatility estimations because of the stationary and ARCH effect of S&B markets returns. Jarque and Bera's (1980) test results observe that the return series are not normal distribution and series have leptokurtic (fat tail). Thus, volatility estimations are made according to GED distribution.

Engle and Ng's (1993) asymmetry diagnostic tests results are presented in Table 2. For Engle and Ng test, we test standardized errors estimated with least squares. If the reaction of volatility to shocks is asymmetrical, the "Sign Asymmetry" indicators will be statistically significant. In addition, the magnitude of the shock will also affect volatility. Because of these tests, the existence of asymmetric volatility in the conditional volatilities of stock market returns and bond market returns emerges. We find the stock market return to be sensitive to signs, negative values, positive values, and joint tests. We find the bond market spillovers to be sensitive to negative value, positive value, and joint tests. Therefore, the null hypothesis that the volatility is not asymmetric based on the negative value, positive value, and joint test results reject in both markets. These findings show that we should investigate the relationship between return and volatility between S&B markets with an ARCH-type asymmetric model.

Full Period Analysis

Asymmetric return and volatility estimations of daily S&B markets returns, which have 4220 observations covering 01.02.2003 and 12.31.2019, are estimated by GJR-GARCH and then we look for asymmetric return and volatility spillovers by VARMA-AGARCH.

Asymmetric Return and Volatility Estimation

In this section, volatility clustering, the fat tail, skewness, asymmetry, ARCH effect and non-normal distribution characteristics of the stock market (S) and the bond market (B) will be taken into consideration by GJR-GARCH model preferred to capture volatility clustering. Table 3 presents the GJR-GARCH (1,1) estimation results using the Generalized Error Distribution (GED) to capture the thick tail, skewness, and non-normally distribution characteristics of daily returns. ARCH and Ljung-Box Q tests of GJR-GARCH estimation results of the S&B market returns series show no ARCH effect.

In the S&B markets, conditional mean equation, a lagged return (ω_1) was positive and statistically significant, as shown in Table 3. This consequence shows a correlation between the previous day return and the current return in both markets. When looking at the conditional variance equation, the ARCH (α_1) and GARCH (β) parameter coefficients are positive and statistically significant. This implies that there is a volatility cluster in both markets. In addition, the sum of ARCH and GARCH coefficients is less than 1. The leverage effect is statistically significant in the S, whereas it is not significant in the B. The stock market leverage effect coefficient has a negative sign. The negative leverage effect on the S shows that good news has a stronger impact than bad news. There is no evidence that the news in the B is more powerful than good news or bad news. The persistence of the shock in the S is much higher than in the B. The mean shock persistence is approximately 69 and 55 trading days in the S&B Markets, respectively.

Table 3. Return and Volatility Forecasts in BIST100 and Bond Market

	S	**B**
Conditional Mean		
ω_0	0.0002**	-0.0003
ω_1	0.0919**	0.0652**
Conditional Variance		
α_0	0.0001**	0.0001**
α_1	0.1156**	0.1325**
β	0.8744**	0.8559**
γ	-0.0976**	-0.0017
Good News Effect	0.0001	0.0001
Bad News Effect	0.0975	-0.0016
Shock Persistence	0.9900	0.9874
Half-life (Day)	68.97	54.66
Skewness	-0.3657	-0.2105
Kurtosis	5.4725	8.5727
Log Likelihood	14080.51	16626.30
Q (5)	1.2583	2.7100
Q (10)	1.3050	3.7480
Q^2 (5)	1.9953	5.6241
Q^2 (10)	1.7296	9.2246
ARCH Test	1.1274	3.7673

**, * indicate significance values of 1% and 5%, respectively.

Asymmetric Return and Volatility Spillovers

Stock market (S) and bond market (B) returns volatility spillovers are estimated by VARMA-AGARCH method in Turkey. The findings are given in Table 4. The VARMA-AGARCH estimation results of the S&B market returns series do not have an ARCH effect because of ARCH Test and Ljung-Box Q Test. Looking at the conditional mean equations, there is proof of short-term predictability in S&B market returns, although different in form. The asymmetric return spillovers effect of S to B determines. The connection between the negative and positive past returns of the S and the current B return is statistically significant. Thus, a decrease in the stock market causes a 4.8% decrease in the bond market on the following trading day. An increase (decrease) in the S causes an increase (decrease) of approximately 5.8% in the bond market on the following trading day. The effect of asymmetric return spillovers on B return to S following trading day return is not statistically significant. The increase or decrease of the B on the current trading day does not affect the S return on the following trading day. Thus, we can conclude that the good and bad news on the S return affected the B return, whereas the good and bad news on the B return did not affect the S return.

The parameter coefficients of a lagged conditional volatility (GARCH terms) that give volatility sensitivity in the S&B market, conditional variance equations in Table 4 are statistically significant ($\beta_{S,1}$ and $\beta_{B,1}$). Current conditional volatility changes in bond market return and stock market return are dependent on their own lagged shocks. This underestimation of the parameter coefficients of a lagged shock (ARCH terms $\alpha_{S,1}$ and $\alpha_{B,1}$) shows that the conditional volatilities do not convert very speedily with the incentive of return uncertainties (error terms-innovations). The GARCH parameter coefficients show the relationship between current volatility and a lagged volatility greatly. This finding reveals that past volatility has a significant impact on current volatility and that volatility gradually develops over time. Therefore,

Table 4: Return and Volatility Spillovers of BIST100 and Bond Markets

S		B	
Conditional Mean			
μ_S	0.0005	μ_B	-0.0001
$\varnothing_S$	0.0782**	$\varnothing_B$	0.1139**
θ_S^+	0.0395	θ_B^+	-0.0580**
θ_S^-	0.0101	θ_B^-	-0.0481*
Conditional Variance			
ω_S	0.0001**	ω_B	0.0001**
$\alpha_{S,1}$	0.1232**	$\alpha_{B,1}$	0.1088**
$\alpha_{S,2}$	0.0084	$\alpha_{B,2}$	0.0120*
$\beta_{S,1}$	0.5989**	$\beta_{B,1}$	0.8658**
$\beta_{S,2}$	0.1172**	$\beta_{B,2}$	0.0105*
γ_S	0.0756	γ_B	-0.2381**
Skewness	-0.3446	Skewness	-0.1501
Kurtosis	5.3390	Kurtosis	7.2919
Log Likelihood	12157.75	Log Likelihood	15371.50
Q (5)	2.6136	Q (5)	2.3448
Q (10)	17.761	Q (10)	5.1742
Q^2 (5)	12.7058	Q^2 (5)	8.9367
Q^2 (10)	15.8542	Q^2 (10)	9.0361
ARCH Test	8.3159	ARCH Test	7.6208

**, * indicate significance values of 1% and 5%, respectively.

S&B market investors can implement active investment strategies that take into account volatility persistence and market trends. However, it should be kept in intellect that the applicability of these strategies will depend on the size and stability of the return periods. Negative volatility asymmetry (γ_B) exists in the bond market.

GARCH term (bond market) $\beta_{S,2}$ in Table 4 shows the long-term shock spillovers from B volatility to S volatility. On the other hand, the stock market GARCH term $\beta_{B,2}$ gives the long-term shock spillovers from S volatility to bond market volatility. The ARCH terms $\alpha_{S,2}$ and $\alpha_{B,2}$ show the short-term shock spillovers between the two markets. The sum of these ARCH and GARCH coefficients explains the magnitude of the volatility spillovers effects between the two markets.

The effect of the S ARCH term ($\alpha_{B,2}$) on B volatility is significant, as shown in Table 4. However, the effect of the B ARCH term ($\alpha_{S,2}$) on S volatility is not significant. The short-term volatility transition occurred in one direction from the S to the B. The long-term volatility transition has been bidirectional ($\beta_{S,2}$ *and* $\beta_{B,2}$).

Global Crisis Period Analysis

Asymmetric return and volatility estimations of the stock market (S) and the bond market (B) returns with a total frequency of 528, covering the period of 03.16.2008 and 04.23.2010, which are the periods of the Global Financial Crisis are tested by GJR-GARCH and then asymmetric return and volatility spillovers are investigated by VARMA-AGARCH.

Asymmetric Return and Volatility Estimation

In a global crisis, the GJR-GARCH (1,1) estimation results using the Generalized Error Distribution (GED) to capture fat tail, skewness and normal distribution characteristics of returns are given in Table 5. ARCH and Ljung-Box Q tests of GJR-GARCH estimation results of the S and B returns series show no ARCH effect.

In the S and B, lagged return (ω_1) in the conditional mean equation is positive and statistically significant. There is a correlation between the previous day's return and the current return in the S and B in the period of the global crisis. When looking at the conditional variance equation, the ARCH (α_1) and GARCH parameter (β) coefficients are positive and statistically significant. This implies that volatility clusters in both markets during the crisis. In addition, the sum of ARCH and GARCH coefficients is fewer than 1. It is observed that the leverage effect (γ) is statistically significant in the S, whereas it is not significant in the B. Leverage effect parameter coefficient in the S is positive. The leverage effect on the S shows that during the global economic crisis, bad news has a stronger impact than good news. The news that emerged during the global crisis in the B did not reveal any significant evidence that the impact of good news or bad news is stronger. The persistence of the shock in the S&B market during the crisis period is close. The mean persistence of the shock determines around 26 trading days in the stock market and the bond market during the crisis period.

Asymmetric Return and Volatility Spillovers

Table 6 presents the return and volatility spillover findings estimated by a VARMA-AGARCH method of stock (S) and the bond market (B) during the global crisis period present. VARMA-AGARCH estimation results do not have an ARCH effect results of the ARCH Test and Ljung-Box Q Test. Conditional mean equations, there is evidence of short-term forecast in S and B returns, although different in format. The effect

Table 5: Return and Volatility Estimate in BIST100 and Bond Market in Crisis Period

	S	B
Conditional Mean		
ω_0	0.0003	-0.0001
ω_1	0.0924*	0.1361**
Conditional Variance		
α_0	0.0001*	0.0001*
α_1	0.1020**	0.0560**
β	0.8712**	0.9178**
γ	0.1601**	0.0302
Good News Effect	0.0001	0.0001
Bad News Effect	0.1602	0.0393
Shock Persistence	0.9732	0.9738
Half-life (Day)	25.52	26.11
Skewness	0.0777	-1.3252
Kurtosis	4.2921	13.4513
Log Likelihood	1645.381	1948.929
Q (5)	1.2846	5.6758
Q (10)	16.293	8.2436
Q^2 (5)	1.3512	2.6912
Q^2 (10)	5.9291	4.5345
ARCH Test	1.2394	2.5133

**, * indicate significance values of 1% and 5%, respectively.

of asymmetric return spillovers from the stock market to the bond market is not statistically significant . The increase or decrease of the S on the current trading day does not affect the return of the B on the following trading day. There is a one-way asymmetric return spillovers from the B to the S. The effect of asymmetric return spillovers from the B to the S is statistically significant. The relationship between the negative past return of the B and the current S return is statistically significant . Thus, a decrease in the B guide to a decrease of approximately 18% spillovers in the S on the following trading day. Thus, on the B return affectS return whereas good and bad news on S return does not affect the S return.

