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RESEARCH ARTICLE

The Effect of Organizational Identification on Green Organizational Behavior

Neriman Çelik[1], **Ali Erbaşı**[2]

Abstract
There is a great deal of academic research that shows employees identified with their organization display behavior in favor of the organization. The subject of this research is based on the assumption that employees identified with the organization they work for will have more green organizational behavior. Simple random sampling method was used in the research. 250 administrative staff willing to participate in the survey from 250 different businesses working in Konya Organized Industrial Zone 1 constituted the sample of the research. The survey technique was used as the data collection technique and data were collected by face-to-face interview method. The total of 250 questionnaires was analyzed through the SPSS 21.0 program. According to descriptive statistics, it was determined that the organizational identification levels of the participants were at a medium level whereas they had a high level of green organizational behavior. In order to evaluate the main hypothesis of the research, regression analysis was performed, and as a result, it was determined that organizational identification significantly predicted green organizational behavior, and organizational identification had a positive and significant effect on green organizational behavior. Accordingly, as the organizational identification level of the employees increases, the green organizational behavior also increases.

Keywords

Identity, Organizational Identification, Ecological Sustainability, Green Organizational Behavior

Introduction

It is generally accepted that employees can behave in favor of the organization they work for when the ties with his/her organization increase. In this context, there are various academic studies that reveal statistical relations between organizational behavior issues as well as the level of organizational identification of an employee with organizational change (Drzensky and Dick, 2009), employee motivation (Miao, et al., 2019), knowledge sharing behavior (Subba, 2019), personal factors (Sökmen & Bıyık, 2016; Hall, et al., 1970), organizational commitment (Ghannam & Taamneh, 2017; Chen, et al., 2015), job satisfaction (Başar & Basım, 2015), psychological contract (Tatachari, 2014), organizational justice and trust (Chen, et al., 2015), psychological capital (Erdem, et al., 2015), and organizational so-

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cialization and solidarity (Erbaşı, et al., 2015). However, there is no study existing in the literature examining the effect of identification of employees with their organization on their green-oriented behavior within the organization. In this context, based on the assumption that employees identified with their organization will engage in more green organizational behavior, the purpose of this study is to reveal which green organizational behaviors (environmental sensitivity, environmental participation, economic sensitivity, green purchasing, technological sensitivity) that the employees identified with their organization present more. Accordingly, the aim is to examine the effect of organizational identification on green organizational behavior.

For this purpose, answers to the following questions are sought: employee's levels of organizational identification and green organizational behavior, which green organizational behaviors they display more in the organization, effect of organizational identification on green organizational behavior, and on which dimensions of green organizational behavior organizational identification has a statistically significant effect. In this context, a framework on organizational identification and green organizational behavior concepts is presented, the methodology used in the study is explained, the findings are included, and the results are evaluated.

Conceptual Framework

Organizational Identification

When looking at the related literature, it can be seen that while organizational identification theory is explained, the concept is handled together with the theories of identity and social identity (for example Albert & Whetten, 1985; Ashforth & Mael, 1989; Mael & Ashforth, 1992; Mael & Tetrick, 1992; Dutton, et al., 1994; Scott, et al., 1998; Foreman & Whetten, 2002; Ashforth, et al., 2008). Identity is a label affixed to the subject to emphasize the subject, qualify it, determine its rights and obligations, place the subject in time and place, and show where it belongs. While identity emphasizes the individual's ability to be a subject, it also includes individual and social relationships (Özdemir, 2001: 108-116). Social identity, on the other hand, is based on the knowledge of the individual's self-perception on membership of a social group or groups and it is part of the self-perception resulting from the value and emotional significance he/she attributes to this membership (Tajfel, 1982: 24).

Given the background, identification represents an extreme model that allows the individual to define his/her own identity in relation to the characteristics he/she perceives from social groups (Sammarra & Biggiero, 2001: 64). Both the concepts of identity and identification encompass the effort of strategy determination for individuals, groups and organizations, organizational development initiatives, group building activities and socialization efforts. In

other words, identity and identification form the basis of the concepts of organizational group and organizational behavior (Alberth, et al., 2000: 13-14). On the other hand, it is also stated that organizational identification theory is a specific form of social identity theory. Because an individual's organization gives the answer to individual's question of "Who am I?". Social identity theory both increases conceptual consistency regarding organizational identification and proposes efficient practices for organizational behavior (Asforth & Mael, 1989: 20-22). Identification emerges as a cognitive perception as a result of the individual's self-identification with a group psychologically (Mael & Tetrick, 1992: 813-817). In other words, identification is expressed as the psychological state in which the individual perceives himself/herself as part of the whole (Rousseau, 1998: 217-221).

In the related literature, organizational identification is accepted as a process in which the targets of the organization and individuals gradually become integrated or compatible (Hall, et al., 1970: 177). With this positive effect created by identification, it is stated that individuals' creative abilities improve and they strive to work more (He & Brown, 2013: 2-16). Organizational identification is a change in the behavior of the individual while in the process of self-definition, individual becomes influenced by the environment as a result of making a classification according to this environment (Foote, 1951: 21). It is observed that individuals with strong organizational identification level focus on tasks that benefit the whole organization rather than self-related issues, and make additional efforts contributing to the organization and colleagues (Dutton, et al., 1994: 242-255). Especially, the positive effects of identification on organizations create a long list on many different topics such as cooperation, performance, intrinsic motivation, job satisfaction, coordinated work, helping reduce work stress, exhibiting organizational citizenship behaviors, making decisions that will benefit the organization, and sharing information (Ashforth, et al., 2008: 335-336). Therefore, organizational identification is the strength of the bond between the organization and the individual. In this sense, it represents a passion in which the individual feels responsible for the success and failures of the organization as a result of the belongingness of the individual. Therefore, the organizational identification of individuals directly affects their positive outcomes and has a significant role in presenting their contributions to the organization at the highest level.

Green Organizational Behavior

The concept of ecology, which was introduced to the literature for the first time in the late 1960s but has become more and more important today, has become the focus of attention in plenty of research nowadays. From this angle, not only academic literature, but also governments, commercial associations, financial institutions, suppliers, partners, NGOs, and all other units are closely interested in the concept of ecology. Ecology consists of environmental management includes minimizing waste, preventing pollution, product management, total quality management, eco-efficiency, industrial ecology, and development of environ-

mental strategists. However, environmental protection is a combination of many cultural frameworks, although it has traditionally been conformed to legislation and social responsibility, it is now framed in various forms. The organizational level form of this framing includes the components of culture, structure, and practice (Hoffman, 2001: 18-24). As we move further into the twenty first century, we are confronted with a new disease that affects a large patient. This disease is climate change. The global challenges and consequences posed by climate change are becoming increasingly apparent. The patient is planet Earth, and the infectious agent is humankind. Although organizations are considered significant contributors to climate change, they also have the potential to positively affect it through their employees. Understanding how employees' pro-environmental initiatives can positively affect climate change has increasingly become the focus of inquiry among organizational researchers (Robertson & Barling, 2015: 3). In addition, climate change is a human made problem, and there are many reasons, such as greenhouse gas emissions. Therefore, governments are in search of a number of solutions, but organizations have a lot of work to do. They should make it possible to be sensitive to their environment and to exhibit appropriate intra-organizational behaviors.

After the technological advances in the industrial revolution, the emergence of the information age, globalization, and the new type of businesses, organizations adopted a view that environmental, social, and economic sustainability are interconnected. Especially today, organizations are implementing environmental initiatives such as environmental management systems, green purchasing, eco-design, recycling, and energy saving with increasing speed (Graves, et al., 2013: 81). The roles and actions of individuals are the basis of the research to evaluate how organizations affect the natural environment (Andersson & Bateman, 2000: 548).

In the related literature, environmentally friendly behaviors that employees exhibit within the organization are defined as green organizational behavior (Erbaşı & Özalp, 2016: 298). These pro-environmental attitudes, which can be expressed as the employees› tendency to be concerned about the environment, emerge as environmentally friendly tendencies in the daily behaviors of the employee in the workplace. This perspective is also consistent with Planned Behavior Theory which suggests that attitudes are effective on behavior (Olson, et al., 2013: 160). Within this frame of reference, the most important problem in the literature regarding green organizational behavior is which employee behaviors will be accepted as green organizational behavior. In this setting, it is possible to evaluate the green-oriented behavior of employees within the organization in 5 dimensions, which are environmental sensitivity, environmental participation, economic sensitivity, green purchasing, and technological sensitivity. We can define these dimensions of green organizational behavior as follows (Erbaşı, 2019: 15):

Environmental Sensitivity: It refers to the tendency of employees to carry out environmentally friendly behaviors they perform in daily life in their workplaces. **Environmental**

Participation: Represents the organization's participation in environmentally friendly practices and rules. **Economic Sensitivity:** It is the employee's environmentally friendly behavior within the organization with economic motives. **Green Purchasing:** Environmentally friendly procurement behaviors in the workplace. **Technological Sensitivity:** To exhibit environmentally friendly behaviors in the use of technological equipment in the workplace.

It is essential to obtain the participation of members in the organization for any kind of sustainable initiatives (Wiernik, et al., 2016: 1-2). The subject of this study is the impact of organizational identification on the behavior of green workers (Ciocirlan, 2017: 52-55), who are motivated by a sincere desire to improve the environment, not by the pressure of managers or other factors. In this context, the H_1 hypothesis below was developed in the research.

H$_1$ Organizational identification has an impact on green organizational behavior.

Within the framework of this main hypothesis, 5 sub-hypotheses have been developed to see the effect of organizational identification on the 5 sub-dimensions of green organizational behavior (environmental sensitivity, environmental participation, economic sensitivity, green purchasing, and technological sensitivity).

H$_{1a}$ Organizational identification has an impact on the environmental sensitivity dimension of green organizational behavior.

H$_{1b}$ Organizational identification has an impact on the environmental participation dimension of green organizational behavior.

H$_{1c}$ Organizational identification has an impact on the economic sensitivity dimension of green organizational behavior.

H$_{1d}$ Organizational identification has an impact on the green purchasing dimension of green organizational behavior.

H$_{1e}$ Organizational identification has an impact on the technological sensitivity dimension of green organizational behavior.

The research model developed within the scope of the hypotheses described above is shown in Figure 1.

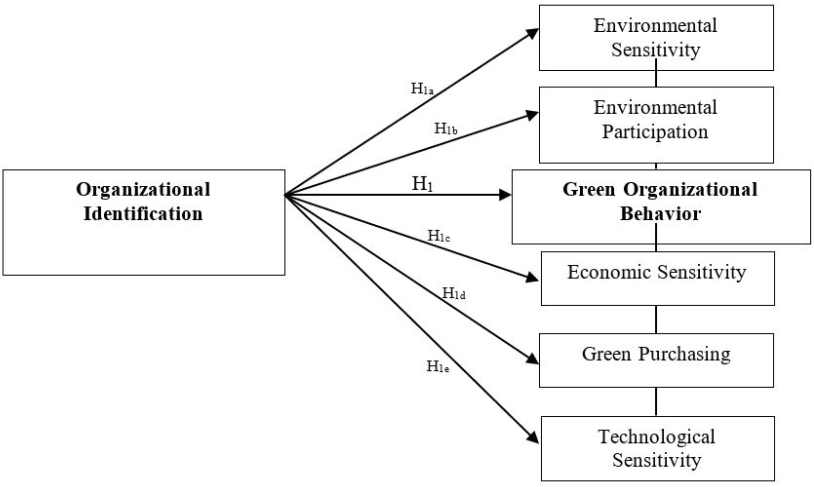

Figure 1. Model of the study

Methodology

Purpose and the Importance of the Research

The purpose of this study is to examine which green organizational behaviors employees who are presented mostly by employees who are identified with their organization and the impact of organizational identification on green organizational behavior consequently. The green organizational behaviors are; environmental sensitivity, environmental participation, economic sensitivity, green purchasing, and technological sensitivity. Research questions developed to achieve this goal are:

- What are the organizational identification levels of administrative employees?
- What are the green organizational behavior levels of administrative employees?
- Which green organizational behaviors do administrative employees show more in the organization?
- What is the impact of organizational identification on green organizational behavior?
- Which types of green organizational behavior get affected by the organizational identification?

Much academic research shows that employees identified with their organization display behavior in favor of the organization (Miao, et al., 2019; Ghannam & Taamneh, 2017; Başar & Basım, 2015; Chen, et al., 2015; Erbaşı, et al., 2015; Erdem, et al., 2015; Drzensky & Dick, 2009; Dutton, et al., 1994; Tüzün, 2006). However, this research did not examine the impact of identification with the organization on the employees' green-oriented behavior within the organization. Accordingly, this research can bring great and important contributions to the literature in terms of being the first research to examine the effect of organizational identification on green organizational behavior.

The Universe and Sample of the Research

The universe of this research is the administrative staff in the businesses operating in Konya Organized Industrial Zone 1. There are 473 businesses and an estimated total of 30,000 employees in Konya Organized Industrial Zone 1. 18% of these businesses operate in automotive, 11% in machinery, 9% in casting, and 62% in other sectors. The reason why administrative personnel are chosen as the universe of the research is the expectation that they may behave green in their workplaces due to their long working hours in the offices. In the research, simple random sampling method was used, and 250 employees willing to participate in the survey working in Konya Organized Industrial Zone 1 constituted the sample of the research. In the research, only one participant from each firm was surveyed. In this context, 250 administrative staff from 250 different companies were included in the sample. Findings regarding the demographic characteristics of the participants are presented in Table 1.

Table 1
Demographic Characteristics of the Participants (n = 250)

Demographic Characteristics		**n**	**%**
Gender	Woman	164	65,6
	Man	86	34,4
Marital Status	Married	113	45,2
	Single	137	54,8
Age	18-25 age	35	14,0
	26-29 age	77	30,8
	30-35 age	73	29,2
	36-40 age	57	22,8
	41-65 age	8	3,2
Education	Primary /secondary school	5	2,0
	High school	68	27,2
	Associate degree	87	34,8
	Bachelor	83	33,2
	Master	7	2,8

Demographic Characteristics		n	%
Job Duration	Less than 1 year	30	12,0
	1-5 years	46	18,4
	6-10 years	83	33,2
	11-15 years	68	27,2
	16 years and above	23	9,2
Total		250	100,00

According to the findings from Table 1, it was determined that 65,6% participants were female, and 34,4% were male; 45,2% are married, and 54,8% are single; 44,8% can be defined as young; 70,8% are university graduates; 69,6% have more than 6 years of professional experience.

Data Collection

In the research, the data were collected by using the survey method, and all the surveys were evaluated. Additionally, a questionnaire form consisting of three parts was designed in the research. In the first part of the survey, a scale was used to measure the organizational identification levels of the employees. This scale has 6 items developed by Mael & Ashforth (1992), and is one of the most frequently used scales in empirical research for the determination of organizational identification (Jones & Volpe, 2010: 6). The "Organizational Identification Scale" adapted to Turkish by Tüzün (2006) is one-dimensional, and the reliability value of the scale is ,78 (Tüzün, 2006: 113-133). The scale was evaluated in a five-point Likert type (5= I strongly agree, 4= I agree, 3= Neither agree nor disagree, 2= I disagree, 1= I strongly disagree).

The second variable of the research is green organizational behavior. Accordingly, the "Green Organizational Behavior Scale" developed by Erbaşı (2019) was used in the second part of the questionnaire. The green organizational behavior scale consists of five dimensions and 27 items. While the reliability value of the whole scale is ,818; the reliability of subdimensions of green organization behavior as follows: environmental sensitivity dimension ,813, environmental participation dimension ,766, economic sensitivity dimension ,710, green purchasing dimension ,724, and technological sensitivity dimension ,701 (Erbaşı, 2019: 15). The scale was evaluated in five-point Likert type (5= Always, 4= Often, 3= Occasional, 2= Rarely, 1= Never).

In the third part of the questionnaire, there were 5 items examining some demographic characteristics of the participants. These are variables such as gender, age, marital status, educational status, and job duration.

Before the implementation of the scale used in the research, a pilot study was conducted.

In that setting, questionnaires were applied to 30 administrative staff in 30 different businesses. Within the scope of the findings obtained through the face-to-face interview method, it was seen that all the statements in the survey were understandable. Accordingly, no changes were made in the questionnaire form. Ethics Comittee Permission Document dated 09.03.2020 and numbered E.25739 was obtained from the Selcuk University Social Sciences Ethich Comission for the research.

Data Analysis

At the data analysis stage, the questionnaires were reviewed first. As a result, it was seen that all the questionnaires were suitable for inclusion in the analysis, and therefore all 250 questionnaires were included in the analysis. SPSS 21.0 program was used to analyze the data obtained from the questionnaires. In the study, central tendency measures were used to classify the demographic characteristics of the participants, and frequency and percentage distributions were examined in this context. Basic statistics were used to determine the organizational identification level and green organizational behavior level of employees, and in this setting, average and standard deviation values were examined. Correlation analysis was conducted in order to test the relationship between employees' green organizational behavior and sub-dimensions and organizational identification levels. Regression analysis was performed to examine the effect of organizational identification on green organizational behavior, and a One-way Manova test was conducted to explain the effect on sub-dimensions.

Validity and Reliability Tests of Scales

In order to test the validity of the scales, explanatory factor analysis was applied to the two scales. Kaiser-Meyer-Olkin (KMO) and Barlett test values of both scales are shown in Table 2. Accordingly, the KMO test value of the organizational identification scale was determined as 0,888 and the Barlett test value as $\chi 2$= 1261,768, df = 15, p = 0.000. These values revealed that both scales used in the research are suitable for factor analysis.

Table 2
KMO and Barlett Test Values of the Scales

Scale	KMO	Bartlett Test		
		Chi Square	df	p
Organizational Identification Scale	,885	1261,768	15	,000
Green Organizational Behavior Scale	,901	4158,951	351	,000

Factor analysis findings of the organizational identification scale used in the research are presented in Table 3. According to the factor analysis values obtained, the items of organizational identification scale have one dimension as in the original scale. The variance explanation rate of the scale was determined to be 75,117%.

Table 3
Factor Analysis of Organizational Identification Scale

Organizational Identification Scale	Factor Loads
When someone criticizes my workplace, it feels like a personal insult.	,810
I am very interested in what others think about my workplace.	,882
When I talk about my workplace, I usually say ‘‘we’’ rather than ‘‘they.’’	,891
My workplace’s successes are my successes.	,877
When someone praises my workplace, it feels like a personal compliment.	,889
If a story in the media criticized my workplace, I would feel embarrassed.	,849

Disclosed Total Variance Rate: %75,117 Method: Principal Components Analysis Rotation Method: Varimax Rotation

Factor analysis findings of the green organizational behavior scale used in the study are presented in Table 4. According to the factor analysis values obtained, the green organizational behavior scale items were collected in five sub-dimensions, as in the original scale. The variance explanation rate of the scale was determined to be 66,336%.