Parameter coefficients of lagged conditional volatilities (GARCH terms) that give volatility sensitivity in S and B, conditional variance equations in the crisis period in Table 6 are statistically significant . The parameter coefficients of the ARCH terms are also significant . The small estimation of the parameter coefficients of a lagged shock (ARCH) shows that the conditional volatilities do not change very quickly due to the effect of return uncertainties (error innovations). The GARCH parameter coefficients, which show the relationship between current volatility and a lagged volatility, are to be larger in the B than in the S. This finding reveals that past volatility has more effect on the current volatility in the B than the S and that the volatility has gradually developed over time.

Volatility asymmetry exists in the S and B . The form of asymmetry is similar in the two markets. Volatility asymmetry is positive in the S and B.

The effect of the stock market ARCH term on B volatility is significant . The effect of bond market ARCH on S volatility is not significant During the global crisis period, the transition to short-term volatility is unidirectional from the S to the B. The effect of S volatility on B volatility is significant in the long run. The effect of B volatility on S volatility is not significant in the long run. During the global crisis, the long-term volatility spillovers from the S to the B is one-way. Thus, volatility spillovers from the S to the B occur in unidirectional in Turkey during the crisis.

CONCLUSION

In this study, we have investigated the effects of asymmetric volatility spillovers in S&B markets in Turkey. The volatility persists and persistence in the stock market is high compared to the bond market that are in line with the theory and expectation. These findings are consistent with the results of Dean et al. (2010).

The negative leverage effect on the stock market shows that good news has a stronger effect than bad news in the full period. The positive leverage effect on the stock market explains that bad news has a stronger effect than good news in a global crisis period. Good and bad news are not significant in the bond market both during the full and global crisis periods. Negative volatility asymmetry exists in the bond market during the full period. This situation reveals that the bad news and good news in the stock market have a more robust effect. Volatility asymmetry is positive in the stock market and the bond market during the global crisis period. Findings of the study are consistent with the results of the study conducted by Okay (1998), Akar (2005), Mazıbaş (2004), Özçiçek (2005) and Yıldız (2016).

Table 6: Return and Volatility Spillovers of BIST100 and Bond Markets in Crisis Period

S		B	
Conditional Mean			
μ_S	0.0001	μ_B	-0,0003
$\varnothing_S$	0.0929*	$\varnothing_B$	0.1692**
θ_S^+	0.1135	θ_B^+	-0.0098
θ_S^-	-0.1795*	θ_B^-	-0.0172
Conditional Variance			
ω_S	0.0001	ω_S	0.0001*
$\alpha_{S,1}$	0.0941**	$\alpha_{S,1}$	0.2069*
$\alpha_{S,2}$	0.0640	$\alpha_{S,2}$	0.0366**
$\beta_{S,1}$	0.8909**	$\beta_{S,1}$	0.4319**
$\beta_{S,2}$	0.0135	$\beta_{S,2}$	0.0396*
γ_S	2.4526*	γ_S	0.7381*
Skewness	0.6641	Skewness	-0.8517
Kurtosis	4.0060	Kurtosis	8.0035
Log Likelihood	1634.787	Log Likelihood	1978.869
Q (5)	0.8863	Q (5)	4.5094
Q (10)	15.236	Q (10)	9.1807
Q^2 (5)	0.6503	Q^2 (5)	0.9693
Q^2 (10)	3.2636	Q^2 (10)	2.3848
ARCH Test	0.7554	ARCH Test	0.2157

**, * indicate significance values of 1% and 5%, respectively.

The crisis has not changed bond investor behavior. However, stock investors have changed their behavior. The change in asymmetric volatility spillovers over the full period and crisis period is evidence of a behavior change. Return spillovers emerge from the stock market to the bond market in Turkey in the full period. During the crisis, return spillovers emerge from the bond market to the stock market. Volatility spillovers between the stock and the bond market are mutual in the full period. Moreover, volatility spillover from the stock market to the bond market is unidirectional. Mutual (feedback) volatility spillovers between S&B markets. These findings are consistent with the results of Zhang et al. (2013) on the US, U.K. and Germany and Hakim and McAlleer (2010) on Australia, Japan, New Zealand, Singapore and the US.

This study focuses on S&B markets in Borsa Istanbul. Different results can be obtained using different methods in different S&B markets. While assessing the results, we should take these limitations of this study into account. Investors can apply active investment strategies that consider the volatility persistence and market trends of stock market investors. However, it should keep in mind that the applicability of these strategies will depend on the size and stability of the return periods. These results offer some suggestions for investors. Within the framework of this finding, we do not recommend an active investment strategy for bond market investors. Bonds are more reliable investment instruments than stocks. However, the returns are lower. Unchanging bond investor behavior in crisis times is evidence to choose bonds for reasons, such as lower risk and reduced share profits. The stock investor is affected by many factors, such as the economic condition, interest rates, and market sentiment. Therefore, bad and good shocks are more effective in stock markets. Stocks and bonds compete for investors' funds and usually have volatility spillovers between both.

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How Does Cynicism Mediate Spiritual Leadership and Organizational Commitment? The Case of Turkish and Indonesian Universities

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ABSTRACT

This study seeks to determine the role of cynicism in the relationship between the perceived spiritual leadership of university employees and their organizational commitment. Because of the international nature of the problem at hand—university staff in Turkey and Indonesia who are engaged in ongoing educational activities—a comparison strategy predicated on cultural differences was favored. The study utilized correlation analysis and normal distribution determination in SPSS, and structural equation modeling in AMOS to reveal regression relations. Findings suggest that academics in Turkey and Indonesia are more committed to their institutions when they have a positive perception of the organization's spiritual leadership. Likewise, when university employees perceive cynicism in the organization, their commitment to spiritual leadership and the organization reduces. In other words, cynicism appears to partially mediate the relationship between spiritual leadership perception and organizational commitment in both countries.

Keywords: Spiritual Leadership, Cynicism Behavior, Organizational Commitment, AMOS, SPSS

JEL Classification Codes: M12,M10,J81

Referencing Style: APA 7

INTRODUCTION

The term leadership, which is used frequently in everyday language, is familiar to everyone. However, a public-accepted definition has yet to be developed. From this perspective, it is possible to assert that the literature contains a variety of leadership definitions. Bennis (1989), for instance, compares leadership to a beautiful woman and asserts that we can only comprehend her once we see her. Additionally, Yukl (2002) prefers to define leadership as a unique management state. Meanwhile, Chemers (1997) defines leadership as the ability to mobilize one's followers to achieve one's goals. Studies of leadership have been very important at every point in history. According to the theory of personal characteristics—also known as the traditional approach in leadership research—leaders are preconditioned to certain personality characteristics from birth (Çelik, 1999). However, studies involving the integration of research results on leadership by Myers (1964) and Stogdill (1981) have played a significant role in changing the current thinking about leadership. The most important finding of these studies is that there is no significant correlation between physical traits or high intelligence and leadership. This implies that leadership is not an innate trait, but rather a learned quality (Aydn, 1991; Kaya, 1993).

Various theories of leadership have developed on the basis of the recognition that many discussions of leadership focus on the leader's personal qualities. Transformational leadership, toxic leadership, visionary leadership, digital leadership, ethical leadership, and spiritual leadership are the leadership concepts that have received the most attention over the past few years. To illustrate one of these theories, sharing leadership entails delegating organizational management to members and providing opportunities (Gronn, 2006). Visionary leadership entails developing future strategies and putting them into action when the time comes (Marx, 2006). Ethical leadership focuses on situations in which individuals in the organization should and should not act (Rubenstein, 2003). Cultural leaders are those who create a culture within an organization, feed off of it, and guide the followers at this point (Sergiovanni & Starratt, 1988).

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Service leadership sees willingness to help as a natural part of the personality and reveals a leadership understanding that aims to serve the members as a means of influencing them in the process of achieving their goals (Ferch, 2005). Therefore, this study will refer to related studies in order to explain the concept of spiritual leadership while simultaneously identifying similarities and differences between countries (Turkey and Indonesia) in regard to the spiritual leadership theory developed by Fry. It intends to shed light on the role of cynicism in the relationship between spiritual leadership and organizational commitment.

CONCEPTUAL FRAMEWORK

Although the concept of spiritual leadership has been briefly discussed, the concept of the soul and the religious and philosophical aspects of spirituality can provide a more comprehensive introduction to the topic. In both theological and philosophical writings, the soul is described as the invisible aspect of the human being. The soul is a concept that concerns the spiritual aspect of the individual, both theologically and ontologically. Furthermore, while classical physics acknowledges that the soul is an energy form and an invisible being that will never vanish, it is still argued that the brain is the source of this energy. When the subject is considered philosophically, the soul is the substance formed by all of the emotions, thoughts, and moral aspects of the person; or it is a non-living object that gives the body the ability to move (Cevizci, 2017).

The concept of a soul has no scientific precedent in the twenty-first century. This is due to the fact that the concept of the soul in modern science is invisible and difficult to test. However, the modern study of psychology and the causes of human behavior did not commence until the first quarter of the 19th century. This study will attempt to answer questions about the soul by referring to the approaches of thinkers from the early Islamic and Hellenistic periods. In Islamic philosophy, the concept of nafs is favored over the concept of soul. Additionally, the word nafs appears 295 times in the Quran, the Islamic scripture (Varlı,2019). Another important point to consider is that the concept of soul or spirit is extremely complex and profound. In fact, even philosophers such as Plato and Aristotle disagreed on this matter. Furthermore, it is believed that the nafs (soul), as it is used in Islam, is a whole with the material and spiritual aspects of human beings, and the soul is a subtle body that holds this whole together and is alive from infinity to eternity (Hökelekli, 2006).

Al-Kindi (796-866), the first Islamic philosopher, described the nafs as a "very precious divine treasure" and compared it to the sun in that it transfers the energy received from the creator to people (Uysal, 2004). In this regard, according to Al-Kindi, Greek philosophy and Islamic philosophy are viewed as equivalent. Furthermore, he divides the nafs (soul) into three stages: the stage with the ability to live, the stage of thought, and the stage with many powers and will (Kindî, 2014). Although the concept of spiritual leadership has been briefly mentioned, the concept of the soul, as well as the religious and philosophical aspects of spirituality, can provide a better presentation of the subject. The soul, according to theology and philosophy, is the invisible aspect of the human being. The soul is a theological and ontological concept that pertains to the spiritual aspect of the individual. Furthermore, while classical physics acknowledges that the soul is an energy form and an invisible being that will never vanish, it is still argued that the source of this energy is the brain. In terms of philosophy, the soul is the substance formed by all of the emotions, thoughts, and moral aspects of a person; or it is a non-living object that gives the body the ability to move (Cevizci, 2017).

Ibn Sina (980–1037), one of the Islamic philosophers, produced very significant works in the fields of philosophy and medicine, and conducted extensive research on the subject of the soul. In the tractate of Kitâbu'ş-Şifâ/Nefs (980/1037), "*We see certain things in our outer world thanks to our will and perceptions. These things we see are not in this forum by their own will or due to our observations. Therefore, everything that creates the nature of these things and enables us to perceive them as they are is called nafs (soul)*" (Ibn Sina, 2013).

He claims that the nafs (soul) is revealed along with the assertion that it is distinct from the material world. In other words, it has been emphasized that it has characteristics such as being personal and not reliant on anyone. In summary, organs are parts of the human body; however, the absence of some of these does not imply the absence of humans. However, these organs alone do not express the human being. Even if everything is destroyed, an individual can still be accepted ontologically; this is known as the 'self' or soul (Atay, 1998). In fact, Ibn Sina, like Aristotle, divides the soul into three parts: the human soul, the vegetable soul, and the animal soul (Ibn Sînâ, 2013). According to Farabi (870-950), the soul is a more pleasant being that is unrelated to the nafs. According to him, the soul is an object that has no form and has nothing to do with the mind, and it can be released in

dreams (Farabi, 2009). Ghazali (1058-1111), like other philosophers, weighed the concept of soul against the triad of heart, soul, and mind (Akçay, 2005). Ghazali dealt with the spirit on two levels. While expressing that the source of the first is in the heart, the second is a subtle body that allows human comprehension. Ghazali (1975) classifies the soul into three types: vegetable soul, animal soul, and human soul. While stating that the soul is a creation in his work, he also stated that it is immortal (Ghazali, 1975).

Following the discussion of Islamic philosophers' ideas on the subject, the soul, according to Kutsa b. Luke (820-913), who lived during the early Islamic period and had a significant influence on the transition of Hellenistic philosophy to the Islamic world of thought, is a subtle body that begins with the heart and serves to ensure the flow of blood. According to him, the soul activates the senses and perceptions (feeling) through the brain nerves, and the movements that result from this provide the emergence of the concept (Aydn, 1999). He differs from the Islamic philosophers whose ideas are presented above in this regard because the soul dies with the body. According to the relevant literature, the concepts of spiritual leadership, organizational commitment, and cynicism are discussed below based on these definitions.

Spiritual Leadership

There have been debates about the concept of leadership throughout history, and it has progressed through various stages. Initially, it was assumed that leaders possessed these innate characteristics, and this aspect was discussed. Accordingly, the characteristics of the leaders were identified, and it was believed that individuals who possessed these traits could be leaders. This view is based on the belief that leadership is innate. However, subsequent leadership discussions have argued that leadership is a situation that develops and realizes through learning. What behaviors should leaders exhibit, particularly in light of behavioral theory? Although an answer to the question has been sought, it has been criticized for failing to take into account environmental conditions. Both the traits approach and the behavioral approach contribute to contemporary leadership theories. Paternal leadership, transformational leadership, spiritual leadership, authentic leadership, toxic leadership, and digital leadership are examples of emerging concepts.

As the topic of spiritual leadership has not been extensively researched, this study hopes to fill a conceptual and methodological gap. Spiritual leaders are those who activate the necessary attitudes and behaviors to provide material and spiritual motivation in the inner worlds of their followers and themselves (Fry, 2003). While spiritual leaders reveal these behaviors and values, they also create vision and values that are compatible with their followers. Furthermore, they force organizations to know, understand, and constantly learn (Fry, Vitucci, & Cedillo, 2005). Because the loyalty and longevity of employees depend on their satisfaction of their spiritual and psychological needs, spiritual leadership seeks to meet those needs as well (Fry, 2003). From this perspective, it is known that there is a connection between their work life and their spiritual life when their time at work is considered. It is well understood that these situations are inextricably linked (Crossman, 2011).

Another characteristic of spiritual leaders is that they adhere to ethical values and have principles (Northouse, 1997), they trust their followers, and they take care to maintain a sense of empathy among them (Sanders, Hopkins, and Geroy, 2003), thereby fostering the development of common values (Fairholm, 1996). Spiritual leaders have a high level of trust in their followers and encourage them to trust one another (Mitroff & Denton, 1999). Spiritual leaders inspire their followers by giving their lives deeper meaning (Kouzes & Posner, 1995). Thus, by eliminating organizational alienation and resistance to change, they can boost productivity (DePree, 1992). Spiritual leaders initially change their environment by empowering others to change (Covey, 2004), and they also create values that connect the logic and emotions of their followers. Thus, they ensure that employees' commitment to themselves and the organization reaches marginal levels in every respect (Pfeffer, 2003).

In recent years, numerous studies on spiritual leadership and organizational commitment have been conducted, as evidenced by the literature. In the study conducted by Bozkuş and Gündüz (2016), for instance, it was determined that there is a significant relationship between spiritual leadership and organizational commitment, and that this relationship is strongest when normative and emotional commitments are present. In addition, Tanrkulu (2020) discussed in her graduate thesis the impact of physical education teachers' spiritual leadership behaviors on their organizational commitment. These studies reveal substantial differences between the demographic characteristics of teachers and their spiritual leadership and organizational commitment. In addition, it is stated that there is a significant and robust correlation between teachers' perceptions of spiritual leadership

and organizational commitment. In a broader context, numerous researchers have examined the relationship between spiritual leadership and employee commitment to the organization over the past decade (Fry, 2003; Fry, Vitucci, & Cedillo, 2005; Fry & Slocum, 2008; Polat, 2011; Chen & Yang, 2012). These data led to the formulation of the following hypothesis:

***H1**: There is a significant relationship between spiritual leadership and organizational commitment*.

Organizational commitment

There are currently numerous definitions of organizations. To begin, there are a few key terms that serve as excellent high-level descriptions of the organization that must be mentioned. The term "organization" is used to describe a group of people working together toward a common goal (Etzioni, 1964). In this context, it is possible to assert that organizations have an instrumental dimension and are based on the principle of unity of purpose (Scott, 1961). Organizations face opportunities and threats as a result of external and internal environmental conditions. For this reason, it wants to create resistance against the uncertainty in these organizational structures. Therefore, it is desirable for the organization's employees to be devoted to their jobs. However, it is not expected that organizations will form commitments solely due to uncertainty; the state of commitment can become quite complex (Iles et al., 1990). The expected formation of commitment in organizations occurs over a period of time with the formation of values and levels of belonging (Miroshnik, 2013). While organizational commitment ensures that employees remain with the organization, it also reduces employee turnover (Colquitt et al., 2013).

In the field of organizational behavior, the model which was developed by Meyer and Allen (1991) is the widely accepted method for measuring organizational commitment. Furthermore, empirical support has been provided by studies conducted in many countries on the subject (see Battal, 2020; Allen and Meyer, 1996; Cheng and Stockdale, 2003; Lee et al., 2001; Meyer et al., 2002). Affective, continuance, and normative commitment dimensions comprise the three-dimensional model of organizational commitment. In a nutshell, affective commitment refers to the interest that employees have in their commitment to the organization as well as the employee's sense of belonging within the organization. The continuation commitment, on the other hand, illustrates the costs (retirement, bonuses, awards, career steps, compensations, etc.) that employees may incur when they leave the organization. Normative commitment is the attitude employees should have toward their coworkers and managers in accordance with the organization's moral and ethical rules. Employees only demonstrate this level of commitment when they feel compelled to remain with the organization (Allen & Meyer, 1996). Numerous studies have been conducted on leadership styles, as evidenced by the literature. The relationship between organizational commitment and leadership types has also been investigated (Batmunkh, 2011; Ergreen and Iraz, 2017; Yahaya and Ebrahim, 2016; Ramayah and Min, 2009). Several studies have examined the connection between cynicism and organizational commitment. For example: Türköz et al. (2013); Yorulmaz and Çelik, (2016); Yıldız (2013); Yavuz and Beduk (2016); Nafei and Kaifi (2013); Yasin and Khalid (2015). (2015). Henceforth, the second hypothesis of the study is as follows:

***H2:** There is a significant relationship between cynicism behavior and organizational commitment.*

Cynicism Behavior

Previous studies on the concept cynicism over the past decade has shown that it is, in fact, a relatively new concept. Furthermore, studies in domestic literature cover recent dates. Despite this, more theoretical and empirical research on the concept of cynicism is expected to be conducted in our countries in the coming years.

Cynicism is a term used to describe the negative emotions that employees may feel towards their organization, such as hatred, greed, anger, psychological burnout, and disappointment. For this reason, cynicism is an undesirable situation for both employees and managers in organizations. Individuals who believe that people only care about their own benefits and that society is largely self-interested, unjust, and Machiavellian are called "cynical." The system of thought that explains this idea is also called cynicism. Cynicism occurs when individuals lose their belief, trust, and sense of justice towards their organizational structures over time. In other words, cynical people are highly critical, focus on mistakes, and have a tendency to be negative (Erdost et al., 2007). Cynicism refers to behavior where people only consider their own interests when explaining their goals and expect others to do the same (Tokgöz and Yılmaz, 2008). These behaviors lead to feelings such as arrogance, lack of empathy, and ruthlessness (Abraham, 2000).

The number of studies conducted on the relationship between spiritual leadership and cynicism is relatively low in our countries. However, when domestic and foreign

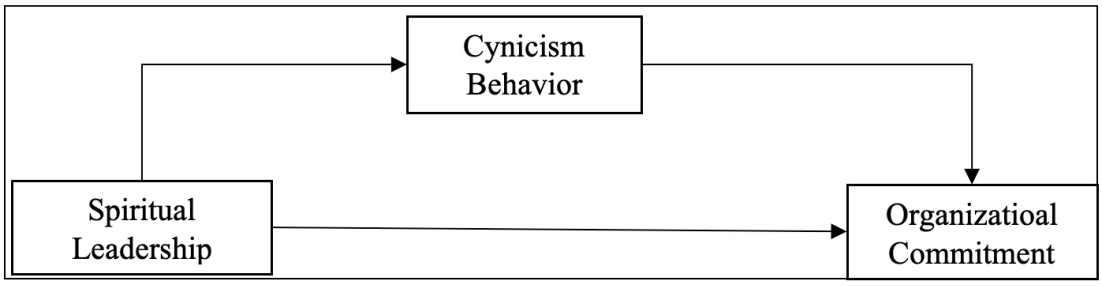

Figure 1. Research Model

literature is examined, some studies demonstrate that spiritual leadership has a significant impact on cynical behaviors (James et al., 2011; Bilgiç, 2017; Ünal, 2020). These studies show a negative relationship between spiritual leadership and cynicism. The third hypothesis of the study was developed based on this information:

H3: *There is a significant relationship between spiritual leadership and organizational cynicism.*

The Mediating Role of Organizational Cynicism Behavior

Numerous studies on the concept of cynicism can be found in the literature, which examine it as a conceptual, dependent, or independent variable. For example, Durmuş (2022), Kaya et al. (2022), Mills and Keil (2005), Andersson and Bateman (1997), and Tran et al. (2022) have conducted research on cynicism. Some studies also explore the mediating role of cynicism in the relationship between different concepts, such as Fayganoğlu (2021), Yıldırım and Ceyhan (2020), Genç (2018), Çoban and Deniz (2021), Ajawarneh and Atan (2018), and Ogunfowora et al. (2018).