Table 4
Factor Analysis Findings of Green Organizational Behavior Scale

Green Organizational Behavior Scale **In the workplace;**	**Environmental Sensitivity**	**Environmental Participation**	**Economic Sensitivity**	**Green Purchasing**	**Technological Sensitivity**
When I see faulty taps, toilet flush, bulbs etc. I can try to fix or forward it to the specialist.	,572				
I dispose of non-recyclable materials (such as garbage) in the waste bins.	,724				
If I need to take a small note, I prefer small or draft papers rather than large paper.	,615				
When I see unnecessary light is on, I immediately turn it off.	,678				
I throw the recyclable materials (such as paper, glass, metal, plastic, bottle, battery) into the recycle bin, or put them aside for future use.	,653				
I don’t throw draft papers; use them somehow (for taking notes, doing activities etc.).	,717				
I pay attention to consume electricity efficiency.	,770				
I pay attention to consume water efficiency.	,745				
I give advice to managers or business owners about environmentally friendly practices.		,734			
I prefer to work in environmentally friendly workplaces.		,731			
I perform organizational communication electronically (For example, sending data via email instead of printing on paper, using social media tools).		,678			

Green Organizational Behavior Scale **In the workplace;**	**Environmental Sensitivity**	**Environmental Participation**	**Economic Sensitivity**	**Green Purchasing**	**Technological Sensitivity**
I encourage my colleagues to engage in environmentally friendly behavior.		,807			
I immediately warn if I see a person who exhibits non-environmentally friendly behavior.		,769			
I comply with environmental rules (such as not smoking)		,553			
I participate in environmentally friendly activities (eg. planting trees, watering plants).		,548			
Whenever I print or copy in the workplace, I use double side of the paper if possible.			,718		
I pay attention not to open the windows when heating system is working.			,695		
I do not consume water with a plastic bottle, I use a water dispenser or a water flask.			,601		
When I go to work, I use public transport / shuttle bus / bicycles, or I walk or I come and go by a single vehicle with my colleagues sitting nearby.			,612		
I use daylight during working hours.			,581		
I direct customers to environmentally friendly products and environmentally friendly behavior.				,526	
I pay attention to the expiration date in consumer products used.				,765	
I prefer environmentally friendly products in the selection of office supplies.				,771	
I prefer products that can be used continuously (glass cups, cloth towels, etc.), instead of disposable products (paper cups, paper towels, plastic cutlery, etc.).				,814	
I do not use printers, faxes, etc. unless mandatory.					,638
I prefer rechargeable batteries for the office materials that require battery use.					,566
When I do not use technological devices (such as a computer), I put them into power saving / sleep mode, turn them off or unplug them.					,529
Eigenvalues	9,356	3,290	2,789	1,432	1,045
Total Variance Explained	34,652	12,184	10,328	5,303	3,869

Disclosed Total Variance Rate: %66,336 Method: Principal Components Analysis Rotation Method: Varimax Rotation

Correlation findings and Cronbach Alpha values of the scales used in the study are given in Table 5. The reliability coefficients obtained indicate that the internal consistency of the scales is sufficient.

According to the Pearson correlation analysis findings in Table 5, a statistically significant and positive relationship was determined between the organizational identification level

of the employees and their green organizational behavior (r= 0,510; p= 0.000). In addition, results also show that organizational identification has a statistically significant and positive relation with the sub-dimensions (environmental sensitivity (r= 0,364; p= 0.000), environmental participation (r= 0,415; p= 0.000), economic sensitivity (r= 0,372; p= 0.000), green purchasing (r= 0,385; p= 0.000), and technological sensitivity (r= 0,416; p= 0.000)) of green organizational behavior.

Table 5
Correlation Matrix and Cronbach Alpha Values

	1	2	3	4	5	6	Cronbach Alpha
1- Organizational Identification	1						,933
2- Green Organizational Behavior	,510**	1					,924
3- Environmental Sensitivity	,364**	,562**	1				,872
4- Environmental Participation	,415**	,755**	,428**	1			,885
5- Economic Sensitivity	,372**	,744**	,383**	,462**	1		,797
6- Green Purchasing	,385**	,836**	,295**	,495**	,545**	1	,864
7- Technological Sensitivity	,416**	,770**	,363**	,363**	,558**	,643**	,722

**. Correlation is significant at the 0.01 level (2-tailed).

When the Cronbach Alpha values in Table 5 are examined, it is seen that the internal consistency coefficient for the organizational identification scale used in the research is ,933, and the internal consistency coefficient for the green organizational behavior scale is ,924. Accordingly, both scales were found to have a high level of reliability. When the sub-dimensions of green organizational behavior are analyzed, it can be seen that environmental sensitivity dimension ,872, environmental participation dimension ,885, economic sensitivity dimension ,797, green purchasing dimension ,864, and technological sensitivity dimension have ,722 Cronbach alpha values.

Findings

Descriptive statistics of the variables used in our study are shown in Table 6. Accordingly, it was determined that the organizational identification levels of the participants were at a medium level, and they had a high level of green organizational behavior. When the average values of the sub-dimensions of green organizational behavior are looked at, the results show that they had a high level of environmental sensitivity, economic sensitivity, and technological sensitivity behaviors while they had moderate green purchasing and environmental participation behaviors.

Table 6
Descriptive Statistics

Variable (n= 250)	Mean	Standard deviation	Min.	Max.
1- Organizational Identification	3,5140	1,14369	1,00	5,00
2- Green Organizational Behavior	3,8617	,71500	1,00	5,00
3- Environmental Sensitivity	4,3071	,66432	1,00	5,00
4- Environmental Participation	3,4693	1,05883	1,00	5,00
5- Economic Sensitivity	4,0472	,82541	1,00	5,00
6- Green Purchasing	3,5020	1,13740	1,00	5,00
7- Technological Sensitivity	3,9827	,94666	1,00	5,00

In this study, regression analysis was performed in order to obtain the effect of organizational identification on green organizational behavior. In the analysis, while green organizational behavior was taken as the dependent variable, organizational identification was taken as the independent variable. The findings obtained are shown in Table 7.

Table 7
Regression Findings Related to the Effect of Organizational Identification on Green Organizational Behavior

Dependent variable	R^2	Independent variable	B	Std. Error	t	p	F
Green Organizational Behavior	0,315	Organizational Identification	,561	,033	10,668	,000	113,802

When the findings shown in Table 7 are analyzed, it was observed that the linear combination of organizational identification level significantly predicted green organizational behavior (R^2= 0,315, $p<0.05$). According to the results obtained, the independent variable explains 31,5% of the change in the dependent variable. Accordingly, it is understood that the organizational identification level of employees explains the variance of green organizational behavior by 31,5%. If the relationship between the variables is formulated; F(1,40039)= 113,802; $p <0.01$ equation can be created.

In our study, one-way Manova test was performed to see the effect of organizational identification on the sub-dimensions of green organizational behavior. Because one-way Manova test can be used in examining the effect of an independent variable on more than one dependent variable. In the analysis, organizational identification as an independent variable and sub-dimensions of green organizational behavior as the dependent variable were taken. Firstly, the data have been examined for the suitability for one-way Manova test. In this setting, it has been determined that the data show normal distribution, there is a reasonable linear relationship between dependent variables, there is a significant difference between the covariances of dependent variables, and error variances of dependent variables are homogeneous. As a result, it was found that all conditions required for the reliability of one-way Manova test were met, and therefore the test results were evaluated (Can, 2014: 192-193). The findings are presented in Table 8.

Table 8
One-Way Manova Test Findings Related to the Effect of Organizational Identification on Dimensions of Green Organizational Behavior

Independent variable	Dependent Variables	Sum Squares	df	Mean Square	F	p	R^2
Organizational Identification	Environmental Sensitivity	26,448	24	1,102	2,971	,000	,241
	Environmental Participation	80,964	24	3,373	3,830	,000	,290
	Economic Sensitivity	43,281	24	1,803	3,211	,000	,255
	Green Purchasing	75,099	24	3,129	2,850	,000	,233
	Technological Sensitivity	68,093	24	2,837	4,117	,000	,305

According to the one-way Manova analysis results for each factor shown in Table 8, the effect of organizational identification on all sub-dimensions of green organizational behavior was statistically significant (p = 0.05). Accordingly, the effect of organizational identification on the environmental sensitivity (F= 2,971, p <0.05), environmental participation (F= 3,830, p<0.05) economic sensitivity (F= 3,211, p <0.05), green purchasing (F= 2,850, p <0.05), and technological sensitivity (F= 4,117, p <0.05) dimensions was statistically significant. When the impact values in the table are analyzed, it is seen that the organizational identification levels of employees affect the technological sensitivity at a highest rate within the green organizational behavior dimensions (R^2= 0,305). In addition, it was concluded that the level of organizational identification has moderately affected the dimensions of environmental participation (R^2= 0,290), economic sensitivity (R^2= 0,255), environmental sensitivity (R^2= 0,2241), and green purchasing (R^2= 0,233).

Evaluation and Conclusion

The purpose of this study is to examine which green organizational behaviors (environmental sensitivity, environmental participation, economic sensitivity, green purchasing, and technological sensitivity) are exhibited by employees who are identified with their organization and the impact of organizational identification on green organizational behavior. For this purpose, decision made on the appropriate universe should be formed from administrative staff that spends a lot of time in the organization. Due to time and cost constraints, geographical limitation has been made and scales applied to the administrative staff in the businesses operating in Konya Organized Industrial Zone 1. Simple random sampling method was used in the study, and 250 administrative staff working in Konya Organized Industrial Zone 1 and willing to participate in the survey constituted the sample of the research (n= 250). Each of these 250 participants works in different businesses, and 250 businesses have been reached within this scope. Questionnaires were collected through face-to-face interview method. The data obtained from the surveys were firstly subjected to validity and reliability analyzes. The findings obtained showed that both scales used in the research were sufficiently valid and reliable.

It was determined that the organizational identification levels of the participants were at a medium level, and they had a high level of green organizational behavior. While they presented high level of environmental sensitivity, economic sensitivity and technological sensitivity behaviors; they presented moderate green purchasing and environmental participation behaviors. It was determined that the highest average on green organizational behavior dimension was environmental sensitivity, followed by economic sensitivity, technological sensitivity, green purchasing, and environmental participation respectively. It was determined that organizational identification significantly predicted green organizational behavior, and in this context, the level of organizational identification of employees explained the variance of green organizational behavior by 31,5%. Consequently, it has been determined that organizational identification has a positive and significant effect on green organizational behavior, and green organizational behavior increases as the level of organizational identification of employees increases. Based on these results, H_1 "Organizational identification has an impact on green organizational behavior." the main hypothesis was accepted.

In the study, one-way Manova test was performed to see the effect of organizational identification on the sub-dimensions of green organizational behavior. According to the results obtained, it was determined that the organizational identification levels of the employees significantly affected all the sub-dimensions of green organizational behavior. Based on these results, all sub-hypotheses of the study (H_{1a}, H_{1b}, H_{1c}, H_{1d}, H_{1e}) have been accepted. As a result of the evaluation made on the impact values, it was determined that the organizational identification levels of employees affect technological sensitivity dimension the most among the rest of the green organizational behavior dimensions, followed by environmental participation, economic sensitivity, environmental sensitivity, and green purchasing dimensions, respectively.

Since there is no study existing in the literature investigating the effect of organizational identification on green organizational behavior, no comparison was made with the findings of the previous research. However, it is expected that this research will provide significant contributions to the literature since it is the first study to examine the effect of organizational identification on the green organizational behavior of employees. The results obtained reflect the characteristics of the Planned Behavior Theory (Ajzen, 1991), which suggests that attitudes are effective on behavior. In addition, the results obtained support that individuals who have a strong organizational identification level make additional efforts that contribute to the organization and their co-workers (Dutton, et al., 1994: 242-255) or that identification create positive effects on the organization such as performance, intrinsic motivation, and job satisfaction (Ashforth, et al., 2008: 335-336). In this context, it is recommended that managers focus on increasing the level of organizational identification in order to increase green employee behaviors in organizations.

The research also has some limitations. It is an important limitation that the research was applied only to 250 employees in 250 businesses using the simple random sampling method among the companies located in Konya Organized Industrial Zone 1. Research in larger universes and samples can make meaningful contributions in generalizing and interpreting the results obtained. In future research, the effect of organizational identification on employees' green organizational behavior can be analyzed on different universes and samples and compared with the results of this research. Again, the relationship between the concepts included in the subject of this research can be discussed more clearly with the increasing number of research on green organizational behavior, which is a new concept in organizational behavior literature.

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RESEARCH ARTICLE

Organizational Neuroscience: A Bibliometric Analysis and Systematic Literature Review

Nihan Tomris Kucun[1], Hazal Duman Alptekin[2]

Abstract
The main objective of this paper is to examine the current state of the literature on organizational neuroscience. This study provides the most comprehensive overview of the development of organizational neuroscience which includes the last 13 years. It also presents how bibliometric and systematic review methodologies can be used together to explore emergent research areas. Bibliometric and systematic review methods were used to review studies carried out in the area of organizational neuroscience from 2007 to 2020. The articles were accessed through the Web of Science (WOS) database which was analyzed by using VOSviewer and SciMAT. Initially, 44 articles were determined to explain the intellectual structure of organizational neuroscience. Then, we conducted a systematic review in Scopus, WOS, and Google Scholar databases to determine which neuroscientific methodologies were prevalent in the scope of organizational neuroscience. As a result, a total of 42 studies adopting the empirical approach were identified. Evidence shows that the majority of the studies were conducted in the US and UK. The most commonly used techniques were electroencephalography (EEG) and functional magnetic resonance (fMRI). "Leadership" and "decision-making" studies were the most researched topic connected with organizational neuroscience. Although there has been a steady increase in the number of publications on organizational neuroscience in the last 20 years, empirical studies have a narrow scope in the literature.

Keywords
Organizational Neuroscience, Neurometric Measurements, Biometric Measurements, Bibliometric Analysis, Systematic Literature Review

Introduction

Although the origin of management and organization science is as old as human history, its endorsement as an academic term and a scientific field took place in the late 1800s (Locke, 1989). Since the 1800s, management and organizational science (MOS) has tried to explain the impact of human behavior on managerial and organizational processes in line with different perspectives such as strategic management, human resources, organizational theory, and organizational behavior. If we look at these perspectives, we see that they generally focus on traditional research methods such as surveys, observations, in-depth investigations, and interviews to explain human behavior in organizational contexts. Although traditional research methods provide rich information about human behavior, people generally can not

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explain the main reason for their behaviors and they have a tendency to hide their feelings and thoughts (Hubert and Kenning, 2008). Moreover, individuals who take part in the research process tend to respond with incorrect information in order to gain social acceptance (Lee and Chamberlain, 2007; Hubert and Kenning, 2008). All these problems, which are constraints of traditional research methods, are causes of inadequate or inconsistent results when explaining human behavior in an organizational context. To overcome these methodological problems, the neuroscience perspective presents new research ways to understand organizational behavior and its dynamics.

Neuroscience and its techniques are not totally new for some scientific areas such as neuromarketing, neuropsychology, and neuroeconomics (Butler and Senior, 2007). The term neuromarketing was first used in the marketing field by Smidts (2002) to explain the effect of neuroscientific tools on the relationship between the neurological response of consumers and their behavior (Lee et al., 2007). More specifically, Shahriari et al. (2020) have highlighted 311 articles between 2005 and 2017 that take part in marketing literature, focusing on the neuroscientific perspective to explain consumer behavior, decision-making process, and brand selection. Moreover, the discipline of economics also has opened its doors to neuroscience since the late 1990s (Glimcher, 2008). Neuroeconomics is used to represent the study of the economic decision-making process and reward-related behavior with neuroscientific tools (Camerer, 2007; Glimcher et al. 2009). Moreover, Srivastava et al. (2019) provided a literature review that includes the field of neuroeconomics and neurofinance and they found that there are 515 papers that include a neuroscientific perspective to explain economic behavior and decision processes. All these areas use neuroscience techniques to improve the knowledge about human behavior (Camerer, et al., 2005; Dijksterhuis, et al., 2005).

In recent years, organizational scholars have also started to pay attention to the neuroscience perspective. At this point, the inclusion of neuroscience in MOS, while pointing to a new development process compared to other science fields, has also divided the views of researchers into the positive and negative sides of organizational neuroscience. The positive side of organizational neuroscience is defined as a biologically rooted approach that gathers neuroscience and MOS together and aims to understand brain mechanisms that affect organizational behavior and managerial relationships (Becker and Cropanzano, 2010; Senior et al., 2011; Healey and Hodgkinson, 2014). On the other side, scholars indicate that there is a problem with the inclusion of neuroscience techniques into the MOS. According to this point of view, the diffusion of neuroscience techniques and viewpoints will lead to divisions in the MOS based on ethical and philosophical foundations (Gavetti et al., 2007; Lindebaum and Zundel, 2013; McLagan, 2013).

Based on all these explanations, our position is close to Healey and Hodgkinson's (2014) work which indicates that critical realism and socially situated cognition will help to improve

organizational neuroscience based on the socially embedded nature of organizational life. Yet, we also believe that if researchers do not understand the neuroscience paradigm and its methodologies, this will lead to support divisions in the field and the proliferation of ethical problems.

As organizational neuroscience is a new area, the attention of researchers is increasing day by day. To turn this attention to the improvement of organizational neuroscience, it is necessary to examine previous research on organizational neuroscience, and the intellectual framework on which they are based.

In this regard, the literature includes few reviews about organizational neuroscience. Sezgin and Uçar (2015) conducted a systematic review of studies on neuroscience in organizational behavior research between 2005-2013. Wang (2019), presented a literature review of the application of the organizational neuroscience to leadership studies. Similarly, Issac and Issac (2019) documented neuroscience applications in leadership studies and conducted a bibliometric analysis which included publication patterns of research. Recently, Prochilo et al. (2019) conducted a review of the literature from 2008 to 2015 which included only empirical studies about organizational neuroscience. Ascher et al. (2018) looked into the applications of neuroscience in strategic management through a literature review and classification of the international journal articles from 2005 to 2013. A recent systematic review, conducted by Dolaşkan and Boz (2020), examined the perspective of neuroscience in three themes which included theory and method, organizational behavior, and leadership. İmamoğlu et al. (2021), like Dolaşkan and Boz (2020) in an earlier review, argued that the importance of the neuroscience perspective provides deeper insight for organizational behavior studies. Nofal and Nicolaou (2021), provided a comprehensive literature review of the biological perspective on the entrepreneurship area.

All these reviews about organizational neuroscience have remarkably contributed to literature. However, these studies focus on particular areas such as management, leadership or organizational behavior and do not offer a comprehensive perspective. In order to fill this gap, the aim of the current study is to provide a comprehensive viewpoint of organizational neuroscience and to examine the growth of empirical research from 2007 to 2020.

Using integrated methodology, which includes bibliometric techniques (VOSviewer and SciMAT) and a systematic review overview, we examine the current status of organizational neuroscience. To the best of our knowledge, this is the first study examining the growth of the organizational neuroscience perspective through the lens of a bibliometric approach and systematic review.

In detail, the main contributions of this study include: (1) offering a comprehensive summary of knowledge on organizational neuroscience; (2) providing a systematic classification

of empirical research and techniques on organizational neuroscience; (3) presenting a useful guideline for future research on organizational neuroscience.

Methodology

Bibliometric process

This study involved three main steps, namely: database creation, bibliometirc analysis, SciMAT analysis research (Figure 1).