Previous studies on this subject have focused on the dependent, independent, and mediator effects of organizational cynicism behavior. This study aims to reveal the mediating effect of cynicism behaviors on the relationship between spiritual leadership and organizational commitment. This model is based on the equity theory, which is one of the motivation theories. Tang and Baldwin (1996) state that employees' commitment to the organization, their sense of organizational justice, and their level of belonging increase when they feel satisfied and treated equally in the workplace. However, their informal or deviant behavior weakens the cynic (Swiercz & Smith, 1991). Therefore, in this study, while examining the commitment of employees to the organization within the context of spiritual leadership, cynicism behavior was included in the model as a mediator that weakens this relationship due to the equity theory. The theoretical infrastructure of this model was developed based on the equation theory and the path model (Baron and Kenny, 1986). Based on this information, the final hypothesis of the theoretical model is presented below:

***H4**: Organizational cynicism has a mediating effect on the relationship between spiritual leadership and organizational commitment*.

RESEARCH METHOD

The study was conducted by asking academic and administrative staff from two universities in Turkey and Indonesia to fill out questionnaires. This section will also include the model, scales, and analyses used in the study, as well as the results.

Research Model

The basic model of the research is presented as follows, based on the above-mentioned literature and Baron and Kenny's (1986) path model.

Research Sampling

The population of this research comprises university employees who actively provide academic and administrative services in Turkey and Indonesia. The sample was selected using a random sampling technique. Additionally, the surveys were conducted on Google Forms with necessary warnings to prevent data loss between countries, and due to the surveys coinciding with the Covid-19 pandemic period.

A total of 424 questionnaires were collected for the research, with 218 from Turkey and 206 from Indonesia. The average number of academic and administrative staff in both universities is 500. Therefore, it can be said that a sufficient sample representing the population has been obtained with a 4% margin of error and a 95% confidence level at a 5% significance level. The respondents' demographic characteristics are as follows:

There are 101 female and 117 male employees within the sample from Turkey. As for age distribution, 97 of them fall into the 30-39 age category, and 105 belong to the 40-49 age group. Regarding seniority, 45 employees

Table 1. Descriptive Statistics and Correlation Coefficients (Turkey)

	Tot ScoreAvr	Ss.	Skewness	Kurtosis	1	2	3
1. Spiritual Leadership	24.85	8.33	.74	-.57	(.81)		
2. Organizational Commitment	20.65	7.19	.36	-.65	**.782****	(.87)	
3. Cynicim Behavior	19.03	5.87	-.69	-.32	-.314**	-.297**	(.74)

have worked for 5 years or less, 122 have worked for 6-10 years, 34 have worked for 11-15 years, 14 have worked for 16-20 years, and 3 have worked for 21 years or more. Meanwhile, there are 94 female and 112 male employees who filled out the questionnaires from Indonesia. Off this number, 104 of the employees are aged between 30-39, and 102 are aged between 40-49. In terms of seniority, 24 of the employees have worked for 5 years or less, 108 have worked for 6-10 years, 48 have worked for 11-15 years, 19 have worked for 16-20 years, and 7 have worked for 21 years or more.

Research Scales

The research employed the survey technique, which is a commonly used method for measurement and evaluation. To gauge the participants' level of instant perception, the study utilized 5-point Likert-style scales. The questionnaire included three scales: the spiritual leadership scale, organizational commitment scale, and cynicism behavior scale. Moreover, the study discussed several statistical measures such as Cronbach Alpha value, AVE values, and CR values. The Alpha values of the scales were expected to be 0.70 or above, while the KMO value should be at least 0.60. Additionally, the AVE value was expected to be 0.50 or more, and the CR value was expected to be greater than the AVE value. It can be inferred that the factors explain the structure at a level of at least 0.50 based on the study by Hair et al. (2019: 9). Furthermore, the study noted that an AVE value lower than 0.50 is acceptable if the composite reliability (CR) is higher than 0.60, as cited in Yılmaz and Kinaş (2020).

Ethical Consent

Ethics Committee Approval was obtained from Bayburt University Scientific Research and Publication Ethics Committee with the letter numbered E-36671036-050.99-62689/ and the decision numbered 2022/04/14 on 21.03.2022.

Spiritual Leadership Scale

To measure the level of spiritual leadership perceived by participants in the study, the researchers used a scale developed by Fry (2007), which consists of dimensions such as hope, visionary, and deep commitment. The Turkish equivalent of the scale was revealed by Kurtar (2009). One of the preferred expressions in the scale is "I understand my university's vision and am committed to it."

Organizational Commitment Scale

The original scale, developed by Penley and Gould (1988), was collected under three dimensions (self-seeking, compulsory, and moral commitment) and the equivalence of the study in Turkey was made by Ergün and Çelik (2019). For our study, we focused on the level of moral commitment, and one of the expressions from the preferred scale was "I really feel like the problems of this university are my problems."

Cynicism Behavior Scale

The Organizational Cynicism scale, developed by Brandes et al. (1999), was adapted for use in Turkey by Karacaoğlu and İnce (2012), and is expressed under three dimensions (emotional, cognitive, and behavioral cynicism) in both its original and Turkish versions. For our study, we focused on the level of emotional cynicism, and one of the questions from the scale used was "I get nervous when I think of my university."

FINDINGS AND RESULTS OF THE RESEARCH

This study utilized SPSS and AMOS programs to analyze the data. The first step involved examining the reliability of the questionnaires, followed by a discussion of the structural validity of the measurement model. To test the structural validity, confirmatory factor analysis was performed using the Turkish versions. Multicollinearity between the scales was checked, and a correlation

Table 2. Descriptive Statistics and Correlation Coefficients (Indonesia)

	Tot ScoreAvr	Ss.	Skewness	Kurtosis	1	2	3
1. Spiritual Leadership	21.36	9.18	**.69**	-.54	(.77)		
2. Organizational Commitment	18.34	5.27	**.45**	-.75	**.546****	(.79)	
3. Cynicim Behavior	12.61	4.36	**-.77**	-.41	**-.447****	**-.266****	(.88)

Table 3. Composite Reliability and Average Variance Extracted Values for the Scales

Kavram	CR(Turkey)	AVE(Turkey)	CR(Indonesia	AVE(Indonesia)
1.Spiritual Leadership	0,741	0,667	0,885	0,599
2.Org Commitment	0,816	0,793	0,836	0,695
3. Cynicim Behavior	0,722	0,615	0,794	0,627

Table 4. Goodness of Fit Values of Scales and Research Model (Turkey)

Goodness of Fit Values	**χ2**	**df**	**CMIN/DF**	**SRMR**	**NFI**	**CFI**	**TLI**	**RMSEA**
Spiritual Leadership	159.230	73	2.181	.062	.920	.955	.954	.074
Org Commitment	7.186	7	1.027	.039	.995	.996	.995	.042
Cynicim Behavior	3.280	2	1,640	.045	.997	.984	.996	.054
Measurement Model	541.045	243	2.227	.063	.944	.962	.922	.075

analysis was conducted to reveal the direction of the relationship between the scales. In the last step, SEM was used to test the validity of the hypotheses. The Bootstrap method in SEM analysis was employed to increase the amount of data and evaluate both direct and indirect effects.

The research findings presented in Tables 1 and 2 indicate that there are significant direct and indirect effects between spiritual leadership, organizational commitment, and cynicism behavior, with a confidence level of 99%. Moreover, the data shows a normal distribution as evidenced by the skewness and kurtosis levels. Furthermore, the reliability of the scales used in the study was deemed acceptable with a reliability level above 0.70, and participants from both countries were found to have understood the scales well according to Kartal and Dirlik's (2016) study.

The study included confirmatory factor analyses (CFA) for both Turkey and Indonesia using the AMOS package program. The CFA results led to necessary modifications and question elimination based on the program suggestions. The researchers utilized the most widely accepted high-level estimation method available in the literature, as per Gürbüz and Şahin (2016). The CFA analyses showed that the model scales were within acceptable ranges, and Composite Reliability (CR) and Average Variance Extracted (AVE) values were examined to reveal any possible reliability issues between the two

Table 5. Goodness of Fit Values of the Scales and the Research Model (Indonesia)

Goodness of Fit Values	χ2	df	CMIN/DF	SRMR	NFI	CFI	TLI	RMSEA
Spiritual Leadership	205.970	98	2.102	.066	.954	965	.956	.073
Org Commitment	10.219	8	1.277	.029	.996	994	.995	.037
Cynicim Behavior	5.671	4	1,418	.032	.956	988	.984	.045
Measurement Model	567.287	241	2.354	.069	.912	934	.912	.078