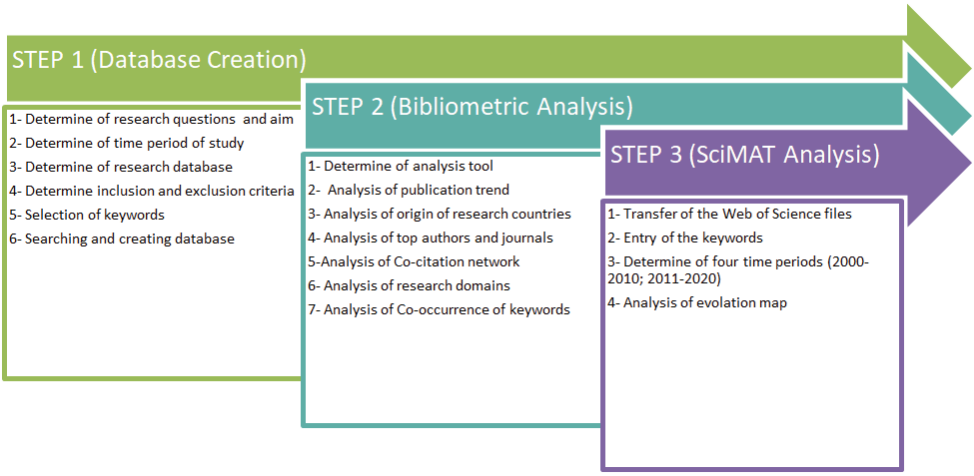

Figure 1. Main steps of research methodology (Adapted from Sharifi et al., 2020)

Figure 1 presents the main steps of the research methodology (Sharifi et al., 2021). Step 1 includes the database creation process in line with the aim of the study and research questions. As mentioned in the literature part, the main aim of this research is to examine the current state of the literature on organizational neuroscience. Moreover, this aim includes two key questions. One of them is "What are the most influential research dynamics (countries, journals, authors, growth rate) that have contributed to organizational neuroscience?" To answer this question we collected data from Web of Science. Web of Science was selected for processing of the data creation because it is a multidisciplinary search tool which provides more consistent information and citation indexing for bibliometric analysis (Van Leeuwen, 2006).

We setted on three inclusion criteria prior to the process of database creation. First, articles had to have been published between 2000 and September 2020. Second, we only included the studies that mentioned the words "organizational neuroscience" and "organizational cognitive neuroscience" in their title, keywords or abstract yielding 76 results. Third, we only included research, book chapters or review articles in English in our dataset which resulted

in 44 articles. Since no studies conducted before 2007 were found in this search, the targeted time interval was accepted as the date of the first study and the research was updated to cover the years 2007- 2020.

We used two software programs which complemented each other (VOSviewer, SciMAT) to perform the bibliometric analysis (Step 2, Step 3). There are several software programs that provide visualitation in the context of bibliometric analysis, such as CiteSpace, CitNetExplorer, HistCite, and GraphPad Prism 5. The reasons why VOSviewer software program was preferred in this study are that VOSviewer supports overlay visualizations and the analysis process works each operating system in Java context (Eck and Waltman, 2014; Bornmann and Haunschild, 2016). Based on these advantages, VOSviewer was used to visualize the review which reflected the main patterns of organizational neuroscience. Moreover, SciMAT software has been used to determine the evolution of organizational neuroscience over the past twenty-year period. The reasons for selecting SciMAT software is that it provides a longitudinal framework for discovering thematic areas (Cobo et al., 2011; Castillo-Vergara et al., 2018). The longitudinal framework helps to reveal a deeper understanding of the development and changes in the area of organizational neuroscience. To understand the evolution process and thematic subfields from 2007 to 2020, we divided this time line into two time periods which were 2007-2010 and 2011-2020 with 7 and 37 publications respectively.

Systematic review process

The second research question of our review is "What is the main focus of empirical studies on organizational neuroscience (preferred methods and main topics)?" The main aim of this question is to determine empirical growth in the scope of organizational neuroscience and provide knowledge about neuroscientific methods for future researchers. To answer this question, we conducted a systematic literature review, which was proposed by Tranfield et al. (2003) (Figure 2).

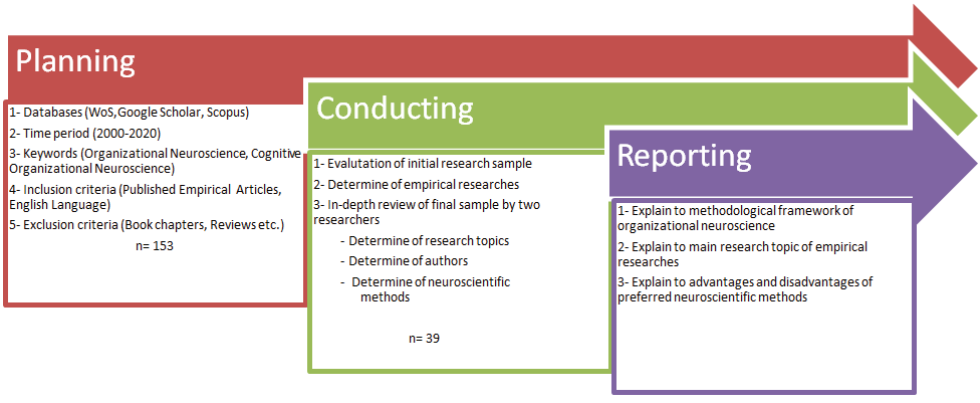

Figure 2. Main steps of systematic review process

In order to gain an understanding of the empirical development of organizational neuroscience literature, we extended our search area and conducted our review in three electronic databases (WOS, Scopus and Google Scholar). We bound our review period to the same as the bibliometric process (2007–2020). We also used the same keywords (organizational neuroscience and cognitive organizational neuroscience) in the search process. We only included studies that used organizational neuroscience techniques in their research procedure. Briefly, studies which consider the ethical aspect of organizational neuroscience, or the reviews and book chapters about organizational neuroscience research and its techniques were excluded and only empirical studies were included in the main analysis. This led us to the identification of 42 articles which were empirical studies about organizational neuroscience.

Results and Discussion

Research Interest, Publication, and Growth

A sum of 44 articles, which were found in Web of Science databases, published in the past 20 years up until the end of September 2020, covering the organizational neuroscience domain were included in our data set. Figure 3 displays the frequency of organizational neuroscience papers on a yearly basis between 2007 to 2020. Between 2013-2015 a massive increase occurs in the number of published articles. In 2015, a peak in the number of published articles occurs with 8 papers in a year. It is seen that there is a relatively decreasing trend after 2015. This decrease may be due to the increase of empirical studies in the field and the long research processes required by these kinds of research. Yet, it is thought that the sharp decline in 2020 is due both to the fact that the year has not yet ended and there are relatively long manuscript acceptance periods, especially for empirical studies.

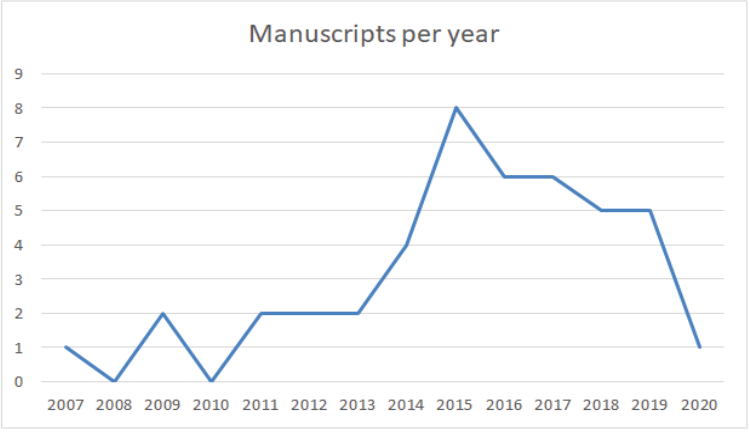

Figure 3. Year wise publication trend of organizational neuroscience

Active Journals

Another analysis was carried out regarding the journals in which the studies in the field of organizational neuroscience are published most frequently. According to the results stated in Figure 4 (bibliographic coupling of journals), the vast majority of the publications belong to the journal of Frontiers in Human Neuroscience (4). According to the citation indicator, Strategic Management journal is the most impactful journal (333 citation), followed by Journal of Long Range Planning (122 citations), Organization Science (90 citations), Journal of Business Ethics (78 citations), and journal of Psychology: Interdisciplinary and Applied (73 citations).

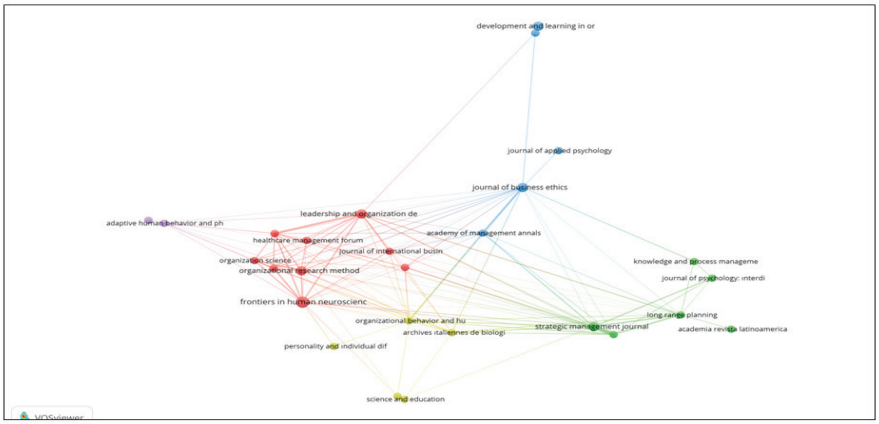

Figure 4. Bibliographic coupling of journals in the field of organizational neuroscience

Active Countries

Considering the affiliations of the 44 articles examined within the scope of organizational neuroscience, it is seen that a great many of the studies on organizational neuroscience belong to the United Kingdom (18), followed by the United States with 13 articles. The highest number of citations is also found in the United Kingdom (555), followed by the United States at 271, and Denmark with 69 citations (Figure 5).

Distinguished Authors

The famous authors in the domain of organizational neuroscience are tabulated in Figure 6. In consideration of the authors in the area, it is seen that the top three authors have published an identical number of organizational neuroscience studies. While the number of citations of the five authors were examined via Scopus and Web of Science databases, it is seen that Nick Lee and Carl Senior are in the first place with the 5 studies. The other three authors (Butler M.J.R.; Hodgkinson G.P.; and Healey M.P.) have at least two studies, and in Figure 6,

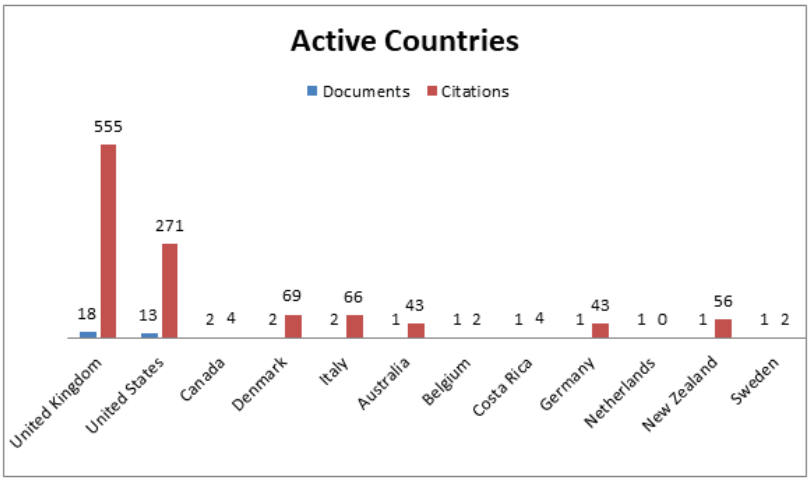

Figure 5. Active countries on scope of organizational neuroscience

it also shows that with 414 citations, Hodgkinson G.P., is the most influential author within the scope of organizational neuroscience.

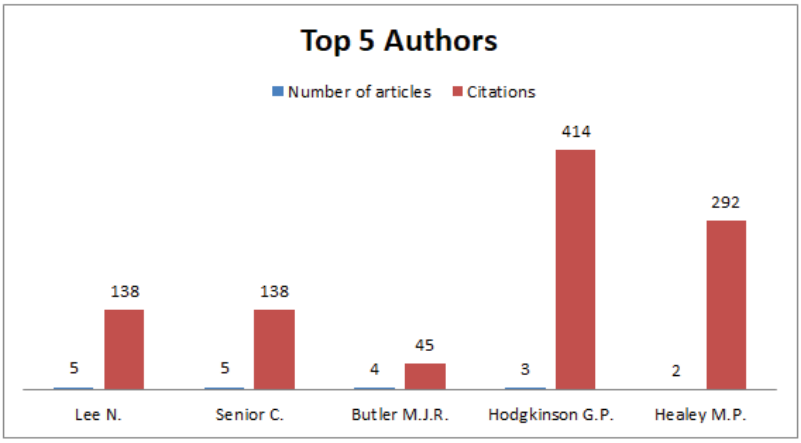

Figure 6. Top 5 authors with the largest number of publications in the organizational neuroscience field

Co-citation Network on Cited Authors

We selected the authors which had been cited a minimum of 20 times, and between the 4474 cited authors 14 of them met the threshold.

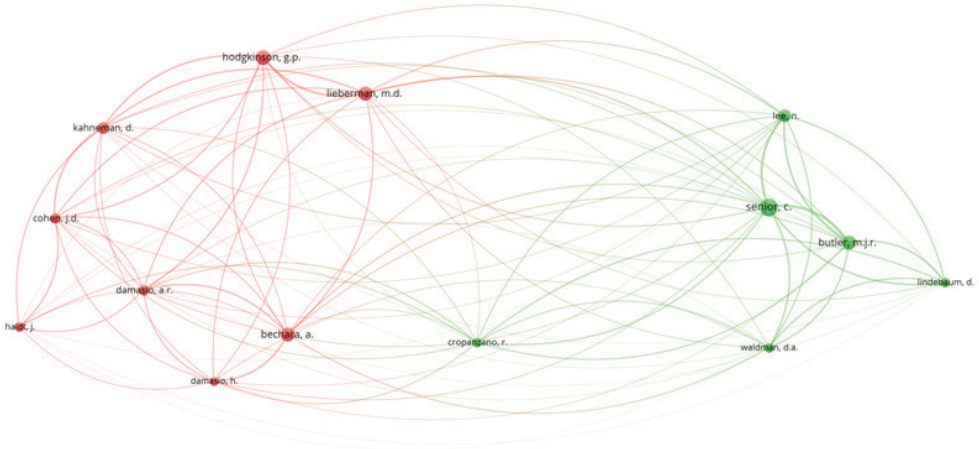

Figure 7. Co-citation map of authors

The most regularly cited authors are Senior, C. (57 citations), Hodgkinson, G. P. (43 citations), Butler, M. J. R. (41 citations), Bechara, A. (39 citations), and Lieberman, M. D. (39 citations).

Cluster 1 contains authors from cognitive neuroscience (i.e., Cohen, J.D.; Damasio, A. R.; Damasio, H.), business ethics (i.e., Haidit, J.), micro economy (i.e., Kahneman, D.), psychology (i.e., Bechara, A.; Lieberman, M. D.).

Cluster 2 encompasses authors from organizational justice and workplace emotion (i.e., Cropanzano, R.), organizational behavior (i.e., Waldman, D. A.; Senior, C.), marketing (i.e., Lee, N.), and management (i.e., Butler, J.R.; Lindebaum, D.)

Co-citation Network on Cited References

To provide a deeper understanding of the structure of the cited references in the organizational neuroscience, we performed a co-citation analysis of the cited references. Figure 8, provided below, shows the network of references' co-citation relations. We obtained 2945 cited references and employed a threshold of a minimum of 3 times. We got a set of 8 references which also represent influential research in the scope of organizational neuroscience.

Figure 8. Co-citation network on cited references

As shown in Figure 8, the references' co-citation network formed 2 clusters. Cluster 1 includes four references and it represents the research organizational neuroscience field and its theoretical roots (shown in red). The most cited reference is Becker et al. (2011) (273 times). Cluster 2 also has four references and it represents the social cognitive neuroscience perspective (shown in green).

Conceptual Structure and Evolution of Organizational Neuroscience

To provide the main themes and historical viewpoint of the evolution of the organizational neuroscience perspective, strategic diagrams were built using SciMAT software. For each period from 2007 to 2020, a conceptual structure was generated as well as the evolutionary maps of fields.

As seen in Figure 9, the first decade which represents between 2007 to 2010, few documents were found addressing organizational neuroscience. Organizations and workplace concept are motor themes which have an effective role in the introduction of the neuroscience perspective to MOS. In addition to these motor themes, organizational justice is an emerging theme which appeared in only one study. Table 1 shows indicators (documents, h-index, centrality and density) of each theme in the period 2007-2010.

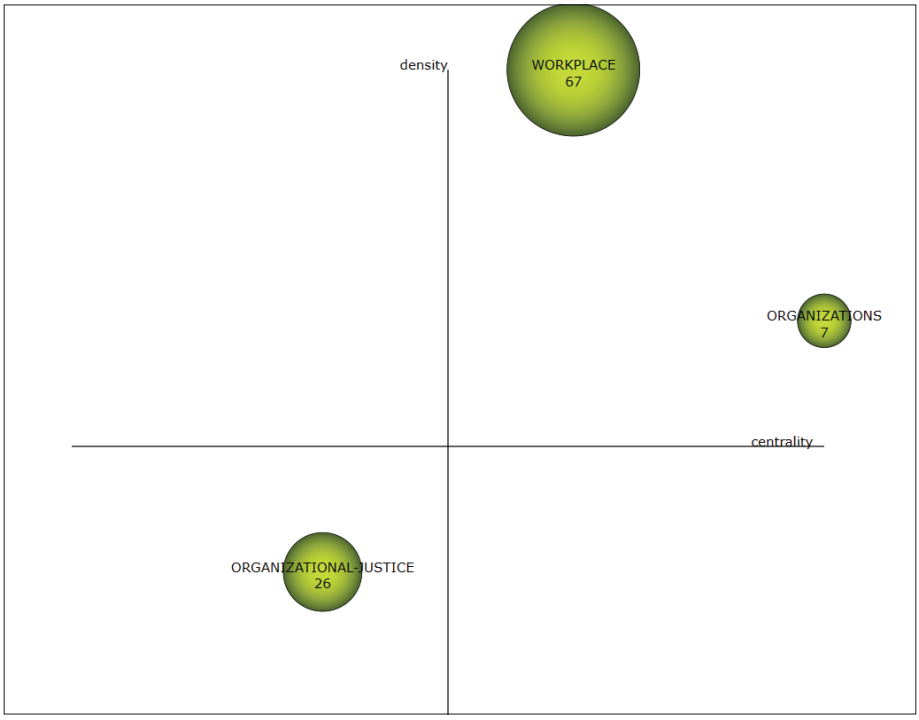

Figure 9. Strategic maps (2007- 2010)

Table 1
The Nodes of the Strategic Maps (2007-2010)

	2007-2010			
Themes	**Document**	**h-Index**	**Centrality**	**Density**
Organizations	2	2	75	466.67
Workplace	2	2	75	277.78
Organizational Justice	1	1	0	150

While interest in organizational neuroscience increased in the second period, this interest led to the prominence of new research topics in the field. More specifically, in the period 2011-2020, the organizational research field revolved around 12 main themes (Figure 10). Organizational justice is consolidated as a motor theme, which was an emerging theme in the period 2007-2010. Moreover, decision-making, behavioral strategies, and leadership are basic themes. Each of them links with the workplace concept which was a motor theme in 2007-2010 and reflects management research. Highly developed topics include organizational theory, intelligence, and organizational decision making but these topics also indicate isolated areas in the scope of organizational neuroscience. Emerging/disappearing topics (lower left quadrant) include themes such as organizational transformation and strategic consensus which have lower centrality and density. Table 2 shows indicators (documents, h-index, centrality, and density) of each theme in the period 2011-2020.