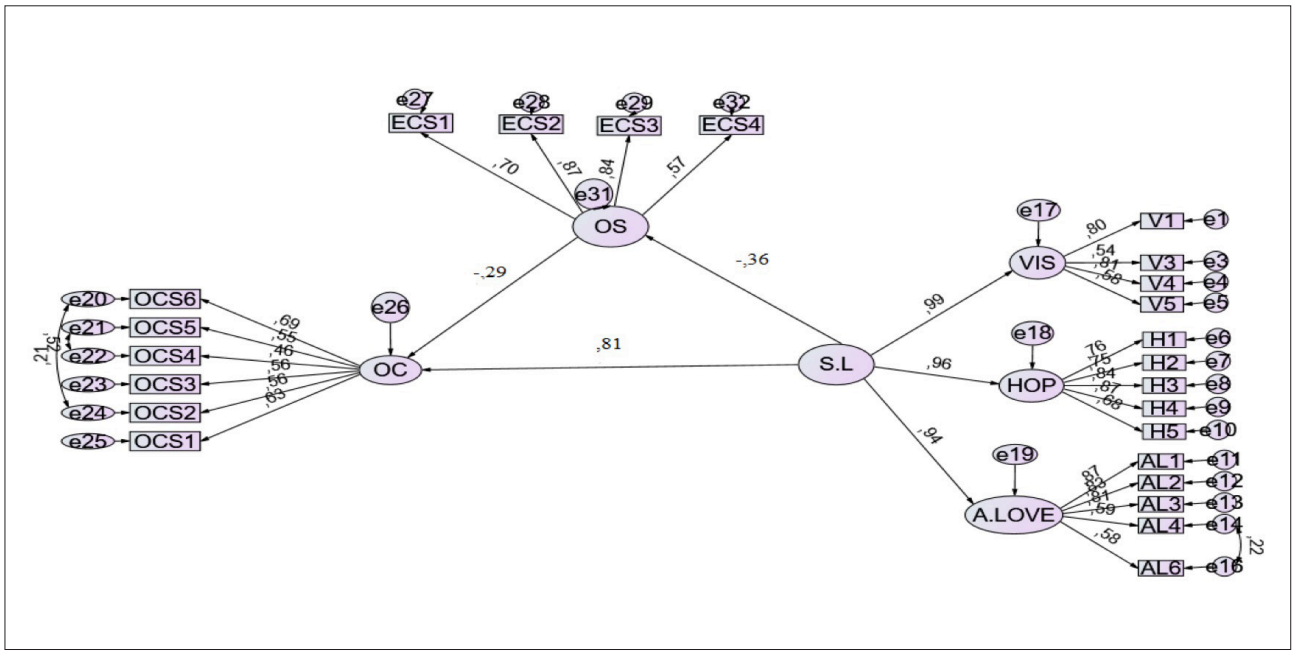

Figure 2. Structural Equation Model (SEM) and Standardized Path Coefficients (Turkey)

countries. AVE values of 0.50 or higher and CR values greater than the AVE value were considered acceptable. The findings showed that the factors explained the structure at a level of at least 0.50, and both countries had acceptable CR and AVE values as per Hair et al.'s (1998) cited in Yılmaz and Kinaş (2020). In Table 3, the CR and AVE values for both countries were reported, indicating that the scales used in the study were reliable in both Turkey and Indonesia.

The CFA's conducted in Turkey and Indonesia have provided interesting insights into the factor loadings present in these countries. The lowest factor loadings in Turkey ranged between 0.54 and 0.87 in their unmodified state, while in Indonesia, the lowest factor load was found to be 0.51 with the highest factor load of 0.78. All of these factor loads were deemed statistically significant, and they were identified separately for both countries within the basic model.

The goodness-of-fit values obtained through CFA for Turkey indicated a χ2/df=2.22, SRMR= 0.63, NFI=0.94, TLI =0.92, CFI =0.96, and RMSEA=0.75, while the overall model goodness of fit values for Indonesia were a χ2/df=2.35, SRMR= 0.69, NFI=0.91, TLI =0.93, CFI =0.91, and RMSEA=0.78. These values suggest that both countries have acceptable levels of goodness of fit. A summary of these values is provided in Table.4 and Table.5.

The study then proceeded with a path model analysis to examine the mediating role of cynicism behavior in the relationship between perceived spiritual leadership and organizational commitment. This analysis aimed to test the hypotheses formulated and explore the mediation effect. The results of the analysis were presented through the structural models, which formed the basis of the study, and were depicted in Figure 2 and Figure 3.

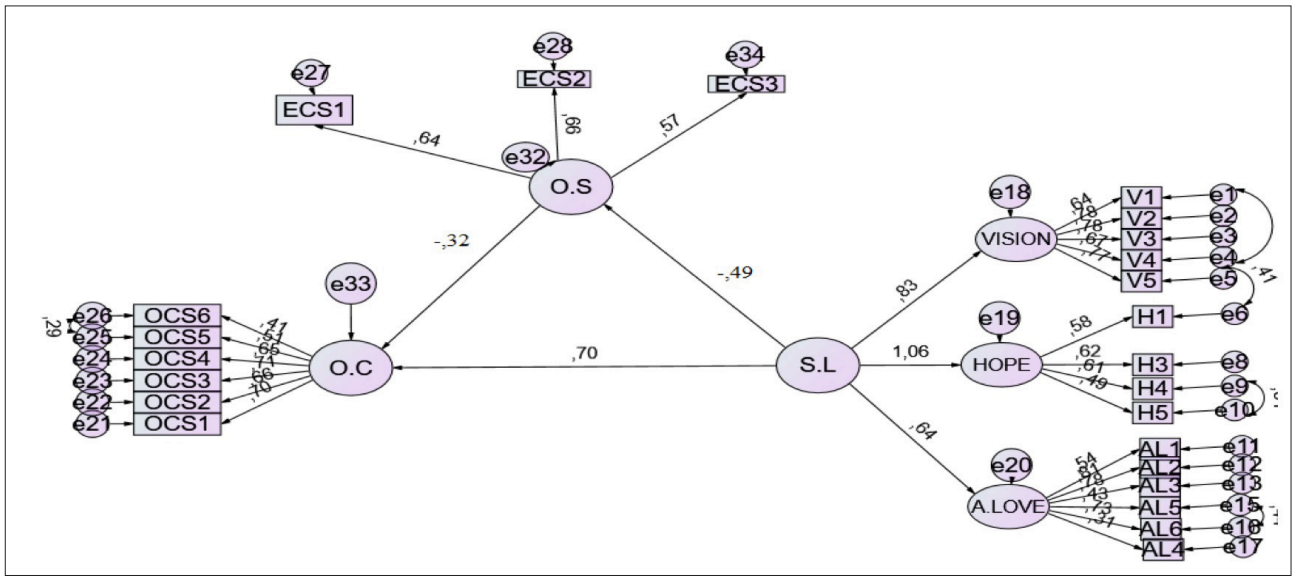

Figure 3. Structural Equation Model (SEM) and Standardized Path Coefficients (Indonesia)

These models provided a graphical representation of the relationship between perceived spiritual leadership, cynicism behavior, and organizational commitment. The values obtained from these models were critical in evaluating the mediating effect of cynicism behavior in the relationship between perceived spiritual leadership and organizational commitment. The findings from this analysis provided a deeper understanding of the complex dynamics that exist between these variables and offered valuable insights into the mechanisms that underlie the relationship between them.

The coefficients displayed in Figure 2 and Figure 3 represent the standardized regression coefficients, which are critical in evaluating the strength and significance of the relationships between the variables. As a general rule, if the standardized regression coefficient values are greater than or equal to 0.50, it is considered a strong effect, between 0.30 and 0.50 a medium effect, between 0.10 and 0.30 a low effect, and if the coefficient is below 0.10, the effect is not statistically significant (Kara and Ellialtı, 2021). Using the models presented in Figure 2 and Figure 3, the H1, H2, H3, and H4 hypotheses were tested, and the results were summarized in Table 6 and Table 7. Additionally, the indirect effects and the significance of the mediating role were evaluated using the bootstrap method in the AMOS program along with the SOBEL test. These analyses provided a comprehensive understanding of the relationships between the variables and the mediating effect of cynicism behavior on the relationship between perceived spiritual leadership and organizational commitment.

Upon analyzing the data obtained from Turkey, the results presented in Table 6 indicated a positive and significant direct effect of spiritual leadership on the dependent variable (β = .812, p<.005), thereby accepting the H1 hypothesis. This finding suggests that managers who exhibit strong spiritual leadership skills in Turkey are likely to increase employee commitment to the organization. The indirect effect models were then explored, revealing that spiritual leadership had a negative impact on organizational cynicism, which acted as a mediating variable (β=-0.364, p<0.05), thereby meeting the conditions for H2 hypothesis. It was also observed that organizational cynicism had a negative and significant effect on organizational commitment (β=-0.292, p<0.05), providing further evidence of the importance of spiritual leadership in reducing organizational cynicism and enhancing employee commitment to the organization. These findings highlight the critical role of spiritual leadership in fostering a positive organizational climate and improving employee engagement and commitment.

Based on the findings of the study, the H3 hypothesis was accepted, indicating that cynical behaviors decrease in organizations with spiritual leaders, and an increase in cynical behaviors can weaken commitment to the organization. Additionally, the mediating effect was analyzed to understand the impact of cynicism behavior on the relationship between spiritual leadership and organizational commitment. The results revealed that the effect of spiritual leadership on organizational commitment through cynicism behavior was significant and positive (β=0.627, p<0.05), and the effect size decreased. The SOBEL test also confirmed the partial mediating role of cynicism behavior (SOBEL= 6.745; p=0.000<0.05). Therefore, the H4 hypothesis was

Table 6. Mediation Analysis Results (Turkey)

Dependant	Independent	β	Std. Dev.	t	p
Direct effect					
Organizational Commitment	→Spiritual Leadership	0,812	0,049	24,542	**0,000***
Indirect effect					
Organizational Cynicism	→Spiritual Leadership	-0,364	0,054	21,065	**0,000***
Organizational Commitment	→Organizational Cynicism	-0,292	0,069	18,471	**0,000***
Organizational Commitment	→Spiritual Leadership	0,627	0,066	13,195	**0,000***

*p<0.05 significant effect, p>0.05 no significant effect; SEM

Table 7. Mediation Analysis Results (Indonesia)

Dependant	Independent	β	Std. Dev.	t	p
Direct effect					
Organizational Commitment	→Spiritual Leadership	0,703	0,037	21,145	**0,000***
indirect effect					
Organizational Cynicism	→Spiritual Leadership	-0,491	0,044	29,047	**0,000***
Organizational Commitment	→Organizational Cynicism	-0,322	0,081	13,475	**0,000***
Organizational Commitment	→Spiritual Leadership	0,541	0,067	15,199	**0,000***

*p<0.05 significant effect, p>0.05 no significant effect; SEM

accepted, emphasizing the critical role of spiritual leadership in reducing cynical behaviors and improving employee commitment to the organization. These findings have important implications for organizations that seek to promote a positive workplace culture and enhance employee engagement and commitment.

The analysis of the Indonesian data is presented in Table 7, where the focus was on examining the direct effect of spiritual leadership on organizational commitment. The results showed a positive and significant effect (β = .703, p<.005), indicating that strong spiritual leadership has a beneficial impact on the commitment of academic and administrative staff working in Indonesia. Therefore, the H1 hypothesis was accepted, and it was concluded that spiritual leadership plays a crucial role in enhancing organizational commitment. Additionally, the indirect effect of spiritual leadership on organizational cynicism was investigated. The analysis revealed a negative and significant effect (β=-0.491, p<0.05), implying that spiritual leadership can mitigate cynicism within the organization. Overall, these findings suggest that strong spiritual leadership is essential for fostering commitment and reducing cynicism among employees in Indonesia.