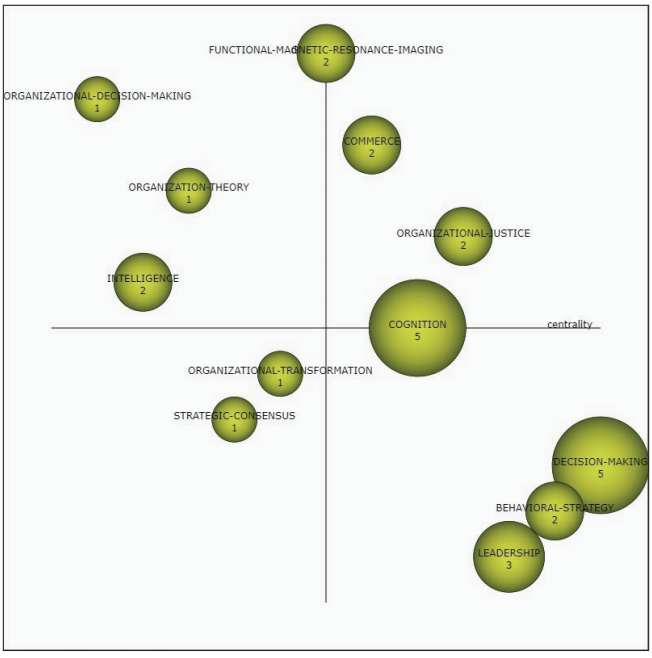

Figure 10. Strategic maps (2011- 2020)

Table 2
The Nodes of the Strategic Maps (2011-2020)

		2011-2020		
Themes	**Document**	**h-Index**	**Centrality**	**Density**
fMRI	2	2	7.5	420.83
Commerce	2	1	41.25	270.83
Decision Making	5	3	276.53	98.61
Cognition	5	3	47.78	106.25
Organizational Justice	2	2	68.33	134.38
Leadership	3	2	101.67	68.75
Organizational Decision Making	1	1	0	300
Intelligence	2	1	0	108.33
Organizational Theory	1	1	0	200
Behavioral Strategy	2	2	164.17	70
Strategic Consensus	1	1	0	100
Organizational Transformation	1	0	0	100

Analysis of Thematic Areas

Figure 11 presents the main thematic evolution of the organizational neuroscience perspective. According to this map 3 concepts, which include organizations, workplace, and organizational justice, have received more attention from organizational scholars in first period of the evolution of the field. More specially, the theme of the workplace is linked with the 12 sub-themes which include fMRI, commerce, decision-making, cognition, organizational justice, leadership, organizational decision-making, intelligence, organizational theory, behavioral strategy, strategic consensus, and organizational transformation. These sub-themes represent to management perspective in the period of 2007-2011.

The theme of organization is a more central research topic compared with the workplace theme. Eight sub-themes are related to the organizational context, such as the business change process, affective states, social behavior, organizational performance, forgiveness, empathy, and creativity. These sub-times represent the organizational behavior perspective in the period of 2007-2010.

Organizational justice is a new emerging topic in the first period. This theme includes three subthemes (fairness, theory of mind, and neuro-organizational justice) which also represent the organizational behavior perspective.

Figure 11. Thematic areas in the evolution process of organizational neuroscience

In the evolution process of the field, the first decade reflected the infancy era of organizational neuroscience. The second period (2011-2020) shows that the organizational justice theme, which in the previous period is being maintained, is still effective for the evaluation of fields. Moreover, the research topics are visibily diversified in the last period (12 themes). Especially, decision making, cognition, and leadership are dominant thematic areas that shape the research interest. Figure 12 presents related sub-themes of each dominant thematic area to provide a deeper understanding of the current tendency of the fields.

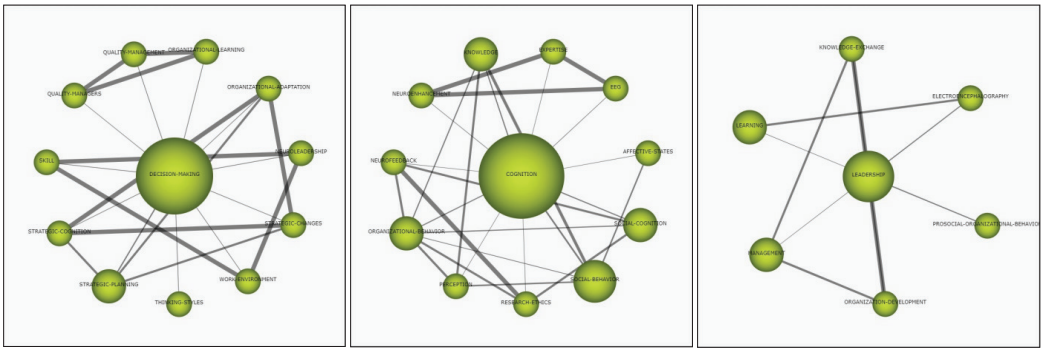

Figure 12. Sub-themes of dominant thematic areas (2011- 2020)

According to the sub-themes network (Figure 12), decision-making is mainly associated with the strategic management process (quality management, strategic change, strategic cognition, power, quality of managers) and organizational behavior (organizational learning, skill, thinking styles). The cognition theme also has a central role that is associated with prominent sub-themes, such as organizational behavior, emotions, social behavior, and knowledge. The rest of the sub-theme network consists of minor areas, such as neuro-feedback, expertise, EEG, research ethics, perception, and social cognition. According to the sub-themes network of leadership, there are seven clusters that represent different research domains that become prominent. At this point, management, learning, and prosocial organizational behaviors have a more dominant role than other sub-themes.

Systematic Review of the Empirical Research on Organizational Neuroscience

Our systematic review considers 153 articles in the field of organizational neuroscience collected from the Web of Science, Scopus, and Google Scholar databases. However, only 42 of the 153 (27.4%) researches in this list have empirical research methods. The application status of different neuroscience techniques in 42 articles and prominent research topics on organizational neuroscience and the advantages/limitations of each technique are summarized in Tables 3 and 4.

It can be observed that in the 20-year period, EEG is the most popular neurometric measurement method used in organizational neuroscience (Wang et al., 2020; Waldman et al., 2019; Edison et al., 2018; Villalba-Diez et al., 2019; Yang and Li, 2018; Bonnstetter et al., 2018; Bonnstetter et al., 2015; Hannah et al.,2013; Balthazard et al., 2012; Waldman et al., 2011). According to Wang et al. (2020) the EEG technique and measurement process help to examine team dynamics such as team member attention, team interaction and the problem-solving process. In addition to that, EEG based measurement has also been used in an MOS study to identify neutral signals of leadership behavior and decision-making processes (Balthazard et al., 2012; Jack et al., 2019). The main reasons for the increase in the use of EEG in organizational neuroscience context can be explained by EEG's overcoming the limits provided by fMRI and its relatively low research costs for organizational context.

Another instrument that became prominent for organizational neuroscience is fMRI (Kokubun et al., 2020; Lelieveld et al., 2020; Shane et al., 2020; Rybnicek et al., 2019; Lemmers-Jansen et al., 2018; Huffcutt et al., 2018; Molenberghs et al., 2017). Especially, fMRI is the first neurometric technique used by Decety et al. (2004) in the scope of organizational neuroscience. Previous research has also pointed out the significant measurement effects of fMRI on Machiavellianism (Bagozzi et al., 2013), organizational justice (Dulebohn et al., 2009), social influence (Mason, et al., 2009), leadership (Boyatzis et al., 2012) and decision-making (Laureiro-Martínez et al., 2015) in organizational life.

Table 3
Presentation of the Scientific Production Profile of the 42 Empirical Articles on Organizational Neuroscience

Electroencephalography (EEG)	**Functional Magnetic Resonance (fMRI)**	**Heart Rate (HR)**	**Eye Tracking**	**Galvanic Skin Response (GSR)**	**Voice Pitch**	**Facial Coding (FACs)**
Waldman et al. (2011) Balthazard et al. (2012) Hannah et al. (2013) Bonnstetter et al. (2015) Eskenazi et al. (2016) Wang Lei et al. (2016) Venturella et al. (2017)* Waldman et al. (2017) Yang & Li (2018) Bonnstetter et al. (2018) Duan (2018) Liu & Xu (2018) Zhang (2018) Edison et al. (2018) Crivelli et al. (2019) Villalba-Diez et al. (2019) Wang et al. (2020)	Decety et al. (2004) Peterson (2005) Dulebohn et al., (2009) Mason et al. (2009) Boyatzis et al., (2012) Bagozzi et al., (2013) Laureiro-Martínez et al. (2015) Molenberghs et al. (2017) Haesevoets et al., (2018) Lemmers-Jansen et al. (2018) Huffcutt et al. (2018) Rybnicek et al. (2019) Kokubun et al. (2020) Shane et al. (2020) Lelieveld et al. (2020)	Akinola and Mendes (2014) Venturella et al. (2017)* Balconi et al. (2019)* De Longis et al. (2020)	Gerpott et al. (2018) Maran et al. (2019) Sun et al. (2020)	Venturella et al. (2017)* Balconi et al. (2019)*	Klofstad & Anderson (2018) De Waele et al. (2019)	Trichas and Schyns, (2012) Trichas et al. (2017)

* Research which used biometric and neurometric techniques together.

The advantages, which cause fMRI to be preferred most widely in organizational neuroscience, can be listed as spatial and temporal resolution of the brain, and the measurement of activity in different brain regions simultaneously (Robertson et al., 2017). Although fMRI is the preferred method, it has some limitations, such as high cost, expensive preparation processes, and restriction of participants in a narrow area in the measurement process.

Although a growing body of literature generally includes neurometric measurement, the use of biometric measurements in organizational neuroscience has become widespread in the last six years. Organizational neuroscience comprises a number of biometric techniques that can directly measure those aspects now considered crucial in the process of organizational

contexts, such as work-group dynamics, decision-making process, leadership behavior, and psychophysiological responses of employees in terms of information storage. At this point, the main biometric techniques used in organizational neuroscience can be listed as follows: eye tracking (Sun et al., 2020; Maran et al., 2019; Gerpott et al., 2018), heart rate analysis (De Longis et al., 2020), galvanic skin response (Venturella et al., 2017; Balconi et al., 2019), voice pitch (Klofstad and Anderson, 2018), and speech rate analysis (De Waele et al., 2019).

One of the frequently used biometric measures is eye tracking. A recent eye-tracking study conducted by Gerpott et al. (2018) involved 18 leaders and non-leaders who were asked to rate their perception of leadership signals in 42 muted video clips of the team meetings, and their eye-gazing patterns to visual attention toward emergent leaders were analyzed. Another study by Maran et al. (2019) showed that leaders' eye-directed gaze that linked with audience members is part of their charisma. These studies showed that applied eye-tracking techniques help to justify the organizational context, especially in the leadership topic.

Heart rate analysis, as with eye tracking, is a biometric technique that tracks the electrical signal created by the heart. The measurement of heart rate has been applied in different research studies in organizational neuroscience in order to assess different processes in employees' and managers' reactions. For instance, De Longis et al. (2020) showed that the use of heart rate variability can be associated with negative emotions and exhaustion at work. In another study, heart rate was used to determine the psychophysiological responses of leaders and employees in the performance evaluation process (Balconi et al., 2019).

In the field of organizational neuroscience, there are some studies showing how Galvanic Skin Response (GSR) can be helpful in understanding the manager's and employee's emotional responses. Usually, GSR is used with other techniques in a complementary manner. For instance, Venturella et al. (2017) tested different communication styles of leaders using heart rate analysis, GSR, and EEG. The results showed positive correlations between heart rate signals, EEG, and GSR. Similarly, Balconi et al. (2019) also used GSR measurement integrated with heart rate analysis to explain the psychophysiological responses of leaders and employees. Another biometric measurement method in organizational neuroscience researches is voice analysis. Voice analysis can be applied both with voice pitch and speech rate in different researches. For instance, Klofstad and Anderson, R. C. (2018) used voice pitch analysis to explain the relationship between voice pitch and leadership ability. In another study, voice pitch and speech rate analysis were used together to explain the vocal cue effect on the organizational crisis process and crisis strategies (De Waele et al., 2019). All these studies suggest that the application of the techniques of neurometric and biometric measurements in the field of organizational neuroscience has its important advantages to explore the complex nature of human behaviors. In other words, the extant research on the application of neuroscience in MOS suggests that it holds some salience, and in the organizational sphere is worthy of exploration.

Table 4
Advantages and Limitations of Biometric and Neurometric Techniques in Organizational Neuroscience

	Prominent topics	**Advantages**	**Limitations**
EEG	Soft skills (Bonnstetter et al., 2015; Bonnstetter et al.,2018) Business unit controllers (Eskenazi et al., 2016) Leardership (Waldman et al., 2011; Balthazard et al., 2012; Hannah et al., 2013; Venturella et al., 2017; Waldman et al.,2017; Edison et al., 2018) Entrepreneurship (Yang, and Li, 2017) Economic management (Duan, 2018) Entrepreneurial cooperative behavior (Liu, and Xu, 2018) Enterprise management (Zhang, 2018) Stress management (Crivelli et al., 2019) Problem-solving behaviors (Villalba-Diez et al., 2019) Team process (Wang et al., 2020)	Mobility of EEG enables research outside the context of laboratories such as factories, firms etc. EEG provides deeper knowledge of relationship between brain mechanisms and emotional responses Use of EEG and its methodology is easier than fMRI.	The process of recording brain signals can differ from person to person (Kenning et al. 2007). Data collection from participants who have long hair is difficult and this situation effects the quality of EEG data. Experimental settings and data artifacts can influence results (Wang et al. 2008). It is necessary to allocate an average of 30 minutes for each participant during the experiment. This situation may create time pressure for the researcher under organizational conditions. The price of a 32-channel EEG is more than $ 35,000. This situation may pose a budget problem for a comprehensive research process.
fMRI	Investor behavior (Peterson (2005) Organizational justice (Dulebohn et al., 2009) Social influence (Mason et al., 2009) Machiavellianism (Bagozzi et al., 2013) Decision-making (Laureiro-Martínez et al., 2015) Leadership (Boyatzis et al., 2012; Molenberghs et al., 2017) Cooperation (Decety et al., 2004; Lemmers-Jansen et al., 2018) Human resources (Huffcutt et al., 2018) Work motivation (Rybnicek et al., 2019) Work engagement (Kokubun et al., 2020) Entrepreneurship (Shane et al., 2020)	fMRI provides deeper knowledge of the relationship between brain mechanisms and emotional responses fMRI can detect changes which include chemical composition, metabolic activity and fluid in the brain (Wang et al. 2008; Perrachione et al. 2008).	Experimental processes which involve fMRI methodology have strict ethical procedures (Wang et al. 2008) The obligation of the participants to remain still during the experiment makes the data collection processes difficult (Zurawicki 2010). fMRI is an expensive method and the realization of the experimental process requires a laboratory environment. The data analysis process is complex and difficult (Kenning et al. 2007).

	Prominent topics	Advantages	Limitations
Eye-Tracking	Leadership and team interaction (Gerpott et al., 2018) Charismatic leadership (Maran et al., 2019) Work-group dynamics (Sun et al., 2020)	Visual attention provides more information for managers on the decision-making process. Diversity of eye tracker tools enables research to be conducted outside the context of the laboratory, such as factories, firms etc. Price of eye tracker systems is cheaper than most other neuroscientific tools (EEG, fMRI etc.) Eye tracker system has an uncomplicated methodology and implementation process.	Eye tracking systems can be used for free from a location with wired and wireless options. However, determining the attention level and attention orientation of a single person in the field of management organization where interpersonal interaction is a priority may not be sufficient for every research design. Also, an experimental design is often not replicated. Additionally, it is often impossible to repeat a study designed in a real-world environment by providing exactly the same conditions (Meißner and Oll, 2019).
GSR	Leardership (Balconi et al., 2019; Venturella et al., 2017)	GSR has an uncomplicated methodology and implementation process. Also, it is relatively cheaper than the other neuroscientific instruments.	To understand whether the level of emotional arousal measured is related to a positive or negative feeling, it should be used integrated with different instruments (Ayata et al., 2017).
Facial Coding	Leardership (Trichas et al., 2017; Trichas and Schyns, 2012)	Facial coding is an emotion recognition method conducted via software. In addition to its ease of use, it provides advantages to the researcher such as the absence of physical contact with the participant, the option to re-analyze by recording and practical analysis algorithms.	FACs coding methods are often questioned for reliability and validity (Skiendziel et al., 2019).
Voice Pitch	Organizational crisis communication (De Waele et al., 2019) Crisis response strategy (Klofstad, and Anderson, 2018)	Voice pitch analysis offers significant advantages in terms of not having to study face to face with the participants. Also, it is possible to use secondary data.	Sample-specific changes like phonetic, cultural and characteristic differences require a rich sound database to detect the targeted changes in terms of expected validity.
HR	Stress-performance (Akinola and Mendes, 2014) Leadership (Balconi et al., 2019; Venturella et al., 2017) Emotion in organizational behaviors (De Longis et al., 2020).	HR electrodes can be integrated into daily clothing and so heart rate variability can be captured in daily routines. HR software packages can be easily integrated with other physiological measurement instruments.	In order to provide specific information about the process experienced by the individual, HR must be used in integration with other neuroscientific methods. Electrodes that contacted the body may foreclose simulating real-life research (Shu et al., 2020).

Conclusion

In this study, we used various bibliometric tools and a systematic review to explain the evolutionary process of organizational neuroscience in the last twenty years. In the first step

of our bibliometric analysis, the results of publication trends on the topic of organizational neuroscience were presented in WOS from 2007 to 2020. In fact, in the first design of the research, the year 2000 was chosen as the starting year, as the first intersection of neuroscience and business disciplines. However, the first period of the research started in 2007, since there was no study in the field of organizational neuroscience until 2007. As a result, a total of 44 articles in the organizational neuroscience field were collected, followed by a thorough bibliometric analysis. Our findings in this step presented the number of publications over time (2015 is the most productive year), productive researchers (Lee, N.; Senior, C.), most cited researchers (Hodkingson, G.P.; Healey, M.P.) as well as the countries (the United Kingdom and United States) and journals with most impact (Strategic Management Journal, Journal of Long Range Planning) related to organizational neuroscience.

The second step of our bibliometric analysis is related to the evolution of the subject of organizational neuroscience which includes the change of conceptual themes and thematic areas in the last twenty years. During the period 2007-2010, there are few research themes to reflect the development process of organizational neuroscience. In this point, the main motor themes include terms of organization and workplace. These themes are related to the application area of neuroscience techniques in MOS. They also provide insight into organizational context and workplace behavior that can be explained from a neuroscience perspective. Organizational justice is an emerging theme in the same period. It has low density and centrality but our analysis showed that this theme returned to motor themes in the next period (2011-2020).

From 2011 to 2020, there were 12 research themes related to organizational neuroscience. This increase in research themes is an indication that organizational neuroscience has attracted more researchers in the last 10 years. Especially, six themes (motor and basic themes), which contributed to the development of organizational neuroscience, include organizational justice, commerce, cognition, decision-making, behavioral strategies and leadership studies. In addition to these themes, organizational transformation and strategic consensus are emerging themes which will provide new research streams for future research.

The final step of our reseach included a systematic review to understand the emprical development of organizational neuroscience. We collected our datas from WOS, Scopus and Google Scholars databases. A total of 42 empirical studies which used neuroscientific tools were evaluated on the basis of their metodologies and research topics. Several points are worth noting for future research.

Organizational neuroscience instruments have the potential to overcome the disadvantages of traditional research tools. Traditional methods are limited when reflecting participant emotions and the main reasons for their behavior. In other words, people have a tendency to hide their real emotions and thoughts because of social presuress. On this point, neuroscience tecniques provide more sensetive data processing againt the information retention tendency and remove the social pressure effect from the data collection process (Varnum, 2016).

According to our systematic review, leadership (Balconi et al., 2019; Maran et al., 2019; Gerpott et al., 2018; Molenberghs et al., 2017; Trichas et al., 2017) is the area in which these tecniques are most widely used. These researches show that neuroscience tecniques provide deeper knowledge about the cognitive process of leadership. This finding is also supported by our bibliometric results. In the period of 2011-2020, leadership is a dominant research theme. This theme also has sub-themes which include learning, knowledge, management, prosocial organizational behavior, organizational development and neuroleadership. We hope that the sub-themes of leadership will inspire future research to provide neurometric and viometric cues of leadership behavior and relations.

Our results suggests that organizational neuroscience provides a sound approach for future research topics such as the decision-making process and organizational justice. These topics also show parallelism with research themes in the period of 2011-2020. In addition to that, 42 empirical studies, which were determined in the literature review, show that EEG and fMRI are the most preferred instruments to research these themes. We hope that future research will use different neurometric and biometric tecniques such as GSR, EMG, hearth rate analysis, facial coding and voice pitch to provide more information about these themes.

Another result of our systematic review is related to the neuroscience devices that are not preferred by researchers. In the search process, we couldn't find any functional near-infrared spectroscopy (fNIRS) studies in the scope of organizational neuroscience. fNIRS, is an optical brain monitoring technique that uses near-infrared spectroscopy for functional brain imaging. Near-infrared light allows direct or indirect measurement of brain activity by measuring changes in blood flow in the frontal lobe of the brain. However, there has been an increase in the use of fNIRS methodology in different research fields such as marketing (Krampe et al., 2018; Liu et al., 2018), economy (Cheng et al., 2015; Wanniarachchi, 2020) and psychology (Lukanov et al., 2016; Al-Shargie et al., 2017; Porto et al., 2020). All these studies have indicated that fNIRS is an effective neurometric technique to explain workload, decision-making, and emotional and cognitive processes. Moreover, Pinti et al. (2020) pointed out that fNIRS has better spatial and temporal resolution compared with EEG. In support of this notion, we expect that future research will focus on the fNIRS methodology to explain leadership cognition, decision-making processes, and team relations.

In the empirical studies examined during the systematic review phase, it is noted that in general only one organizational neuroscience method is used at a time. There are quite a limited number of studies that use different integrated measurement techniques (Balconi et al., 2019; Venturella et al. 2017). In future research, integrated use of neurometric and biometric tools should be developed to establish a comprehensive perspective for organizational neuroscience.

Taken together, the major contributions of these bibliometric and systematic reviews are the results of examining the organizational neuroscience literature. These results offer the

researchers and scholars a guide to further explore the organizational neuroscience area and the methods. This study also states an important gap in empirical studies about organizational neuroscience which needs to be filled in the future. To the best of our knowledge, this is the first research that investigates the evolution of organizational neuroscience via bibliometric analysis and a systematic review process.

Several limitations must be considered when interpreting the findings of this study. Firstly, our bibliometric processed only the Web of Science database. Especially, SciMAT and Vosviewer tools retrieve only one data extension such as ISIWos, Pubmed, and Scopus in the analysis process. This situation prevents the analysis of different databases together. Nevertheless, future research could be focused on different databases such as Scopus, and Google Scholar, and they could be analyzed in an integrated manner to provide wider knowledge. Second, the literature review and bibliometric process are generated with the keywords "organizational neuroscience" and "organizational cognitive neuroscience" in their title, keywords, and abstract. However, this restriction is not adequate to capture the full information from the data. Apart from keywords, full texts should be included for a more comprehensive exploration. Finally, our data sources consist only of published articles, books, and chapters. Future researches should include multi-sources, such as doctoral theses and conference proceedings which would be more convincing.

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RESEARCH ARTICLE

The Effect of Negative Past Experiences, Poor Relationship Quality and Rumor on Brand Hate: A Research on Fast Food Industry

Yakup Durmaz[1], Bülent Demirağ[2], Sinan Çavuşoğlu[3]

Abstract
This study investigates negative past experiences, poor relationship quality, and the impact of rumor on brand hate. The sample of the study consists of fast-food customers in Turkey. Out of the non-probability sampling methods, convinence sampling method was adopted. 455 customers were reached by using convenience sampling method, but only 433 of them provided data suitable for analysis. Questionnaire forms designed to measure data variables were available online (via Google forms, e-mails and other social media networks). The collected data was analyzed using SPSS and AMOS, and the validity and reliability of the scales were measured. AMOS was used to test the hypotheses using the Structural Equation Model. The findings show that there is a positive relationship between negative past experiences and rumor and brand hate. However, it was determined that there is no positive relationship between poor relationship quality and brand hate.

Keywords

Brand experience, Relationality, Fast-food industry

Introduction

Because the modern concept of marketing is consumer-focused; actions and policies of businesses have a broad perspective which includes consumer expectations, perceptions, and evaluations of the product. Therefore, the number of studies on consumer experiences with the product and the brand, relationship quality, and brand rumors are increasing steadily. (Haarhoff, 2018; Nasidi, 2016; Kanagal, 2009; Fournier and Alvarez, 2013; Kucuk; 2016; Dubois et al., 2011).

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Consumer experience includes the negative or positive perceptions of consumers on how well the product they got met their needs (Johnston and Kong, 2011: 5). When the desires and needs of consumers are not completely met, they start to have negative experiences. Consumers who have negative experiences with a brand will avoid or even despise the brand, causing problems for the businesses in the market where the competition is strong.

Businesses can strengthen the relationship quality by evaluating consumer needs and wants. If conflicts that cause poor relationship can be resolved (ensuring that work processes are at the same level with marketing strategies), it will be possible to have a long-term bilateral relationship (Palmatier, 2008). A consumer-focused marketing concept requires improving relationship quality. In order to create a strong value, brands and companies should establish a healthy relationship established with the consumers. This way, understanding hate or love towards a brand becomes would be possible.

Rumor is information consisting of confirmed/non-confirmed news or propaganda regarding a product or the brand (Aditya, 2014: 121-122). Rumor including negative statements against the business is regarded as "gossip harassment" (Liu et al., 2014). Rumors mostly have negative effects on the businesses. However, if rumor is used as a feedback device, negative feelings towards the product or the brand would be diminished and managing harmful psychological perceptions like hate would be beneficial for the businesses.

Brand hate represents the negative feelings of consumers towards the brands they tried before (Navarro, 2013). For this reason, it is necessary to focus on the relationship between consumers and brands, in other words, on the feelings of consumers while they are trying out a brand (Fournier and Alvarez, 2013: 259). Negative feelings cause a gradual alienation from the brand. The studies on the causes and results of brand hate show that negative past experiences with the brand, rumor and poor relationship quality lead to brand hate (Kapferer, 2004; Ahmed and Hashim, 2018; Zarantonello et al., 2018).

In today's competitive environment, businesses have to analyze consumers well. Businesses that pay attention to the feelings and thoughts of consumers and take appropriate strategies and decisions will gain competitive advantage. Developing technology and the resulting social platforms have created spaces where consumers can share their experiences, feelings and thoughts with others comfortably and instantly. Many consumers, especially those who have not used the product before, pay attention to the recommendations (Kement et al., 2018) and complaints (Demirağ and Çavuşoğlu, 2022) of others while purchasing a product. A rational consumer is likely to avoid or even hate a product because of negative comments made by people who had used the product before and had negative experiences It is important for businesses to develop some strategies for such scenarios that will threaten their competitiveness, sales and even existence. Increasing the quality of the relationship they have with the consumers can be a useful strategy.

If businesses cannot create more trust and satisfaction, it can have negative effects such as rumors and hatred. The lack of a strong relationship with consumers can cause them to be unable to evaluate the veracity of a rumor and therefore to have negative feelings and thoughts in a short time. In cases where the quality of the relationship is weak and combined with negative customer experiences, the product, brand and even the business can be seriously damaged. As the negative discourse towards the business increases on different platforms, it will inevitably cause more customers to have a negative view.

The results obtained from the hypotheses are thought to contribute to both the literature and businesses. This study focuses on negative consumer evaluations. It is aimed to contribute to the limited number of research results in the literature by examining the relationship between bad relationship quality, rumors, negative experiences, and brand hate. It is also important to carry out the research in the fast-food sector. It is thought that examining the relationship between bad relationship quality, rumors and negative experiences, and brand hate will contribute to the limited number of research in the literature. It is also important to carry out research in the fast-food sector. With the changes in the consumption habits today, eating habits of consumers have also changed. Reasons such as the fast pace of life, long working hours have made consumers lean towards parctical eating habits. Even though the wave of healthy eating habits during Coronavirus have decreased the consumption of fast food (Bohlouli et al., 2021), there is still an ever-growing fast-food sector where new brands emerge everyday. Therefore, a consumer-oriented study can offer valuable results in terms of competitive strategies for the businesses in the sector.

This study analyzes the effects of negative past experiences, poor relationship quality and rumor on brand hate in the light of the hypotheses developed based on the literature and empirical studies. Therefore, it aims to determine the causes of brand hate that create a significant competitive disadvantage, and to contribute to marketing performers and the literature.

Conceptual Framework

Negative Past Experience

Brand experience is conceptualized as “sensations, feelings, cognitions, and behavioral responses evoked by brand-related stimuli that are part of a brand’s design and identity, packaging, communications, and environments” (Brakus et al., 2009: 52). Past experiences are related to daily life (Haarhoff, 2018: 4). Experience plays a big role in developing behavior-oriented beliefs. In the formation of the behaviors, the quality of the experience directly affects the possibility of an objective behavior (Bojko, 2013: 4). Experience is at the focus of the marketing activities. Brakus et al. (2009: 52), state that experiences of consumers with the brand are undeniably popular in marketing. Therefore, marketing performers emphasized

that understanding how consumers experience with the brand is significantly important for developing marketing strategies for products and services. Pine and Gilmore (1998) emphasize the importance of creating strong and permanent consumer experiences (Lemon and Verhoef, 2016: 69). Consumers make decisions by taking past experiences into consideration as well as marketing programs and noncommercial information sources; they consider their experiences as an "internal information source" (Hanaysha, 2017: 8). Consumers start creating experiences when they use a product or start a cognitive effort about the product and while coping with a need, they use their negative/positive experiences as an internal source and try to build trust (Nasidi, 2016; Kement and Bükey, 2020). Past experiences of consumers mostly stem from past relationships associated with the product or the brand (Khan, 2018: 2). Results of expectations and perceptions of consumers in their quality assessments, in other words deductions regarding product quality creates product experience (Urban, 2010: 820). Product quality, physical qualities, way of presentation, podt-sale consumer services are important factors in the formation of this experience. Katawetawaraks and Wang (2011: 68) state that in addition to these factors, negative past experiences of consumers can also be caused by salespeople. Oppressive attitude and weak consumer control mechanisms of salespeople can cause negative experiences regarding corporate identity and salespeople. This would increase online sales. For this reason, determining consumer perceptions regarding the product is important. Past experiences of consumers have an impact on perceptual filters, and this redounds on product evaluations (Solomon et al., 2010). When consumers have a utilitarian approach towards the product and cannot get the benefit they hoped to get from it, will strengthen the possibility of the emergence of negative past experiences in product evaluations (Martin, 2017: 3). Consumers can convey negative and positive suggestions about the product and their experiences to more consumers in parallel with the technological developments. Especially, individual negative experiences with the services and corporates after or during purchase can affect existing or potential consumers' experiences (Verhagen et al., 2013: 1430). Consumers do not share their negative past experiences with other consumers (even though they often complain about the negative aspects of the product) until their complaints reach a serious level. Even though this situation prevents potential customers to be alienated from the firm, it also eliminates the chance to regain a customer who can give positive reports to others (Richins, 1983: 76). In addition, as dissatisfaction prevents the detection of the factors causing negative experiences because of the lack of feedback, it precludes turning negative experiences into positive ones.

Poor Relationship Quality

The term, relationality draws attention as an important argument that firms use as a sales strategy. In this context it is suggested for the salespeople to try to develop good relationships with the consumers (Ghzaiel and Akrout, 2012: 2), as there is a mutual affinity between companies and individuals in consumer markets. This relationship is formed as a result of the exc-

hange process between consumers and salespeople. Although the products are trade related, consumer relationships depend on social relationships. For this reason, a good product should be supported with a good relationship (Kanagal, 2009: 12). Consumers perceive the relational activities of firms as weak or superior and then make product evaluations. The perceived relationship quality depends on the consumer value. Comparison between quality perceptions of consumers regarding the service and sacrifices creates relational perceived value (Liljander and Strandvik, 1995). While high relationship quality (effective communication) creates high service quality, poor relationship quality (conflicts and lack of cooperation) negatively affect the service quality (Alawneh, 2012: 299). Businesses can strengthen the relationship quality by evaluating the needs and wants of consumers. In addition, elimination (ensuring that work processes are at the same level with relationship marketing strategies) of conflicts that cause poor relationship quality, long term investment relationships depending on relationship quality will be possible (Palmatier, 2008). Relationship quality determines the possibility of fluctuation between the supplier and the customer. High relationship quality is regarded es a good relationship while poor relationship quality is regarded as a bad relationship. The quality of the relationship is critical in creating a competitive advantage (Kempeners, 1995: 1630). Likewise, Crosby et al. (1990) state that long term exchange process between consumer-salesperson is a function of relationship quality. Therefore, future sale opportunities mostly depend on the relationship quality and reciprocal explaining and cooperative intentions create relational sale behavior by strengthening the relationship quality and create a strong connection between the salesperson and the customer. In addition, the level of the relationship quality directly affects the perception of consumers about the company or the brand. Consumers perceiving good relationship quality are less willing to retaliate than consumers perceiving poor relationship quality. Businesses can reduce the effect of retaliation when they focus on the relationship quality and turn the consumer perception in favor of themselves (Gregoire and Fisher, 2006). This way consumers can turn to positive word-of-mouth communication about the company or the brand. Pandir an Enginkaya (2018: 151) mention the effect of relationship quality on positive word-of-mouth communication. Fournier (1998: 367) emphasizes the relationship between relationship quality and brand loyalty and states that brand relationship quality and brand loyalty are results of strong relationships and in time, this consistent structure towards the brand will give information regarding the future of the business.

Rumor

Rumors are shared in the market about the products, brands or establishments and are spread from one consumer to another through world-of-mouth communication (Sudhir and Unnithan, 2014). Negative rumor, which is also called “gossip harassment” in psychological and sociological research, consists of three stages. These are; rumor formation, spread and control (reduction of the rumors) (Liu et al., 2014). Each three step is shaped by certain communication activities. In social psychology rumor spreads according to the structure of

the groups that act in unison towards the same goal and social conditions. In this context, the place of products newly hitting the market in the perceptions of the consumers can change depending on market conditions and the benefits of the people who spread the rumor (Thompson and Ward, 2008: 756). Rumor is a source that modern business managers use as a reference during information exchange. Although non-harmful narratives can diminish after a certain amount of time, some can start out innocent and can, in time, tun into a harmful one for business activities (Kimmel, 2008: 190). Rumors about the business can negatively of positively affect the business, the brand or the corporate structure (Kapferer, 2004). Businesses try to keep negative rumors away from their companies and try to benefit from the positive impacts of positive rumors in their brand extension strategies (Dubois et al., 2011: 1021). Negative rumors spread faster that positive rumors and can harm the business and their products faster (Nodira and Přemysl, 2017: 113-114). In other words, negative rumors spread more among the consumers. This is caused by the fact that negative information is more accessible and leads to a lower perceived diagnosis of any positive information about the product or the brand (Aditya, 2014: 120). Rumors also have the potential to become a part of a malicious campaign by turning into gossip and being used to affect others through misinformation and propaganda (DiFonzo and Bordia, 2007: 275). For this reason, it is easy for businesses who implement aggressive policies to turn to unfair competition in their campaigns and strategies toward their competitors. For example, negative rumors on McDonald's using red worm meat in their hamburgers have put the firm in a difficult position. Even though this rumor is not true, McDonald's coping attempts with this rumor was not effective and firm's sales decreased by 30% in the areas that this rumor was spread (Jensen, 2015: 575). Easy accessibility to information, rapid changes in information technologies and not being able to control information make the spread of the rumors inevitable. Chua et al. (2016) state that a misinformation circling through social media can rapidly turn into a rumor; however, adding reliable sources decrease the rumors and can have a corrective function. Therefore, correcting the rumors spread online against the businesses with reliable sources will facilitate the transition to the last stage and will reduce the damages caused by negative word-of-mouth communication to minimum.

Brand Hate

Hate is defined as deeply felt dislike and disgust. Hate mostly triggers hostility towards disliked objects (Navarro, 2013). Fischer et al. (2018), argue that hatred has a tendency towards actions and is a result of negative perceptions and rather than the work of individuals or groups it stems from questioning who those people are. Because hatred stems from a psychological process, in addition to psychology and sociology it is also present in marketing literature. Consumer oriented modern marketing approach foresees the analysis of consumer attitudes and behaviors with all their aspects. Although the studies in literature mostly focus on the positive elements towards the brand the number of studies focusing on negative ele-

ments that are dangerous to the continuity of the businesses and that cause refrainment from the brand like brand hate is gradually increasing (Fournier, 1998; Bryson and Atwal, 2019; Lee et al., 2009). Factors like the complex structure of consumer behaviors, competition, dynamicity of needs and wants etc. make it more important to understand the factors creating negative thoughts and emotions. Dalli et al. (2006: 87) state that it is important to reveal both positive and negative aspects in evaluations regarding consumer behavior in order to better explain and understand purchasing and consuming behaviors. At this point it is important to examine brand hate and factors causing hatred. Brand hate is a concept opposed to brand love and it represents consumer's alienation from the brand for several reasons (Carroll and Ahuvia, 2006). Brand hate represents hatred towards a brand (Zarantonello et al., 2016: 10). Monahan et al. (2017) state that it is impossible for a consumer to love every brand and that when a consumer hates a brand it will jeopardize the future of the business. Brand hate has an active (negative communication) or a passive (avoiding the brand) effect (Bryson et al., 2013). Johnson et al. (2011) state that consumers who have strong vengeance feeling will resist the targeted brand. Kaniewska-Sęba and Pająk-Patkowska (2017: 57), state that consumers who use hateful expressions against the brand have a higher possibility to be one of the dissatisfied customers in social networks and this will put marketing performers in a difficult position. Factors causing brand hate and results of this hate are approached in different aspects in literature. Sternberg (2003) state in brand hate theory that hate is caused by poor relationship quality and rumors. Accordingly, hate theory states that in addition to direct personal experiences, indirect nonpersonal experiences (rumors) also cause hatred and this can trigger brand hate among the consumers of a brand (Hashim and Kasana, 2019: 230). Sakulsinlapakorn and Zhang (2019), state that aggressive personality, low brand trust, high levels of guilt and low justice perception are among the reasons that consumers avoid a brand, and this strengthens the turn from brand love to brand hate. Bryson et al. (2013: 32) state that brand hate is affected by three factors. The first one is negative stereotypes attributed to consumers of a brand; the second one is the dissatisfaction stemming from the brand experience and the last one is the negative effect of reference groups (family, work environment, kith and kin etc.) (Karlsson and Rodrigues, 2015: 8). This result shows that in addition to user's profile, reference groups should also be taken into consideration. Hegner et al. (2017) specified the reasons of brand hate as negative past experience, symbolic unconformity and ideological unconformity, and determined that these reasons cause brand alienation, negative expressions and brand retaliation.