The study examined the relationship between organizational cynicism and organizational commitment, as well as the effectiveness of spiritual leadership in strengthening commitment and reducing cynicism behaviors in two countries. The H2 hypothesis was accepted, indicating that the mediation condition was met. The findings showed a negative and significant effect of organizational cynicism on organizational commitment (β=-0.322, p<0.05), leading to the acceptance of the H3 hypothesis. The effectiveness of spiritual leadership was found to have a significant and

positive effect on organizational commitment, while also weakening cynicism behaviors. The mediation effect was also significant, indicating that the role of spiritual leadership in organizational commitment decreased with the effect of cynicism, but remained positive (β=0.627, p<0.05). The Sobel test confirmed the significance of these results (SOBEL= 6.745; p=0.000<0.05). Overall, the study suggests that spiritual leadership can be an effective strategy for improving organizational commitment and reducing cynicism in different cultural contexts.

In the final stage of the study, the researchers examined the mediation effect of cynicism behavior on the relationship between spiritual leadership and organizational commitment. The findings revealed that the effect of spiritual leadership on organizational commitment decreased through cynicism. Despite this, the effect remained significant and positive, with a beta coefficient of 0.541 and a p-value of less than 0.05 (β=0.541, p<0.05). The Sobel test confirmed the significance of the mediation effect, indicating that the last hypothesis of the research, H4, was accepted due to the partial mediation role of cynicism behavior (SOBEL= 5.442; p=0.000<0.05). These results suggest that even in the presence of cynicism, spiritual leadership can still have a positive impact on organizational commitment.

CONCLUSION AND RECOMMEDATION

The theoretical section of the study introduces the concept of spiritual leadership, which serves as the focus of the research and represents the independent variable in the basic model. The etymology of the term "soul" is briefly discussed, along with its philosophical, scientific, and mystical aspects. The concept of "nafs" is also mentioned in relation to the soul, and their similarities and differences are explored. The literature on spiritual leadership, organizational commitment, and cynicism behavior is reviewed, along with relevant studies on the mediation effects of cynicism behavior. In the analysis and findings section of the study, data were collected from 206 university employees in Indonesia and 218 university employees in Turkey using an online survey method. These employees included both academic and administrative staff working in state universities. The study focuses on identifying the relationships between the aforementioned concepts and testing the research hypotheses.

The first step of the study involved assessing the reliability of the measurement scales used to evaluate spiritual leadership, organizational commitment, and cynicism. The scales were found to be reliable. Descriptive statistics, correlations, skewness, and kurtosis were calculated for each scale in both countries to determine whether the data followed a normal distribution. The results showed that the distribution was normal in both countries, although there were positive and negative correlations between the scales. In the second stage, the composite reliability (CR) and average variance extracted (AVE) were calculated based on the standardized regression coefficients obtained from confirmatory factor analyses conducted separately for Turkey and Indonesia. The aim was to determine the reliability of the scales as dependent and independent variables. The data met the basic conditions required for the study, with an AVE value of 0.50 or higher, a CR value greater than the AVE value, and a Cronbach's alpha value above 0.70 in both countries. The discriminant validity test was not conducted because the correlation between the scales was not very close to 1. This suggests that the scales were not perceived as being very closely related in the two countries.

The second section of the study focuses primarily on DFA analyses conducted with the AMOS software. To organize and clarify the presentation of data from both countries, the overall goodness-of-fit levels of Turkey and Indonesia have been determined. From Tables 4 and 5, it can be determined that both countries' goodness-of-fit levels are acceptable. Based on the structural equation and path models shown in Figures 2 and 3, it can be inferred that there is a strong connection between spiritual leadership and organizational commitment in both countries. This indicates that the employees' perception of spiritual leadership behavior has a significant impact on strengthening their commitment to the organization, according to the employees in Indonesia and Turkey. However, when considering the presence of cynicism behavior, it is evident that even if employees perceive spiritual leadership in the organization, there is still a significant decrease in their commitment to the organization, according to the perception of employees in both countries.

The research findings from Figure 2 and Figure 3 reveal a significant negative impact of cynicism behavior on both spiritual leadership and organizational commitment in both Turkey and Indonesia. This suggests that when employees perceive cynicism behavior in their organization, it decreases their perception of spiritual leadership and their level of commitment to the organization. The study also includes a mediation analysis for Turkey and Indonesia, which is presented in Table 6 and Table 7. The SOBEL test results were examined using the

theoretical mediation model proposed at the beginning of the study by two methods (Baron and Kenny, 1986). The findings show that cynicism behavior has a partial mediating effect on the relationship between perceived spiritual leadership and organizational commitment in both Turkey and Indonesia. This confirms the basic hypotheses (H1, H2, H3, and H4) created for both countries.

Overall, the study demonstrates that the perception of spiritual leadership behavior has a positive impact on organizational commitment, but this effect is weakened by the presence of cynicism behavior. Furthermore, cynicism behavior mediates the relationship between spiritual leadership and organizational commitment in both Turkey and Indonesia. The Torah, Psalms, Bible, and Qur'an are considered the major books of monotheistic religions, all of which mention the prophet Adam as the ancestor of humanity. The Torah and Psalms were revealed to Jews, the Bible to Christians, and the Qur'an to Muslims. The Psalms contain praises and supplications to Allah but no religious provisions. Hinduism, Buddhism, and Zen Buddhism are common in India, Nepal, and Bangladesh, but these religions differ from monotheistic ones in their views on creation.

The story of Abel and Cain, the children of Adam, who represent good and evil, is mentioned in the three holy books. Adam is considered a spiritual leader who showed compassion and love towards all his descendants. The fight between good and evil continues today, and examples of this struggle can be seen in literature and real life. Steinbeck's novel "East of Eden" provides an excellent example of this fight between pure good and pure evil and how individuals at the head of families can be spiritual leaders who direct the development of their families. The concept of spiritual leadership has existed since the first people, and these leaders have influenced the behaviors of their followers with their love, optimism, and spirituality. They have guided both sides in the fight between good and evil. Future studies could explore management philosophies of spiritual leaders from national and international cultures.

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Is the Excise Tax Perceived as an Externality Tax? An Empirical Study on Turkey

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ABSTRACT

This study aims to investigate the perceptions and attitudes of individuals towards the excise tax applied in Turkey since 2002 and whether the excise tax is accepted as an externality tax. We collected the data from 1304 participants across Turkey with online and face-to-face survey methods and analyzed them with regression models. The results show that the excise tax directly affects individuals' expenditures in the high-income group. The perceptions of individuals with high general tax awareness and those who expect an update in tariffs every year have positive attitudes about the excise tax. Those who think that the scope of excise tax should be narrowed have negative perceptions of excise tax. Besides, the positive perceptions of excise tax by individuals who consume harmful products more frequently and those who think that the excise tax on harmful products should be raised support that the excise tax is an externality tax.

Keywords: Tax Perception, Tax Awareness, Excise Tax, Negative Externalities, Externality Tax.

JEL Classification Codes: H20, H23, H30

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INTRODUCTION

Pigou (1920) stated for the first time that units emitting externalities should be taxed to internalize negative externalities. Later, some other researchers [Plott (1966); Buchanan (1969); Baumol (1972); Diamond (1972)] carried out more descriptive studies on corrective taxes. Excise taxes, which tax certain goods such as alcoholic beverages, tobacco products, and fuel products, are separated from the value-added tax on all kinds of goods and services (Hines, 2007: 50).

When we look at the goods that constitute the subject of excise taxes, it is clear that they are mainly harmful to the environment and human health. The excessive consumption of these goods causes many negative externalities, especially health problems and environmental pollution. Governments aim to reduce negative externalities by preventing excessive consumption with the excise tax. From this point of view, the findings of Gruber and Koszegi (2004), O'Donoghue and Rabin (2006), DeCicca and McLeod (2008), Eckerstorfer and Wendner (2013), King et al. (2020) show that taxes are applied as an externality tax. Also, the rigid price elasticity of the demand for goods subject to excise tax (Cnossen, 2010: 237) made this tax an essential source of revenue for governments. In Organisation for Economic Co-operation and Development (OECD) countries, the share of excise tax revenues in total tax revenues was 7.2 on average in 2018 (OECD, 2020: 38).

As emphasized by Song and Yarbrough (1978), Torgler and Schneider (2007), and Dornstein (1987), taxpayers' attitudes, behaviors, and tax perceptions are essential for reaching expected taxation targets. Studies measuring attitudes and behaviors towards excise tax generally focus on product groups subject to excise tax, such as tobacco and fuel products. For instance, Farley et al. (2015) found that smokers support increases in this tax if the tax on tobacco products encourages healthy lifestyles and supports smoking cessation. Scott (2012) and Li et al. (2014) found that people reacted strongly to the excise tax on fuel. Also, the increases in the tax in question reduced their fuel consumption.

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Regarding the excise tax on alcoholic beverages, the previous studies [Chaloupka et al. (2002); Wagenaar et al. (2009)] show that people are sensitive to this tax. Also, increases in this tax reduce the consumption of alcoholic beverages. According to the experimental study conducted by Chetty et al. (2009), when people are aware that the excise tax on alcoholic beverages is included in the price, they reduce their consumption of alcoholic beverages.

Although some studies consider excise taxes as an externality tax, others show that these taxes do not reduce or internalize negative externalities. For example, Rietveld and Woudenberg (2005) and Santos (2017) provide evidence that excise taxes on fuel are very weak in reducing negative externalities. Curti et al. (2019) concluded that the excise tax on tobacco products effectively reduced cigarette consumption. The increase in this tax caused people to use illegal cigarettes and increased the informal economy.

Very few studies measure attitudes towards the excise tax applied in Turkey. From these studies, Gergerlioğlu (2017) concluded that the excise tax on fuel reduces the frequency of vehicle use, and people prefer vehicles that consume less energy. Hayrullahoğlu (2015) states that the excise tax levied on alcoholic beverages and tobacco products do not cause much change in the consumption of individuals in terms of public health. However, it provides significant revenue to the government. Çetin and Özkan (2018) provide evidence that increases in excise tax on alcoholic beverages and tobacco products do not reduce consumption of these products.

So far, no study has examined whether the excise tax applied in Turkey is an externality tax. In this context, the study has two main objectives. The first aim is to determine the factors affecting the perception of excise tax by measuring individuals' attitudes, behaviors, and perceptions towards the excise tax applied in Turkey. The second aim is to reveal whether this tax is an externality tax based on the attitudes and behaviors of individuals towards the excise tax. This study contributes to the existing literature that the excise tax is an externality tax. Also, this study is one of the rare studies that measure the perception of excise tax applied in Turkey.

EXCISE TAX IMPLEMENTATION IN OECD COUNTRIES

Although there is agreement on excise taxes on certain products between the European Union (EU) and OECD member countries, there are differences in practice. For example, countries like Turkey, Australia, Canada, Belgium, and France apply a single excise tax to tax goods subject to particular consumption. Many countries, such as England and Switzerland, tax these goods separately, including tobacco tax, alcoholic beverage tax, and fuel tax. Also, the tariffs applied by countries to product groups subject to excise differ.