Speculative Framework

The Relationship between Negative Past Experience and Brand Hate

There are different factors causing brand hate in the literature. Because hatred is a psychological concept, psychological factors causing consumers to avoid a brand is evaluated thro-

ugh consumer perceptions and beliefs. One of these is the negative experiences that consumers have with the brand. Yoon (2013), state that by negatively affecting the perceptions of consumers, negative consumer experiences increase the tendency to avoid the brand. Yoon determined the reasons of brand hate as negative past experiences with the brand, corporate mistakes and image unconformity. Winchester and Romaniuk (2008), analyzed brand experiences of consumers and negative beliefs through tendencies to associate them with the brand and found that consumer using the brand in the past mostly tend to produce negative beliefs towards the brand. Ahmed and Hashim (2018) examined the precautions (apology, compensation and explanation) to decrease brand hate in consumers who have negative experiences with the brand and found that these precautions have a corrective effect on brand hate caused by bad experiences. Hegner et al. (2017) draws attention to negative past experiences as one of the most important determinants of brand hate. According to the study, negative past experiences with the brand is a reason for the consumer to ignore the brand Bryson et al. (2013) emphasizes the dissatisfaction caused by brand experience as the underlying reason of brand hate (as cited in Karlsson and Rodrigues, 2015: 8). Kucuk (2016) found that negative past experiences negatively affect customer loyalty. De Castro Almeida (2018), state that consumers feel hatred when they perceive the brand negatively and that negative past experiences and ideological unconformities are among the most important determinants of brand hate. In their study on consumers with brand hate against Apple, Rodrigues et al. (2021) found that negative past experiences positively affect brand hate.

In the light of the studies made on the relationship between negative past experiences and brand hate, the following hypothesis was developed

H_1: Negative past experiences have a positive effect on brand hate.

The Relationship between Poor Relationship Quality and Brand Hate

Understanding the risks that comes from the negative relationship between brand and consumer has increased the number of studies made on this field (Hegner et al., 2017; Alvarez and Fournier, 2016; MacInnis and Folkes, 2017). Hashim and Kasana (2019: 233) state that the effect of poor relationship quality on brand hate has been unfortunately ignored; however, relationship quality is a significant cause of brand hate. Relationship made with a brand guides perceptions, feelings and behaviors towards the brand. Negative feelings towards the brand emerge undesirable results for businesses like hatred or despise attributed to the brand (Fournier and Alvarez, 2013: 259). Fournier and Alvarez (2013), emphasize that negative perceptions in consumers' relationships with a brand are more important that positive perceptions and therefore surviving and avoiding risks are only possible through managing negative relationships. This assessment reveals the connection between brand hate, which is a result of negative perception towards the brand, and relationship quality. Hegner et al. (2017)

emphasize that negative relationship between consumers and brands, and negative past experiences are important causes of brand hate. Zarantonello et al. (2016) emphasize that brands are under threat because of poor relationship quality and that as long as negative relationships continue brand hate will not be eliminated. Grégoire et al. (2009) studied the effects of time, relationship strength, consumer revenge and online complaints on brand alienation and found that even though the feeling of revenge decreases, brand alienation keep increasing and this triggers the tendency of consumers to hold a grudge (hate) against the brand. Similarly, Gregoire and Fisher (2006) studies the effects of relationship quality on consumers' intention to retaliate. The results of the study show that consumers who perceive high relationship quality has less tendency to retaliate than the ones who perceive a poor relationship quality. However, results also show that strong relationship quality only prevents retaliation when consumers think that they have little control over service failure, and they think they are responsible. Islam et al. (2020) stated in their study on smartphone users that poor relationship quality positively affects brand hate.

In the light of the studies made on the relationship between poor relationship quality and brand hate, the following hypothesis was developed

H_2: Poor relationship quality has a positive effect on brand hate.

The Relationship between Rumor and Brand Hate

Psychologists say that in addition to moral violations factors like negative rumors, disrespectful behaviors and abuse of emotions or betrayal also affect the feeling of hatred towards an object (Zarantonello et al., 2016). Consumers can take others as reference for their purchasing decisions. In other words, they can use the choices and evaluations of others as tips while they are making their own decisions. Therefore, negative messages, rumors etc. can be determinative in preferability and sales of a brand or a product (Huang and Chen, 2006). Social psychologist Kapferer, state that the biggest effect of rumors about a brand is damage threat; however, not all rumors have the potential to damage a brand and in order to protect brand balance and prevent hate, rumors have to be managed (Kapferer, 2004). Kucuk (2016: 40), state that consumers who symbolically hate a brand are greatly affected by rumors and instead of searching for the reality they develop myths that would reinforce the rumors, like; "everyone hates this brand and therefore I should hate it too". Kaniewska-Sębave Pająk-Patkowska (2017: 57), state that consumers who use hateful statements about the brand have a higher possibility to join the dissatisfied customers in social networks who are troubled with the brand. Kimmel and Audrain-Pontevia (2010), state that information shared by businesses during information exchange in market and rumors caused by the perceptions of the opposite party, pose a significant threat for the name of the brand. Thompson and Ward (2008) found that rumors about a new product are gradually spread among consumer groups and cause a

negative impact in consumer groups. Chong et al. (2019), found that rumors about iPhones that were spread between 2002-2019 have increased the impact of Apple in share prices and that rumors about the appearance of iPhones (especially positive rumors) have a significant effect on share prices. Hashim and Kasana (2019) in their study on fast-food sector, found that negative past experiences, rumors, poor relationship quality and symbolic uniformity cause brand hate, and especially rumor is a significant factor in the formation of brand hate. Kesse et al. (2021) stated that the strongest effect of brand hate is rumor and a single rumor can harm even the most famous brands (eg McDonald's and P&G).

In the light of the studies made on the relationship between rumor and brand hate, the following hypothesis was developed

H_3: Rumor has a positive effect on brand hate.

Methodology

Sample and Data Collection

The population of the research consists of consumers who have experienced with Fast Food chains in Turkey and who have e negative idea about them after consumption. Because the research population is too wide, it is impossible to reach the whole population. Therefore, sampling method was used. From non-probability samples, convenience sampling method was used. According to Krejcie and Morgan (1970), when the population is over 10.000, 387 sample is considered sufficient at 0,05 significance level and error margin. Sample number was determined as 433 considering that it would represent the population. Questionnaire forms were distributed online (via Google forms, e-mails and other social media networks).

Questionnaire consists of two parts. The first part consists of questions regarding demographic features of the participants like gender, age, education, marital status and income status. The second part consists of 4 questions to evaluate negative past experiences (Hegner et al., 2017), 5 questions to evaluate poor relationship quality (Chen and Myagmarsuren, 2011), 12 questions (Kimmel and Audrain-Pontevia, 2010) and 6 questions to evaluate brand hate (Hegner et al., 2017). The questionnaire is a 5-point Likert scale and it includes items with statements ranged from strongly agree (1), strongly disagree (5).

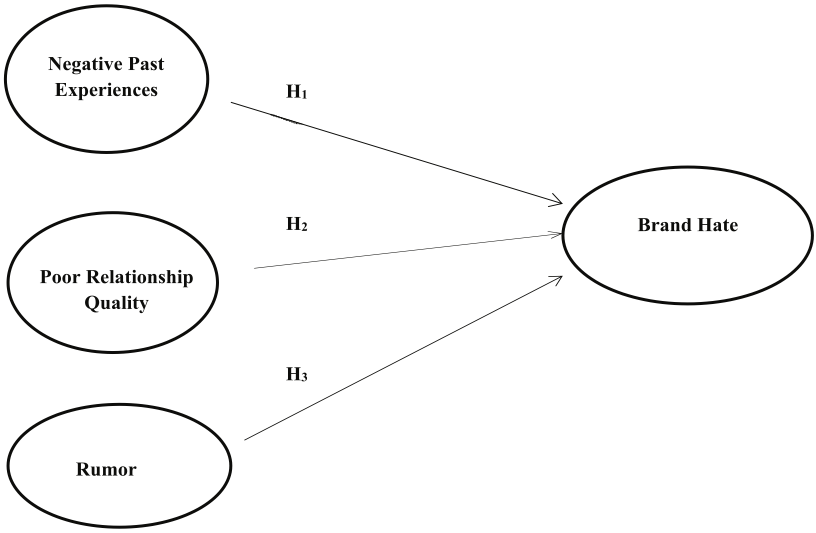

Figure 1. Research proposed model

Data Analyses

SPSS and AMOS statistical programs were used to calculate the validity and reliability of the questionnaires and to test the hypotheses. Normality results were examined to determine which tests would be used to calculate the hypotheses that were aimed to be measured (See Table 2). The skewness and kurtosis values were calculated to determine the normality of the expressions of the variables. It is expected that the skewness and kurtosis values are within the limits of -3 and +3 (Shao, 2002) in order to say that the expressions of the scale show normal distribution. When the normal distribution scores of the expressions of the variables are examined, they were found to be within the desired range. Parametric tests were used to test hypotheses in the research.

In order to determine Cronbach's Alpha values and internal consistency, compsite reliability was calculated while for construct validity, factor loadings and average variance extracted (AVE) was calculated (Bagozzi and Yi, 1988; Hair et al, 2012). The square root of the AVE values were calculated to determine discriminant validity (Fornell and Larcker, 1981). Structural Equation Model in AMOS was used to test the hypotheses, variance inflation factor-(VIF) and coefficient of determination (R^2).

Results

Participants Profile and the Measurement Model

In this part of the study, demographic features of the Fast Food consuming customers were analyzed and then correlation analysis results were reported. Afterwards, structural equation

model analysis results were reported and interpreted. Demographic features of the participants are presented in Table 1.

Table 1
Frequency Analysis

Demographic Variables		**Frequency**	**Percentage**
Gender	Male	216	49,9
	Female	217	50,1
Age	18-24	192	44,3
	25-34	124	28,6
	35-44	103	23,8
	45-54	14	3,2
Marital Status	Married	207	47,8
	Single	226	52,2
Education Status	High School	95	21,9
	Associate Degree	195	45,0
	Bachelor's Degree	129	29,8
	M.D/ PhD	14	3,2
Income Status	Very Low	43	9,9
	Low	94	21,7
	Middle Class	261	60,3
	High	16	3,7
	Very High	19	4,4
Negatively Thought Fast Food Chain	McDonald's	118	27,3
	Domino's Pizza	38	8,8
	KFC	41	9,5
	Burger King	54	12,5
	Popeyes	18	4,2
	Subway	20	4,6
	Usta Döner	26	6,0
	Tavuk Dünyası	35	8,1
	Çiğköftem	26	6,0
	All	41	9,5
	Others	16	3,7
Total		**433**	**100**

216 (49,9%) of the participants are male, 217 (50,1%) of the participants were female. 44,3% of the participants (n: 192) are aged between 18-24. Fewest age range is 45-54 (n: 14). 45% of the participants are associate degree students (n: 195). 60,3% of the participants are middle class (n: 261). The answers to the question "Which of the Fast Food chains do you have a negative opinion against?" were mostly McDonald's (n: 118).

The reliability of the research model was determined by CA values and internal consistency was calculated using CR. Fornell and Larcker (1981) and Hair et al. (2019) stated that CA and CR values have to be over 0.70. The reliability and validity table shows that the results are above the specified limit. These results confirm that all latent variables given in the proposed model are reliable and have internal consistency.

Factor loadings and AVE values were calculated to determine the convergent validity of the variables. Factor loadings of the expressions (Kaiser, 1974) and the AVE values of the variables (Hair et al., 2019) were above 0.50, thus ensuring the convergent validity of the research model.

Table 2

Validity and Reliability

Variables		**S.**	**K.**	**CA**	**CR**	**AVE**	**Faktor Loadings**
Negative Past Experiences	NPE1	-,286	-,627	,85	,89	,69	,721
	NPE2	,145	-1,130				,668
	NPE3	-,458	-,472				,838
	NPE4	-,573	-,114				,819
Poor Relationship Quality	PRQ1	-,385	-,521	,85	,89	,63	,808
	PRQ 2	-,450	-,366				,785
	PRQ 3	-,390	-,254				,783
	PRQ 4	-,804	,154				,620
	PRQ 5	-,821	-,029				,651
Rumor	RUM1	-1,820	2,706	,93	,94	,59	,705
	RUM 2	-1,692	2,408				,697
	RUM 3	-1,661	2,149				,672
	RUM 4	-1,251	1,992				,786
	RUM 5	-1,009	1,215				,770
	RUM 6	-1,039	1,408				,802
	RUM 7	-1,144	1,529				,761
	RUM 8	-1,204	1,723				,789
	RUM 9	-,953	,646				,814
	RUM 10	-,932	,522				,761
	RUM 11	-,927	,563				,744
	RUM 12	-,250	-,605				,577
Brand Hate	BH1	-1,486	1,524	,92	,94	,72	,882
	BH 2	-1,609	2,116				,926
	BH 3	-1,524	1,851				,924
	BH 4	-,773	,441				,695
	BH 5	-,764	,066				,652
	BH 6	-,587	-,434				,640

S: Skewness; K: Kurtosis; CA: Cronbach Alfa; CR: Composite Reliability; AVE: Average Variance Extracted

The discriminant validity analysis was tested by comparing correlations with the square root values of AVE. In the AVE square root values (bold values) in Table 3, each intersecting structure should have a higher value than the intersection of other hidden variables (Garson, 2016).

The results show that the square root values of AVE are higher than the correlation coefficients. The proposed model was found to meet the criteria determined by discriminant validity analysis.

Table 3

Mean, standard deviation and discriminant validity

Variables		Mean	SD	1	2	3	4
1	Negative Past Experiences	3,22	,870	***0,831***			
2	Poor Relationship Quality	3,52	,866	,608	***0,796***		
3	Rumor	3,85	,782	,582	,700	***0,773***	
4	Brand Hate	4,00	,922	,625	,655	,789	***0,852***

Note: The results written in bold numbers in the sections of each scale refer to the square root of the AVE Values

After calculating the goodness of fit values of the research model, it was determined that the research model has a good goodness of fit.

Table 4

Model Fit Indices

	χ^2	DF	χ^2/DF	GFI	CFI	TLI	RMSEA
Criteria			**≤5**	**≥,85**	**≥,90**	**≥,90**	**≤,08**
	1070,208	310	3,452	0,84	0,91	0,90	0,075

After the measurement model was completed, the structural model was analyzed. Model, which was developed with negative past experiences, rumor, poor relationship quality and brand hate, was tested using AMOS package program. Evaluation of the results of the structural model includes the analysis of the predictive ability of the model and the relationships between different structures (Hair et al., 2017). Structural model evaluation is also known as internal model evaluation as it examines the relationship between latent variables. This stage begins with checking the structural model for the linearity problem and continues with the evaluation of the relationships and path coefficients in the structural model. Table 5 presents the VIF values of the structural model. When a VIF value higher than 3 at the factor level, it is an indicator of both linearity problem and common method bias (O'brien, 2007). Since there was no VIF score above this threshold in the model, there are no linearity and bias problems in the model. The R^2 value was examined for its predictive power. R^2 is the coefficient showing what percentage of the exogenous variables explain the endogenous variables (Hair et al., 2019). Yıldız (2021) stated that R^2 values can be between 0 and 1 and that higher values will show higher accuracy in the predictions. The exogenous variables explanation rate of brand hate was found to be 67%. The results are shown in Table 5.

Table 5

Structural Equation Model Regression Weights

Variables		Estimation	S.E.	t	P	VIF	R^2	Result
H_1 N.P.Experience	Brand Hate	0,222	0,071	3,124	0,02*	*1.719*	*0.67*	*Accepted*
H_2 P.R.Quality	Brand Hate	-0,013	0,071	-0,183	0,855	*2.226*		*Declined*
H_3 Rumor	Brand Hate	0,884	0,089	9,903	0,00***	*2.122*		*Accepted*

*p=<0.001***; p=<0.01**; p= <0.05*; N.P.Experience: Negative Past Experience; P.R.Quality: Poor Relationship Quality; SE: Standard Error; VIF=Variance Inflation Factor*

Path analysis results show that model is acceptably fit (Chi-square: 1038,847; d.f. 309; p<0.001; RMSEA: 0.074; NFI: 0.89; CFI: 0,92; IFI: 0,92; TLI: 0,91).

Path analysis show that negative past experience has an effect on brand hate. The relationship between negative past experience and brand hate is statistically meaningful (p<0,05). Brand hate positively affect negative past experience. Therefore "H_1: Negative past experiences positively affect brand hate" hypothesis was accepted. Path analysis results show that there is not a meaningful relationship between poor relationship quality and brand hate. In this regard "H_2: Poor relationship quality positively affect brand hate" hypothesis was declined. Results show that rumor has an effect on brand hate. In this regard the relationship between rumor and brand hate is statistically meaningful (p<0,001). Brand hate positively affect rumor. Therefore, "H_3: Rumor positively affect brand hate" hypothesis was accepted.

Conclusion and Discussion

This research studies the effect of negative past experiences, poor relationship quality and rumor on brand hate. These reasons for brand hate essentially emerge from consumer experiences and perceptions. The study was conducted on consumers who have consumed fast food before and have negative thoughts towards these fast food brands. Fast food consumption is more among young and middle-aged people. Demographic data of the study also show that most of the participants are aged between 18-44. This result is not surprising because it is common knowledge that young and middle-aged consumers, who are active in working life (job, studentship), have turned fast-food consumption into a consumption culture due to time restrictions and economic reasons. In addition, consumers in this age category are more active in using communication technologies that older consumers. Thus, consumers can reach a wider scale of brands, can compare them and can have an idea about negative/positive experiences of other consumers. In other words, consumers in this category have different and intense feelings depending on the frequency of encountering with the brand and experiences, and they are more certain of themselves than consumers above middle age.

Consumers, who consumed fast food and developed negative feelings towards them, were asked questions about the experiences they had gone through and the reasons behind them. Analyses show that negative past experiences positively affect brand hate. This result is consistent with the studies in the literature (Yoon, 2013; Winchester and Romaniuk, 2008; Ahmed and Hashim, 2018; Hegner et al., 2017; Bryson et al., 2013). Researchers draw attention to negative past experience among the factors that cause brand hate. Additionally, this result is a tip for businesses to focus on consumer experiences. Detecting the experiences that cause negative feelings in consumers, facilitating cognitive efforts, taking solution-oriented precautions, improving product qualities and consumer feedback mechanisms are considered beneficial in this context, because experiences with the product and the brand will affect consumer willingness and behaviors (repurchase, overpaying). A rational consumer would

not be willing to repurchase a product that s/he had a negative experience with unless it is a monopoly. This way, the future, profits and continuity of the business will be damaged.

Negative experiences will affect how consumers share their experiences with the product or brand. The negative experiences shared pn different platforms will cause many potential customers to avoid the businesss and therefore affect the sales and decisions of the business negatively. Another danger here is that some consumers can avoid the brand based on the negative experiences of others and can defame the brand even though they have never experienced with it before. This makes it more difficult for businesses in terms of determining their target market in a competitive environment. The results of the study show that a significant number of the the fast-food consumers are of the young and middle-aged people. Considering that this influence group is more effective on reference circles and they use communication technologies more effectively, businesses should be very careful towards negative experiences.