In the international arena, the EU took the first step towards harmonizing excise taxes in 1992 (Gebauer et al., 2005). First, the EU divided excise taxes into three main product groups: tobacco and tobacco products, alcohol and spirits, and mineral oils. In 2003 and 2004, it added energy products and electrical groups to these product groups. It made partial harmonization for product groups. However, the rates and amounts of excise tax applied to these groups vary depending on economic factors and factors such as the traditions of the countries, consumption habits, and the importance given to protecting the environment (Tyc, 2008: 88).

Excise tax covers a wide variety of product groups in some country applications. Alcoholic beverages, tobacco products, and mineral oils are common among these product groups in all OECD countries. In recent years, governments have frequently used the excise tax to provide revenue and influence people's consumption behavior who consume products harmful to health and the environment (OECD, 2018: 120). However, since the demand for tobacco products and alcoholic beverages is rigidly elastic, it is challenging to change people's consumption behavior through the excise tax (Warren, 2008: 15).

While specific tax bases are preferred in excise tax generally, some countries may prefer the ad Valorem tax base. Specific bases are preferred in excise tax, significantly reducing negative externalities. The taxation of alcoholic beverages according to the degree of alcohol and the lead content of petroleum products are some significant examples of this case (Keen, 1998: 20).

Countries tax alcoholic beverages at different rates or amounts. For example, the Czech Republic, Germany, Luxembourg, Slovak Republic, and Turkey have taxed around USD five per hectoliter in the taxation of beer. Finland charges USD 41, and Israel USD 66 in tax. Australia, Canada, Iceland, Mexico, the Netherlands, Norway, and Switzerland apply a progressive tariff in the taxation of beer. In addition, Austria, Czech Republic, Germany, Hungary, Israel, Italy, Luxembourg, Portugal, Slovak Republic, Slovenia, Spain, and Switzerland do not charge tax on wine. Finland and Ireland charge more than USD four per liter of wine, and Norway more than USD six. Australia, Chile, Korea, and Mexico apply

a value-based tariff to wine instead of a quantity-based tariff (OECD, 2020: 136).

There is harmonization and integration between the EU member countries in the taxation of tobacco products. There are two methods for taxing cigarettes from tobacco products: the minimum excise tax as a percentage of the cigarette price and the excise tax per thousand cigarettes. Although there is harmonization among EU member countries, the rates and amounts of excise tax applied by governments to tobacco products differ. For example, in countries among the founding members of the EU (Belgium, France, Germany, and Luxembourg), high amounts of excise tax are collected from cigarettes. On the other hand, in countries such as the Czech Republic, Poland, and Hungary, which joined the EU in 2004 and later, the excise tax on cigarettes is relatively lower. Although different rates and amounts of excise tax are applied to tobacco products in general, the tax imposed has increased the prices of these products and reduced their affordability (Blecher et al., 2013: 1).

Mineral oils are taxed by dividing them into product categories according to their technical characteristics. Basic product categories are unleaded gasoline, diesel, liquid petroleum gas (LPG), and fuel oil. In addition to these products, some OECD countries also tax energy products such as natural gas, electricity, and coal in this context. The directive published by the EU in 2003 has also influenced the taxation of energy products (OECD, 2018: 126). The main reason for the tax on mineral oils and energy products in EU countries is to reduce greenhouse gas emissions. Carbon dioxide emissions from the transportation sector increased by 34 percent in 1990-2008, especially for the Eurozone (Novytska, 2013: 8). For instance, Israel, England, the Netherlands, and Sweden apply the highest excise tax to fuel products such as diesel and gasoline used in vehicles. However, the USA, Canada, and Chile apply the lowest excise tax. While Israel, Estonia, and Sweden receive higher excise tax than other countries for fuel oil used in homes, Canada, Belgium, and Japan receive lower excise tax amounts (OECD, 2018: 150-160).

In 2002, Turkey started to implement the excise tax to simplify the complex structure of indirect taxes, comply with EU legislation, save energy, and affect consumer preferences in goods harmful to the environment and human health. The goods that constitute the subject of excise tax, which has a single-tier tax structure, are divided into four groups (Ulgen, 2002: 30): Fuel products and mineral oils; motor land, sea, and air vehicles; alcoholic beverages, beer, wine, carbonated and cola drinks, and tobacco and tobacco products; luxury goods and household appliances include refrigerators, washing machines, air conditioners, televisions.

The excise tax base is determined as specific and ad Valorem regarding the type of goods subject to tax. In this context, a quantity-based tax base was preferred for fuel products and mineral oils, and the tax amount was determined as fixed. The value-based tax base was generally preferred for the other goods subject to excise tax, and the tax amount was determined as fixed or proportional.

Except for tobacco and tobacco products, which are the subject of excise tax in Turkey, the rates and amounts of excise tax applied to other product groups are above OECD averages. Although the excise tax tariff on tobacco products is below the OECD average, the price of tobacco products is close to the OECD average, as a high value-added tax is levied on these products (OECD, 2020: 143-165). Another aspect of the excise tax application in Turkey that differs from other countries is that the goods subject to luxury consumption are broad.

RESEARCH METHODOLOGY

We conducted this study, which we carried out in order to measure the excise tax perception of the society and to determine the factors affecting this perception, with 1,304 people across Turkey using face-to-face and online survey methods. We collected the data for the study in February 2021. We reached a sufficient number of participants at the regional level by participating in the survey from all provinces. The survey of this study was created by the researchers, benefiting from previous studies by Dornstein (1987), Torgler and Schneider (2007), and Devos (2008).

We conducted a pilot study on 80 people to minimize scale errors. Since the excise tax affects all segments of society, we randomly selected the sample without clustering, except to reach a certain number in demographic groups. The hypothesis of the study is:

H_1: Excise tax is an externality tax.

H_0: Excise tax is not an externality tax.

One of the purposes of implementing the excise tax in Turkey is to influence consumer preferences for products harmful to the environment and human health. Thus, the consumption of these products can be reduced. The created hypothesis will test whether the excise tax is perceived as an externality tax. In addition, the "What are the factors affecting the perception of the excise tax?" question will be answered.

EMPIRICAL FINDINGS

The Cronbach's alpha coefficient obtained from the reliability analysis of the scale used in the analysis is 0.727. We chose a five-point Likert scale for the survey statements, excluding demographic factors. We coded this scale as "Strongly Disagree: 1" and "Strongly Agree: 5".

The data from the survey study conducted throughout Turkey on the perception of excise tax were analyzed using OLS regression models. First, four questionnaire statements tested to be a factor were averaged and transformed into a single variable. This variable was coded as "Excise Tax Perception" and used as the analysis's dependent variable. We calculated the mean value of the dependent variable as 2.99.

These statements and their average values are as follows.

1. I know from which goods and services excise tax is taken (Mean: 3.24).
2. The purpose of the excise tax is to provide revenue to the government (Mean: 3.41).
3. The excise tax aims to reduce the consumption of goods harmful to human health (Mean: 2.46).
4. Excise tax helps ensure income distribution and taxation (Mean: 2.41).

After conducting a regression analysis, we separated the factors that affect the perception of excise tax into demographic, socio-cultural, economic, and institutional factors. Studies such as Frey and Torgler (2007), Torgler et al. (2008), and Marandu et al. (2015) have been used in grouping the factors. The level of explanation (R-squared value) of the excise tax perception of the first model is 22.48 percent. Four more different models were created by adding "Excise tax/Externality relationship-2", "Excise tax/Externality relationship-3", "Requirement of excise tax-2", and "Excise tax rate-2" variables, respectively, to this model. The explanation level of the excise tax perception of the last model has increased to 30.62 percent. This percentage shows that the models created to explain the excise tax perception are meaningful. We also performed robustness tests for each model.

Demographic Factors

In the study, gender, marital status, age, city of residence, education status, profession, monthly average income, motor vehicle ownership, zero km car purchase or not were used as demographic factors (See Table A.1). In addition, the frequency of smoking and the consumption of carbonated beverages and alcoholic beverages were used as harmful product consumption (See Table A.2).

Approximately 39% of those participating in the research are female, 61% are male; 55% are married, 45% are single; 71% are young (18-35 years old), 24% are middle age (36-50 years old), 5% elderly (51 years and above); 41% is official, 59% is in the other profession group. Participants are divided into five groups in terms of monthly average income. Approximately 36% of the participants are low-income [0-2000 ₺ (Turkish Lira)], 31% low-middle income (2001-4000 ₺), 26% upper-middle-income (4001-6500 ₺), 5% high-income (6501-10000 ₺), 2% the highest income group (10001 ₺ and above). The provinces in which participants lived were grouped by geographical region. The regions where participants live were added as control variables in the models created.

According to the results, excise tax perception differs significantly in terms of the monthly average income of the individuals, the frequency of smoking, and the frequency of consuming carbonated drinks. Statistically, at the 5% significance level, individuals in the high-income group have a negative excise tax perception than those in other income groups. İndividuals who smoke more frequently have a positive excise tax perception than others at the 10% significance level. The excise tax perception of individuals who consume carbonated beverages more frequently is positively differentiated at the 5% significance level.

Socio-Cultural Factors

The questionnaire statements coded as "General tax awareness" and "Excise tax awareness," which are used as socio-cultural factors in the regression analyzes, are given below:

1. Paying taxes is a civic duty (Tax awareness-1, Mean: 3.73).
2. Taxes are the equivalent of public expenditures (Tax awareness-2, Mean: 3.38).
3. I closely follow the excise tax rates and amounts (Excise tax awareness-1, Mean: 2.99).
4. When buying a product, I check whether this product is subject to excise tax or not (Excise tax awareness-2, Mean: 2.79).

According to the results of the analysis, excise tax perception differed significantly at the level of 1% in

Table 1. Factors Affecting Excise Tax Perception (OLS Regression Analysis Results)

Variables	MODEL - 1		MODEL – 2		MODEL – 3		MODEL – 4		MODEL - 5	
	Coeff.	t stat.	Coeff.	t stat.	Coeff.	t stat.	Coeff.	t stat.	Coeff.	t stat.
Demographic Factors										
Male	-0.019	-1.09	-0.021	-1.25	-0.022	-1.31	-0.030*	-1.76	-0.027	-1.64
Single	-0.015	-0.76	-0.012	-0.63	-0.009	-0.50	-0.008	-0.43	-0.009	-0.47
Teenager	-0.029	-0.64	-0.028	-0.64	-0.029	-0.67	-0.033	-0.77	-0.029	-0.69
Official	0.004	0.88	0.009*	1.67	0.008	1.46	0.006	1.23	0.006	1.23
High income	-0.045**	-2.07	-0.045**	-2.16	-0.046**	-2.24	-0.047**	-2.36	-0.045**	-2.28
Education	0.008	0.51	0.014	0.93	0.016	1.06	0.012	0.79	0.012	0.80
Harmful Product Consumption										
Smoking	0.024*	1.82	0.023*	1.83	0.025**	2.04	0.022*	1.77	0.022*	1.77
Carbonated beverage consumption	0.039*	1.81	0.043**	2.09	0.041**	2.04	0.042**	2.08	0.041**	2.03
Alcoholic beverage consumption	-0.014	-0.63	-0.003	-0.15	0.011	0.54	0.016	0.77	0.019	0.91
Socio-Cultural Factors										
Tax awareness-1	0.090***	4.99	0.082***	4.65	0.079***	4.53	0.063***	3.58	0.063***	3.62
Tax awareness-2	0.099***	5.57	0.081***	4.65	0.079***	4.68	0.073***	4.31	0.068***	3.97
Excise tax awareness-1	0.065***	3.40	0.056***	3.10	0.063***	3.53	0.067***	3.78	0.067***	3.81
Excise tax awareness-2	0.027	1.62	0.021	1.32	0.018	1.18	0.018	1.17	0.018	1.19
Economic Factors										
Update in excise tax tariffs	0.073***	3.90	0.056***	3.10	0.042**	2.31	0.036**	1.95	0.037**	2.00
Scope of excise tax	0.098***	4.94	0.090***	4.82	0.085***	4.66	0.077***	4.13	0.075***	4.05
Excise tax/Expenditure Relationship	-0.057***	-2.62	-0.053**	-2.56	-0.049**	-2.38	-0.044**	-2.14	-0.044**	-2.13
New car purchase	0.017	0.79	0.009	0.47	0.013	0.65	0.022	1.07	0.033	1.61
Cigarettes etc. products	0.075***	4.81	0.054***	3.62	0.016	0.99	0.009	0.62	0.014	0.91
Excise tax rate-1	-0.032	-1.23	-0.023	-0.99	-0.017	-0.73	-0.010	-0.47	0.002	0.12
Institutional Factors										
Requirement of excise tax-1	-0.046**	-2.23	-0.039**	-2.04	-0.043**	-2.28	-0.029	-1.56	-0.025	-1.31
Excise tax reduction	-0.011	-0.49	-0.002	-0.12	-0.005	-0.22	-0.003	-0.17	0.008	0.38
Excise tax/Externality Relationship-1	0.032**	2.17	0.033**	2.35	0.048***	3.34	0.051***	3.52	0.053***	3.71
Other Variables Added to the Model										
Excise tax/Externality Relationship-2			0.133***	8.64	0.122***	7.95	0.121***	7.99	0.120***	7.93
Excise tax/Externality Relationship-3					0.092***	5.44	0.091***	5.51	0.089***	5.35
Requirement of excise tax-2							-0.072***	-3.93	-0.071***	-3.91
Excise tax rate-2									-0.070***	-2.72
Observations	**1,304**		**1,304**		1,304		1,304		1,304	
Prob.	0.0000		0.0000		0.0000		0.0000		0.0000	
R-squared	0.2248		0.2732		0.2913		0.3013		0.3062	

Dependent Variable: Excise tax perception.

Reference Groups: Male, Single, Teenager, Official, High income.

Significance Levels: * 0.05 < p < 0.10, ** 0.01< p < 0.05, *** p < 0.01

"Tax awareness-1", "Tax awareness-2", and "Excise tax awareness-1". On the other hand, no significant difference was found in "Excise tax awareness-2". Accordingly, those who see paying taxes as a civic duty and those who see taxes as the equivalent of public expenditures made by the government have a favorable view of excise tax compared to other individuals. These findings show that individuals with high tax awareness have a positive excise tax perception. In addition, those who closely follow excise tax changes have a positive excise tax perception compared to other individuals.

Economic Factors

Survey statements used as economic factors in regression analyzes are as follows:

1. The goods on which excise tax is taken should be updated every year (Update in excise tax tariffs, Mean: 3.55).

2. Excise tax must be taken from the household appliance (refrigerator, washing machine, Etc.) (Scope of excise tax, Mean: 2.01).

3. Excise tax directly affects my expenses. (Excise tax/ Expenditure relationship, Mean: 3.84).

4. Excise tax, taken from motor vehicles, prevents me from buying a new car (New car purchase, Mean: 3.91).

5. Excise tax should be taken from addictive products such as cigarettes (Cigarettes Etc. products, Mean: 3.75).

6. The excise tax charged on petroleum and petroleum products is high (Excise tax rate-1, Mean: 4.25).

7. Excise tax rates and amounts are high (Excise tax rate-2, Mean: 4.18).

According to the results, excise tax perception, from economic factors is "Update in excise tax tariffs," "Scope of excise tax," "Excise tax/Expenditure relationship," "Cigarettes, Etc. products", and "Excise tax rate-2" also differ significantly. Apart from these, no significant differences were found in "New car purchase" and "Excise tax rate-1".

1% in the first two models and a 5% significance level in the last three models, the perception of excise tax of those who think that goods subject to excise tax should be updated every year is favorable compared to those who do not care about it. The excise tax perception of those who think that excise tax should be taken from white goods is statistically positive at the 1% significance level compared to those who do not. The perception of excise tax by those who think it directly affects their spending is more negative at 5% significance than those not in this opinion. In the first two models, the perception of excise tax of those who think that excise tax should be taken from addictive products such as cigarettes is more positive at the 1% significance level than those not in this idea. The excise tax perception of those who believe that excise tax rates and amounts are high in Turkey differs negatively at the 1% significance level.

Institutional Factors

The following survey statements were used as an institutional factor in the regression analyzes:

1. The scope of goods and services subject to excise tax should be narrowed (Requirement of excise tax-1, Mean: 3.77).

2. The excise tax application in Turkey should be ended (Requirement of excise tax-2, Mean: 3.27).

3. Excise tax received from goods harmful to human health is high (Excise tax/Externality relationship-1, Mean: 2.94).

4. Excise tax rates taken from goods harmful to human health should be increased (Excise tax/ Externality relationship-2, Mean: 3.51).

5. Excise tax taken from goods harmful to human health is the cost of health expenses made to individuals using them (Excise tax/Externality relationship-3, Mean: 2.62).

6. Excise tax reductions are required (Excise tax reduction, Mean: 4.14).

According to the regression analysis results, excise tax perception, from institutional factors is "Requirement of excise tax-1", "Requirement of excise tax-2", "Excise tax/Externality relationship-1", "Excise tax/Externality relationship-2", and "Excise tax/Externality relationship-3" also differ significantly. On the other hand, no significant difference was found in the "Excise tax reduction."

In the first three models with a 5% significance level, the perception of excise tax by those who think that the scope of goods subject to excise tax should be narrowed is negative compared to those who disagree with this view. Statistically, at the 1% significance level, those who think that excise tax should be stopped in Turkey have a negative view of excise tax.

The perception of excise tax from those who think that excise tax from goods harmful to human health is high and should be increased further is more positive at the 1% significance level than those not in this idea. Supporting this finding, the perception of excise tax for those who think that excise tax taken from goods harmful to human health is the price of health expenses made to individuals who use them is also positive at a 1% significance level. In this case, the H_0 hypothesis is rejected, and the H1 hypothesis is accepted. That is, individuals perceive the excise tax as an externality tax.

CONCLUSIONS

The survey throughout Turkey measured society's attitude, behavior, and perception toward excise tax. According to the results, participants generally stated that excise tax tariffs applied in Turkey are high, and the scope of excise tax should be narrowed. The participants think that the purpose of the excise tax is to provide

revenue to the government. The rate of participation in the survey statements stating that the excise tax rates taken from goods harmful to human health should be increased and that the excise tax prevents the purchase of a new car is noticeably high.

According to the regression analysis results, the excise tax perception differs significantly among demographic factors only in income, smoking frequency, and the frequency of consuming carbonated beverages. According to this, while individuals in the high-income group have a negative excise tax perception, individuals who consume harmful products such as cigarettes and carbonated beverages more frequently have a positive tax perception. No significant difference was found in other demographic variables.

The tax perception of individuals with high excise tax awareness is more positive than others. Those who expect an update in their excise tax tariffs every year have a more positive view of excise tax. On the other hand, those who think that the excise tax directly affects their expenditures have a negative view of it in general. Those who think that the excise tax application in Turkey should be ended or the scope of the goods subject to excise tax should be narrowed have higher negative perceptions about excise tax.

One reason for applying the excise tax is to reduce the consumption of goods harmful to health and the environment. According to the regression analysis results, the attitudes of those who think that the excise tax taken from harmful goods is high and that it should be increased even more have a positive attitude towards excise tax. The findings obtained from the study, which are limited to the perceptions, attitudes, and behaviors of individuals towards the excise tax in Turkey, support that the excise tax is an externality tax. This result indicates that there may be a relationship between excise tax revenues and the consumption of harmful goods to health or the environment. From this point of view, this study guides future studies to test whether the excise tax is an externality tax with various time series.

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APPENDICES

Table A.1. Frequency Distributions of Demographic Variables

Variables		Frequency	Percent
Gender	Female	510	39.1
	Male	794	60.9
Marital Status	Married	715	54.8
	Single	589	45.2
Age	18-35	930	71.3
	36-50	313	24.0
	51 and above	61	4.7
Education	Not graduated	24	1.8
	Primary education	78	6.0
	High school	182	14.0
	Associate	159	12.2
	Bachelor	674	51.7
	Master/Doctorate	187	14.3
Income	0-2.000 ₺	472	36.2
	2.001-4.000 ₺	404	31.0
	4.001-6.500 ₺	343	26.3
	6.501-10.000 ₺	63	4.8
	10.001 ₺ and above	22	1.7
Region of residence	Mediterranean	214	16.4
	Aegean	401	30.8
	Marmara	241	18.5
	Black Sea	68	5.2
	Central Anatolia	255	19.6
	East Anatolia	81	6.2
	Southeast Anatolia	44	3.4
Profession	Housewife	86	6.6
	Student	292	22.4
	Retired	32	2.5
	Self-employed	108	8.3
	Worker	178	13.7
	Tradesman	65	5.0
	Official	541	41.5
	Farmer	2	0.2
Motor vehicle ownership	Yes	647	49.6
	No	657	50.4
New car purchase	Yes	242	18.6
	No	1062	81.4

Table A.2. Frequency Distributions of Harmful Product Consumption

Variables	Smoking		Carbonated beverage consumption		Alcoholic beverage consumption	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Never	707	54.2	107	8.2	860	66.0
Rarely	139	10.7	568	43.6	204	15.6
Sometimes	110	8.4	464	35.6	176	13.5
Usually	170	13.0	130	10.0	50	3.8
Always	178	13.7	35	2.7	14	1.1