Another result of the study is that rumor positively affect brand hate. This result is consistent with other studies (Zarantonello et al., 2016; Kapferer, 2004; Kucuk, 2016; Kaniewska-Sęba and Pająk-Patkowska, 2017; Kimmel and Audrain-Pontevia, 2010; Hashim and Kasana, 2019). The effect of rumor on brand hate show that rumor spreads hate about a product or a brand. This situation can cause a dangerous outcome for the businesses. The fact that perceptions regarding the product is negative is a strong reason for the consumer to avoid the product. In situations like this it is suggested for businesses to use communication technologies effectively and use informative or rather amendatory messages (if possible, through personalized messages) regarding the factors causing rumors. Inaction can make hatred permanent by strengthening the perception that the consumer is "being ignored". Especially, taking actions against the source and means of spread of the rumor can turn rumor into positive communication. For example, when a consumer causes a rumor by saying that the products used in X business are out of date, reaching other customers and sending messages that the rumors are groundless would at least help potential customers to not be alienated from the brand. Hashim and Kasana (2019: 240) state that businesses can reduce the negative effects of rumors about the product/brand by taking part in social an environmental responsibility projects and therefore decrease the number of consumers experiencing brand hate.

It is recommended that businesses have some strategies so that the rumor does not turn into gossip and destructive emotions such as hatred over time. It is important to follow the opinions and suggestions on physical or digital platforms. Identifying dissatisfactory factors and providing feedback on corrective measures as soon as possible will, thus, prevent the rumors from getting bigger and bigger. Another strategy that can be applied by businesses is to instantly response in the face of rumors. In this case, the best method is to explain to all customers on digital platforms that the rumor is false. This can be achieved by creating a strong customer database. Having at least the contact information of customers, learning their

age range and even their tastes with the customer order tracking system can provide information to businesses about the measures they can take in the face of rumors. Another strategy is to have and effectively use means of communication that would increase the quality of the relationship. Strong communication will ensure that the business is aware of the rumors even before they emerge thanks to messages, e-mails and other forms of communication. What the businesses should focus on at that point, is to note the distinction between rumor and complaint. Failure to follow the complaints will make rumors and gossip inevitable. Businesses have to resolve complaints in order to eliminate rumors.

The most remarkable result of this study is that poor relationship quality does not have a positive effect on brand hate. This result shows that while negative past experiences and rumor can be causes of brand hate, poor relationship quality is not one. In other words, participants do not pay attention to poor relationship quality in the formation of brand hate. Hashim and Kasana (2019) in their study on the causes of brand hate, state that the causes of brand hate should be evaluated differently, for example, efforts make to reduce the negative effects of past experiences will not change the effects of rumor or relationship quality on hate. This assessment proposes that each cause should be evaluated on its own. Moving from this fact, different reasons can be put forward regarding this result. Fournier and Alvarez (2013: 259), state that the relationship with the customer create positive/negative feelings about the brand. In addition, quality perceptions of consumers regarding service would be compared with the sacrifices and thus relational perceived value will be formed (Liljander and Strandvik, 1995). The fact that participants of this study do not have certain perceptions regarding relationship quality may have inhibited the formation of a negative result like hate. In other words, it can be said that expectations and perceived values regarding the product are not formed yet. In addition, participants may have focused on atmospheric factors like employers, ambience, aesthetics and view instead of relationship quality. On the other hand, according to Zarantonello et al. (2016) if poor relationship quality is continuous, it can crate brand hate. Participants in this study may never have a poor relationship quality perception or even though they had before it had diminished for such a long period of time that it is not considered as a cause for brand hate. Lastly, participants may not have though relationship quality as a reason for brans hate depending on their personality traits expectations, beliefs, behaviors etc. The numbers of the reasons for this issue can be increased; however, it is suggested for fast food restaurants to focus on rumor and negative past experiences more than relationship quality in order to avert brand hate.

Like all studies, this study also has its limitations. This study is conducted only on the perceptions of consumers regarding fast food sector. It is suggested that there should be more studies on different sectors in the future. Another limitation of the study is about the sample number. This study reached 433 consumers. If more consumers are reached in future studies, study results would be more valuable. Conducting future research in different cultures and ge-

ographies will be important in terms of comparing the results of this study. Lastly, this study approaches negative past experiences, poor relationship quality and rumor as causes of brand hate. It is believed that if future studies are conducted on different variables creating brand hate, they will provide hate literature with more comprehensive and original information.

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RESEARCH ARTICLE

Bibliometric Analysis and Mapping of the Benefits and Challenges of Cloud ERP Systems

Önder Şahinaslan[1], Ahmet Şahin[2], Ender Şahinaslan[3]

Abstract
Enterprise resource planning is an effective tool in achieving management goals. Cloud ERP systems and applications are platform-independent offerings of this management tool in a cloud environment. This study was carried out to make sense of the advantages, difficulties and relationships of the cloud ERP system with scientific studies. For this purpose, the Scopus, Web of Science and Google Scholar databases and the Publish or Perish, WOSviewer and Excel applications were used. Statistical analysis, text mining, word network association, visual mapping and trend analysis were performed. As a result of the analysis, it was found that the total rate of publications produced in the last 3 years was 43%, the most cited work was Springer (20%) and the country was the USA (10%). It was determined that the three most frequently used keywords were 'cloud ERP', 'ERP system' and 'ERP'. A strong correlation was found between 'study' and 'challenge' in text mining. The challenge was closely related to 'SMEs', 'data', 'provider', 'technology', 'literature' and 'cloud environment'. In recent studies, the concept of 'cloud ERP implementation' in SMEs has come to the fore.

Keywords

Cloud ERP, Information Systems, Bibliometric Analysis, Text Mining, Visual Mapping

Introduction

Today, technological progress and developments cause radical and rapid transformations in business processes and applications (Sahinaslan and Sahinaslan, 2021). With the developments in Industry 4.0, internet of things and digital technologies, the demand for these technologies is increasing exponentially (Şahinaslan, 2020). Companies are becoming more dependent on the opportunities and innovations offered by information technologies day by day. On the other hand, the success of factors such as quality, efficiency, speed and cost in global competition is directly proportional to technological innovation and timely adaptation to opportunities. Keeping up with technology also offers the chance to react positively to change and seize opportunities. Along with the transition and transformations to current digital technologies, many traditional processes and practices applied in company management

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are evolving into radical changes and transformations. In this process of change, companies use up-to-date technological tools and practices to move from traditional management models to modern management models. Since the rapid development of technology is also reflected in information technologies, companies develop software and systems that solve their own needs in keeping up with this development and integrate them into their organizations.

Companies move forward more confidently into the future by being inspired by the historical process, constantly renewing and developing. Today, when many new businesses are established, some of the businesses are also closed. The existence and continuity of both newly opened businesses and existing businesses depends on the institutional management of the enterprises, their keeping up with the economic and social developments, and the use of information at the right time and place at the most affordable cost. Enterprise resource planning (ERP) is the general name of the system and application software developed for the effective management of the corporate processes of planning, procurement, design, production and distribution of the resources of an enterprise. With ERP, all data and information used by managers, employees, suppliers, customers, in short, all units and relevant persons who are connected with the business and deemed necessary, can be managed from a central point and automatically obtained and conveyed to the relevant places (Arı and Diri, 2019). Thus, all corporate resources and processes of the enterprise are controlled and managed through a single application. ERP application, on the one hand, contributes to the prevention of losses caused by human mistakes in enterprises, and on the other hand, it saves time and money by using the resources of the enterprises effectively and efficiently. This is an important advantage for businesses to compete globally in today's market conditions.

The concept of cloud computing refers to a new approach to the provision and use of information services (Seyrek, 2011). Cloud ERP is the general name given to running the ERP system and application on a solution provider's virtual server, not on the local business network. Today, cloud ERP solutions that serve SMEs over cloud computing infrastructures are offered. ERP solutions integrate and automate key financial and operational business processes wherever possible. It provides resources to identify assets such as people, goods, money, maintain inventory, and manage ordering, procurement, and delivery processes and performance to keep the procurement, production, and distribution processes running effectively. In an ERP system, where all these processes and resources work in an integrated manner on a corporate scale and their online performance needs to be observed, all users need easy access to this system to operate. Cloud-based ERP software and application offer a solution in meeting this need. In this structure, businesses access their software over the Internet, so all they need is an internet connection and a browser (Sarıtaş, T., Üner, N., 2013). Cloud ERP solutions offer the same or even more flexibility and functionality in terms of operation and cost advantages as in-house systems provided to businesses by traditional ERP software service providers. On the other hand, rapidly developing technology brings with it some weaknesses

or incompatibilities (Sahinaslan E. , 2019). In this respect, when deciding to use a new technology in a field, the opportunities, benefits and, if any, negative effects of technology should be investigated. This research can be obtained from academic studies in that field as well as experimental studies. Examining the written literature in a certain time period, analysing the topics and relationships are important for due diligence. The findings obtained from these studies also reveal how the researched subject has developed over time. Thus, it contributes to the identification of a problem or difficulty and to understanding its root causes. Bibliometric is the analysis of the relations between the studies produced by the determined people and institutions in a chosen field and period (Tabur, 2021). Examining bibliometric studies is a very effective and widely used method in order to have an idea about the subject by seeing the studies in the field as a whole (Şentürk and Fındık, 2015). Bibliometric techniques have shown a significant improvement over time and guide researchers in performing a detailed and more effective measurement (Akgün and Karataş, 2017). Bibliometric is also used in mapping and visualizing the results of analysis of relationships between academic studies in different disciplines. Web of Science and Elsevier Scopus are widely used databases in bibliometric analysis studies (Mongeon and Paul-Hus, 2016).

With up-to-date cloud technology, cloud ERP is offered as a useful solution for businesses. However, many difficulties and risk concerns complicate the transition of institutions to this technology. Revealing the opportunity, challenge and technological trend will facilitate the technological transformation of these institutions. On the other hand, although there are limited studies on the benefits and challenges of cloud ERP, no bibliometric analysis study has been found in this area. The lack of any bibliometric studies on this subject, which has become very popular especially for SMEs today, is our main motivation for starting this study. In this study, the Elsevier Scopus and Web of Science (ESCI) database and the Publish or Perish application, in which international scientific studies are indexed and comprehensive data on prestigious researches are shared, were used. Statistical and bibliometric data analysis was performed on key data related to Cloud ERP advantages and challenges. The sources identified in the study were classified in areas such as subject, author, institution, country, keyword, and citation, and statistical analyses were made. In addition, scientific field mapping, visualization and trend analysis studies were carried out using the VOSviewer application, and certain findings and results were achieved.

Literature Review

Major studies have been carried out to reveal the advantages and challenges of Cloud ERP. Among these studies, Saini et al. listed the advantageous areas of cloud ERP as fast adaptation, scalability, advanced technology, and easy integration, while they stated security risk, functional limitations and subscription costs as disadvantages (Saini et al., 2011). Part-

hasarathy lists the advantages of cloud ERP as advanced technology, easy integration, fast adaptation, scaling, usage, while areas such as customization, data ownership, cost, IT employee competence, limited functionality are considered risky areas such as difficulty, compliance, security, and SLA (Parthasarathy, 2013). Peng and Gala list the advantageous areas of cloud ERP over ERP as fast installation and ease of updating, low cost of hardware and support, increase in system speed and performance, and ease of access from anywhere. In terms of difficulties, they list the difficulties experienced in the privacy and security of data, the problems arising from cloud providers in terms of service quality and legal compliance, insufficient management support due to the organization, internal communication, change management and business process integration difficulties (Peng et al., 2014). Albar and Hoque, in their research in Saudi Arabia, stated that cloud-based ERP systems emerged as a solution to the difficulties faced by the traditional ERP system. He stated that this new solution is more flexible and adaptable, provides financial gain, requires less upfront investment and can be implemented faster. As the difficulties arising from the cloud ERP system; security risk, integration and customization, limitations in some functions and cloud membership costs (AlBar and Hoque, 2015). Johansson et al conducted a study to identify the opportunities and concerns associated with enterprise-wide cloud ERP. They stated that SMEs and especially small companies benefit from them, most of the concerns are important for SMEs, on the other hand, they have a serious concerns because of the complex and different expectations for large organizations, and a hybrid solution for these can relieve the concerns of large organizations (Johansson et al., 2015). Scholtz and Atukwase emphasized that choosing a cloud ERP system over a traditional and familiar ERP system promises greater flexibility, better business efficiency and lower IT costs. However, he pointed out that despite these advantages, some of the companies still do not adopt cloud ERP, which is much higher in emerging markets such as Africa. He emphasized that one of the reasons for this was due to misperceptions arising from the lack of sufficient information about the benefits and difficulties of this system (Scholtz and Atukwase, 2016). Fayed et al, pointed out that artificial intelligence, block chain, IoT and sensors connected to this network produce real-time data on the source, capacity, forecast and performance of goods and materials, and classical ERP systems do not fully support such structures and innovations. It is emphasized that cloud ERP systems contribute to the strategic effort of the enterprise in terms of bringing this data together, reducing the work and satisfying the customer. According to research conducted on experienced individuals, they state that there are challenges to be overcome in artificial intelligence, machine learning, IoT and blockchain, which will have devastating effects in the near future (Fayed et al., 2020). In the study by Idoko, it was concluded that cloud ERPs have a significant impact on service quality, competitive advantage and corporate performance (Idoko, 2021).

Material Method

This study aims to investigate the extent to which the benefits and challenges of cloud ERP, which has come to the fore with cloud computing and have become increasingly popular in recent years, have been the subject of international academic studies. For this purpose, the Scopus, Web of Science and Google Scholar databases were used over the Publish or Perish application, which are popular databases. The tools and methods used in the study, the data analysis study process stages are discussed in this section.

Research Method and Design

In this study, the descriptive analysis method and content analysis from bibliometric quantitative research methods were used. The Publish or Perish (Harzing, 2016), Scopus (Scopus, 2021) and Web of Science (Science, 2022) databases were used as data sources. Studies obtained from these data sources as a result of certain criteria were subjected to preliminary examination and current academic studies on the subject were determined. Analysis, table, graphic and visual mapping studies were carried out using MS-Excel and VOSviewer applications. In addition, visual mapping and trend analysis in the Google Trends application were made on the key areas of the sources used in the study. The research method and design basic process steps are shown in Figure 1.

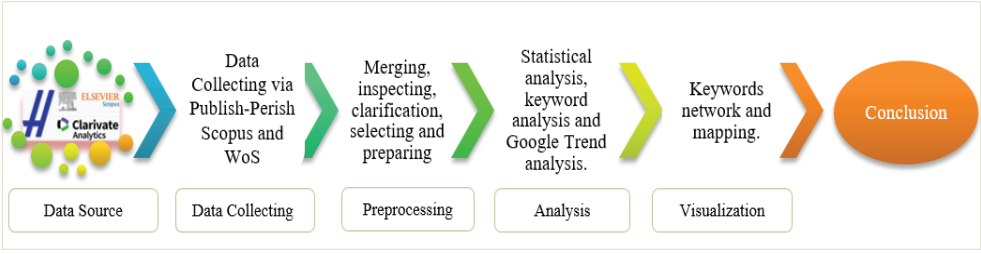

Figure 1. Study main process stage.

Collecting of Data

The collection of data constituting the source of the study started with the use of the Publish or Perish application. However, due to the limitations or difficulties experienced in obtaining records on the Scopus and Web of Science databases, Scopus and Web of Science's own application interfaces were used.

Application of publish or perish

It is possible to collect the desired data from sources such as Google Scholar and Scholar Profile, Microsoft Academic, Scopus, Web of Science (WOS), PubMed, Semantic Scholar,

OpenAlex by using the Publish or Perish application of Harzing. The databases that the application can search are shown in Figure 2.

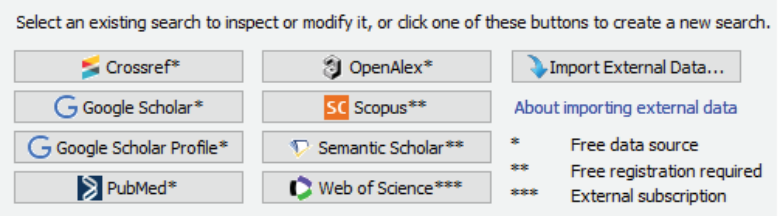

Figure 2. Application databases of Publish or Perish.

The Publish or Perish application includes a structured version of Scopus accepted parameters. A Scopus search is performed over these parameters and then analysed and converted into a set of statistics (Adams, 2017). The Publish and Perish program, which we use as a material, takes data from Google Scholar and calculates complex measures (Bensman, 2011). For searches to be made through this application, firstly, the database to be searched is selected. Then, on the screen that opens, a search is made by filling in selection parameters such as title, author, year, key field, and ISSN. It is possible to export the list obtained as a result of the search to environments such as MS Excel. This application was not preferred because prerequisites such as membership to the Scopus and Web of Science databases is required. Searches were made in the Google Scholar and PubMed databases, which are offered free of charge within the application. A screenshot of the search made in the Google Scholar database is shown in Figure 3.

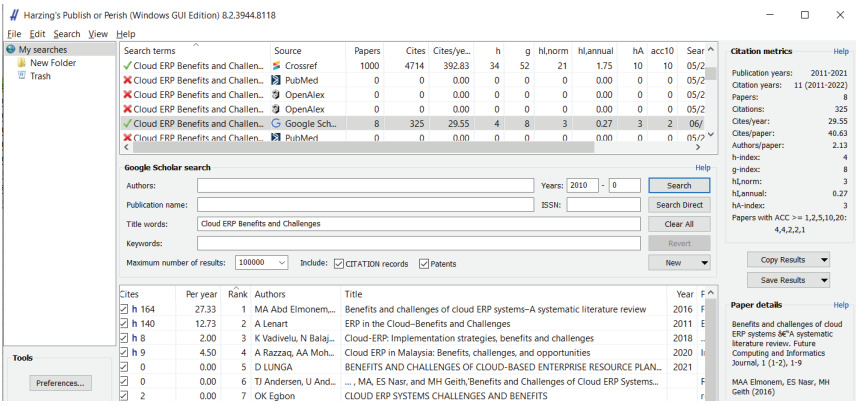

Figure 3. Search result of 'Google Scholar' on Publish or Perish.

The search term is used in the year field (2010 and later) and the title (Cloud ERP Benefits and Challenges). As a result of this search, data belonging to 8 academic studies published in English were obtained. A search of the PubMed database did not find any records. Thus, it

has been determined that a total of 8 articles obtained through the Publish or Perish application are related to cloud benefits and challenges. The data provided by the application such as the title, author, publisher, keyword, abstract, number of citations of these resources were collected in an Excel file.

Scopus database

The Scopus bibliometric database allows the simple or advanced searching of articles in the database using various keywords. The inquiry of the research was carried out over the internet. In the advanced keyword search, the "Cloud ERP" ("Benefits" OR "Challenges") and the "PUBYEAR > 2009" parameter are used in the "TITLE-ABS-KEY" field. The screenshot and result of the query are given in Figure 4. As a result of the query, 69 sources were obtained.

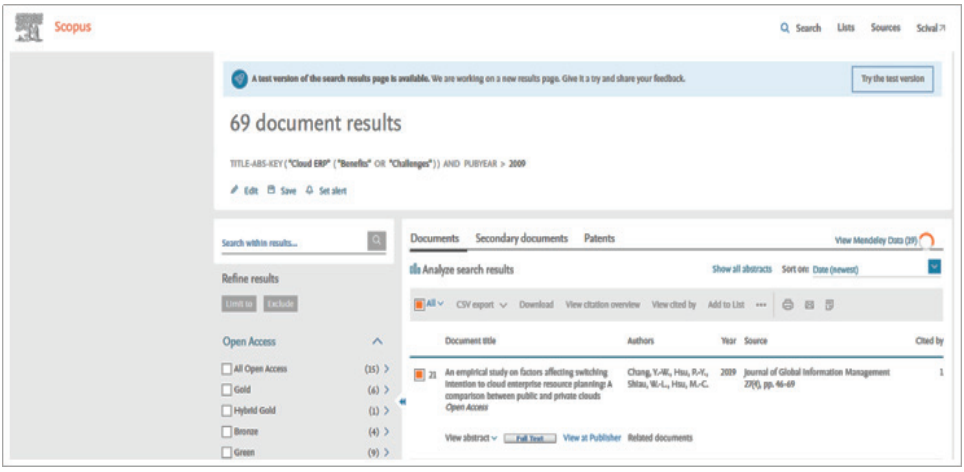

Figure 4. Screenshot of Scopus.

Web of Science database

Searching the Web of Science database ("Cloud ERP" ("Benefits" OR "Challenges") query was run. As a result of the query, 36 study data for 2010 and later were obtained. Certain fields were selected from the listed fields and exported to Excel. Screenshot of the query and the result is given in Figure 5.

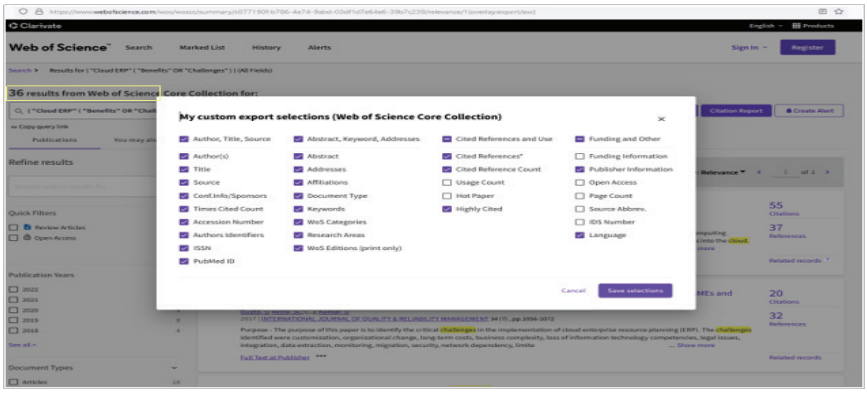

Figure 5. Screenshot of Web of Science.

Pre-processing of Data

A total of 113 reference study lists, which were obtained as a result of queries made through Google Scholar, Scopus and Web of Science databases through the Publish or Perish application, were combined into a single Excel file. In combining, attention was paid to collecting all data such as author, title, key field, abstract, number of citations, document type, source, year, and publisher under the same data field. The amount of raw data collected by years on the basis of the data sources obtained is shown in Table 1.

Table 1
Database distribution of raw data studies by years

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Google Scholar	1	-	-	-	-	2	1	1	-	2	1	-	8
Scopus	1	2	3	5	4	9	10	5	11	11	7	1	69
WOS	1	-	1	2	2	3	4	4	7	5	5	2	36
Overall Total	3	2	4	7	6	14	15	10	18	18	13	3	113

During the preliminary analysis of the data, each data field was subjected to a detailed analysis in terms of content. In the data obtained through the Publish or Perish application, it was seen that fields such as country, publisher, document type were empty. Incomplete data were completed by reaching the original of this study. In the preliminary examination made on the names and authors of the studies, it was determined that 3 studies were conference compilations and were removed from the study pool. It was determined that 33 of the remaining 110 studies were registered in different databases at the same time or in different document types in the same database. The document type-database match numbers of these resources are shown in Table 2.

Table 2
Document type-database match numbers of duplicate records

	Google Scholar	Scopus	Web of Science	Total
Article	2	16	16	34
Book Chapter	-	1	-	1
Conference Paper	-	14	-	14
Proceedings Paper	1	-	13	14
Review	-	2	2	4

Examples of duplicate records showing various differences in data areas are shown in Table 3. When these records are examined, it is seen that there are various differences in the title, country, number of citations and document type.

Table 3
Examples of duplicate records

Study	Country	Cited	Publisher	Doc. Type	Source
Cloud ERP: A new dilemma to modern organisations?	USA	55	Taylor & Francis Inc.	Article	WOS
	United Kingdom	70	International Association for Computer Information Systems	Article	Scopus
ERP in the cloud - benefits and challenges	Poland	46	Springer Verlag	Conference Paper	Scopus
	Germany	29	Springer-verlag Berlin	Proceedings Paper	WOS
	-	139	Springer	-	Google Scholar
Reducing integration complexity of cloud - based ERP systems	USA	2	Assoc Computing Machinery	Proceedings Paper	WOS
	Jordan	18	Association for Computing Machinery	Conference Paper	Scopus
The effect of status quo bias on cloud system adoption	USA	25	Taylor & Francis Inc.	Article	WOS
	Taiwan	27	International Association for Computer Information Systems	Article	Scopus

In the data deduplication studies belonging to the same title and author were evaluated among themselves. The evaluation was carried out on the data fields of each record such as author, publisher, key field and abstract, as well as the data fields in Table 3. In this evaluation, the most appropriate study was tried to be determined. While the selected study was kept in the study records, other duplicate records were excluded from the study. After these eliminations, a detailed analysis was carried out on the title, key area and abstract data of the remaining 76 studies. As a result of all this preliminary examination and analysis, it was

determined that 30 publications were directly related to our study subject. Statistical, bibliometric analysis, visual analysis and mapping of the study were carried out on the studies in this list.

Data Analysis

Statistical and bibliometric analysis studies were carried out on 30 study data fields written in English, which were determined during the data pre-processing phase. The term bibliometric, used as a data analysis technique, refers to mathematical analysis and models that appear in publications and documents. In bibliometric, documents in the scientific communication system are analysed using numerical and statistical techniques. Bibliometric deals with statistical analysis of scientific studies and data such as author, subject, citation, database, publisher, and country, and allows to make an inference and explain the situation in a particular field based on the statistical results obtained. In this sense, bibliometric variables for author, number of publications, number of citations, article source type, and keyword analysis were examined.

The VOSviewer package program was used in word analysis studies. This application is a free computer program used in bibliometric analysis and mapping studies (Van Eck, 2013). It was used to create visualization and density maps that facilitate better understanding and interpretation of datasets (Özköse and Gencer, 2017). In the study, word analysis and visualization studies were carried out in the fields of article title, keyword, abstract and author over 30 academic studies determined for bibliometric analysis. Google Trends analyses the queries on the Google internet search page and other related websites and presents the results obtained (Google, 2014). It allows downloading search results in certain formats so that users can further analyse their study. The Google Trends application provides the opportunity to analyse the access data collected in the internet search pool. It studies on an algorithm based on how many times a particular word or phrase is used in a Google search.

Visualization

As a result of the analysis studies on the study data, the MS Excel application and VOSviewer application for analysis, mapping and text mining on selected keywords were used for statistical analysis and visualization of the data. The Google Trends application was used for trend analysis and visualization.

Findings and Discussion

A total of 113 study data obtained separately from the Scopus (69), WOS (36), Google Scholar (8) databases were combined under a single Excel file. As a result of detailed examination and singularization studies on these raw data fields, 30 different studies on the subject

of the study were determined. Statistical and bibliometric analysis studies were performed on these studies presented in Table 4.

Table 4
Bibliometric analysis study resource publication list

No	Study Title	Pub. Type	Source	Year
1	Critical success factors and challenges for cloud ERP system implementations in SMEs: A vendors' perspective (Tongsuksai et al., 2021)	Conference Paper	Scopus	2021
2	Challenges of Cloud-ERP Adoptions in SMEs (Haddara et al., 2021)	Conference Paper	Scopus	2021
3	Cloud-Based ERP Systems Implementation: Major Challenges and Critical Success Factors (Shatat and Shatat, 2021)	Article	Scopus	2021
4	Cloud ERP in Malaysia: Benefits, challenges, and opportunities (Razzaq and Mohammed, 2020)	Article	Google Scholar	2020
5	Cloud ERP Systems Challenges and Benefits (Egbon, 2020)	Article	Google Scholar	2020
6	Understanding Cloud ERP Adoption Phenomenon: Large Organizational Perspective (Ahmed et al., 2020)	Proceedings Paper	WOS	2020
7	Implementation of cloud ERP in the SME: evidence from UAE (Alsharari et al., 2020)	Article	WOS	2020
8	An empirical investigation of organizations' switching intention to cloud enterprise resource planning: a cost-benefit perspective (Chang and Hsu, 2019)	Article	Scopus	2019
9	A Study on the Challenges of Implementing Cloud-Based ERP (Alharthi et al., 2019)	Conference Paper	Scopus	2019
10	Cloud ERP Adoption Pitfalls and Challenges A Fishikawa Analysis in the Context of the Global Enterprises (Bhadra et al., 2019)	Conference Paper	Scopus	2019
11	Difference Comparison of SAP, Oracle, and Microsoft Solutions Based on Cloud ERP Systems: A Review (Elbahri et al., 2019)	Proceedings Paper	WOS	2019
12	The main factors in analysing the deployment of Cloud ERP in order to create a competitive advantage (Costan and Pascu, 2019)	Proceedings Paper	WOS	2019
13	Creating Business Value from Cloud-Based ERP Systems in Small and Medium-Sized Enterprises (Hustad et al., 2019)	Conference Paper	Scopus	2019
14	Reducing integration complexity of cloud-based ERP systems (Muslmani et al., 2018)	Conference Paper	Scopus	2018
15	Critical Factors of Success ın ERP cloud Projects under the Aspects of Processes, System and Technology ın the Brazilian Busıness Context (Gheller et al., 2017)	Article	WOS	2017
16	An empirical study of technological factors affecting cloud enterprise resource planning systems adoption (Kinuthia and Chung, 2017)	Article	Scopus	2017
17	Data security issues in cloud-based Software-as-a-Service ERP (Saa et al., 2017)	Conference Paper	Scopus	2017
18	Identification of challenges and their ranking in the implementation of cloud ERP: A comparative study for SMEs and large organizations (Gupta et al., 2017)	Article	Scopus	2017

No	Study Title	Pub. Type	Source	Year
19	An Analysis of the Perceived Benefits and Drawbacks of Cloud ERP Systems: A South African Study (Scholtz and Atukwase, 2016)	Conference Paper	Scopus	2016
20	Benefits and challenges of cloud ERP systems–A systematic literature review (Abd Elmonem et al., 2016)	Article	Google Scholar	2016
21	Exploring the strategic alignment concern when switching toward cloud ERP (Mezghani, 2016)	Conference Paper	Scopus	2016
22	The effect of status quo bias on cloud system adoption (Fan et al., 2015)	Article	Scopus	2015
23	Cloud ERP adoption opportunities and concerns: The role of organizational size (Johansson et al., 2015)	Conference Paper	Scopus	2015
24	Implementation of cloud ERP: Moderating effect of compliance on the Organizational factors (Gupta and Misra, 2015)	Conference Paper	Scopus	2015
25	Cloud computing and ERP: A framework of promises and challenges (Zhong and Rohde, 2014)	Conference Paper	Scopus	2014
26	Cloud ERP: A new dilemma to modern organisations? (Alex Peng and Gala, 2014)	Article	Scopus	2014
27	Switching toward cloud ERP: A Research model to explain intentions (Mezghani, 2014)	Article	Scopus	2014
28	Cloud ERP query flow control simulation with quality restrictions and profit gaining criteria (Romanov and Varfolomeeva, 2013)	Article	Scopus	2013
29	Cloud ERP implementation challenges: A study based on ERP life cycle model (Iqbal et al., 2012)	Conference Paper	Scopus	2012
30	ERP in the Cloud–Benefits and Challenges (Lenart, 2011)	Article	Google Scholar	2011

Statistical Analysis

In this section, the distribution of the source studies used in the analysis study according to years, databases, type of publication, publishers, citation numbers and countries has been subjected to statistical analysis from various aspects. The data obtained as a result of the analysis are presented through the graphic or table representation obtained from MS Excel.

Number and rates of publications by years

The distribution chart of the studies carried out on the benefits and difficulties of the cloud ERP system by years is shown in Figure 6. When the distribution of a total of 30 selected studies between 2011 and 2021 is examined, the annual number of publications reached 3 since 2014, in parallel with the widespread use of Cloud ERP, this number increased to 4 in 2017, and it reached 1 in 2018.

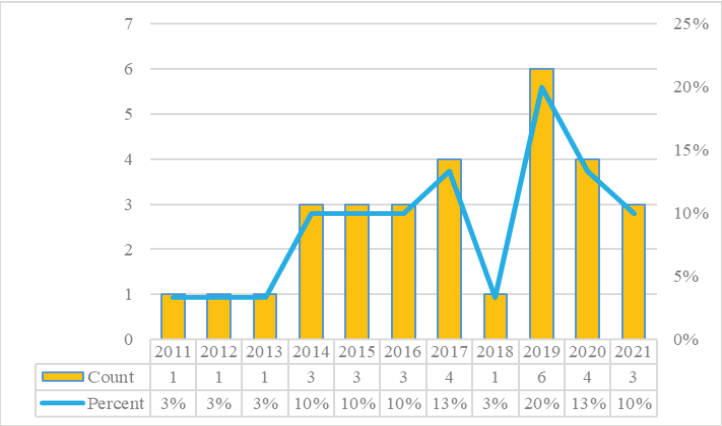

Figure 6. Number of publications by year.

It is observed that the highest increase was experienced with 6 units in 2019. In the same graph, when the percentages of the number of publications in the total are analysed, it is seen that it is at least (3%) and at most 20% in 2019, and at least 10% in recent years, excluding 2018. When analysed as a whole, it is observed that while the concept of Cloud computing and then ERP Cloud took place at a basic level (3%) between 2011 and 2013, which are considered the first years of its emergence, there was a rapid increase, and it remained popular except for 2018. It is noteworthy that the rate of 13 different publications in the last 3 years has been 43.33%.

Distribution by database and publication type

The research was carried out through the Publish or Perish application, Scopus, Web of Science and Google Scholar databases. The obtained studies were subjected to pre-processing and analysis. The studies by the same author published in different databases on the same subject were singularized, taking into account the number of citations and other field characteristics, and 30 main sources were determined. Their distribution by database is Scopus (n=21, 70%), Web of Science (n=5, 17%) and Google Scholar (n=4, 13%). The distribution of these studies by type of publication is article (n=14, 47%), conference paper (n=13, 43%) and proceeding paper (n=3, 10%).

Distribution by publishers

The distribution, number and ratio of studies by publishers are shown in Figure 7. Springer (n=5, 17%) has the most publications, IEEE (n=4, 13%) is in second place, and IACIS (n=3, 10%) is in third place. Elsevier shares the 4th place with Emerald and IGI Global publishers (n=2, 7%), while it shares the 5th place with the other publishers in the chart (n=1, 3%).

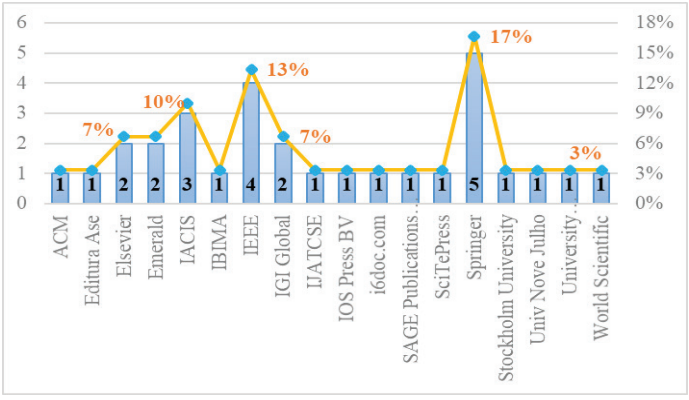

Figure 7. Number and rate of studies by publishers.

Distribution by Number of Citations

The year in which the studies were published and the total number of citations they received are presented in Figure 8.

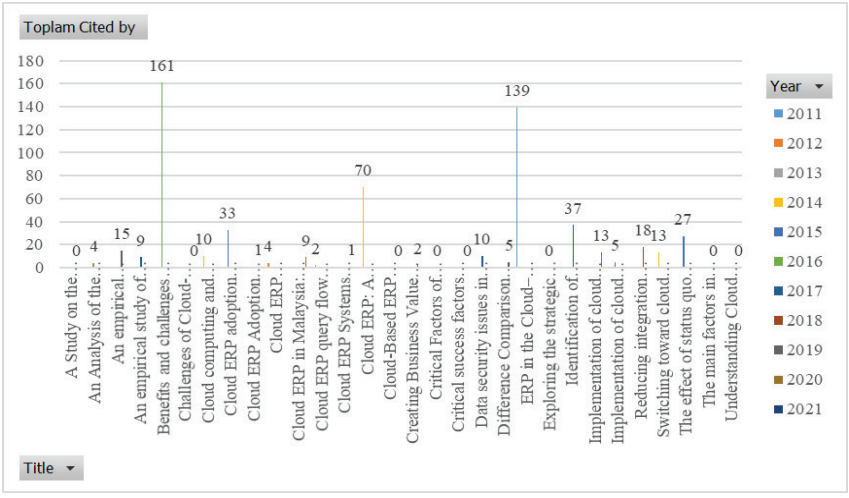

Figure 8. Number of citations per academic study.

When the graph is examined, the study named 'Benefits and challenges of cloud ERP systems–A systematic literature review' by (Abd Elmonem et al., 2016) took the first three places with a significant difference, with a total of 161 citations. The study named 'ERP in the cloud–benefits and challenges', published by (Lenart, 2011) in 2011, achieved a very high number compared to the others. The study named 'Cloud ERP: A new dilemma to modern organisations?', which was studied by (Alex Peng and Gala, 2014) in 2014, took the third

place with 70 citations. Due to the fact that some studies can be searched in both the Scopus and WOS databases, an approach that is the sum of the citations in the two databases could not be taken as the total citation sales. However, it is a fact that the total number of citations for this study will exceed the number specified here. Obtaining a DOI number for each publication may be a solution to avoid such confusion or duplication. It has been observed that 8 publications in total have not received any citations yet.

The number of publications produced on a yearly basis and the total number of citations received and their rates are shown in Table 5. According to the number of citations, there are 3 publications in 2016 (n=165, 28.06%), one publication in 2011 (n=139, 23.64%) and 6 publications in 2019 (n= 23, 3.91%). It is seen that 3 publications published in 2021 have not been cited yet.

Table 5
The number and rates of citations on a yearly basis

Pub.Year	Count	Cited by	Percent	Pub.Year	Count	Cited by	Percent
2011	1	139	23.64%	2017	4	56	9.52%
2012	1	4	0.68%	2018	1	18	3.06%
2013	1	2	0.34%	2019	6	23	3.91%
2014	3	93	15.82%	2020	4	23	3.91%
2015	3	65	11.05%	2021	3	0	0.00%
2016	3	165	28.06%				

Distribution by Countries

When the distribution of studies by country is analysed, the United States (n=3, 10%) ranks first, while India, New Zealand, Norway, Saudi Arabia and Taiwan (n=2, 6.67%) rank second. There is a study from Bahrain, Brazil, Canada, Egypt, England, Greece, Iraq, Jordan, Kazakhstan, Poland, Romania, Russian Federation, South Africa, Spain, Sweden and the United Kingdom. When the data is analysed, it is seen that broadcasting countries have a similar distribution worldwide, with at least one country from each continent and slightly higher in economically rich countries. On the other hand, it was found interesting that countries such as Germany, France, Italy, China, Japan and Turkey, which are in the developed country category, are not included in this list. It is thought that this may be due to the fact that the study was conducted in English publications. In addition, considering that the study has limitations in terms of subject, it is difficult to reach a definite conclusion about whether cloud ERP comparison is a matter of preference for countries. There is a need for a more comprehensive study in all languages in order to reach a stronger decision on this issue.

Visual Network Analysis and Mapping

The VOSviewer software was used in visual data network analysis and mapping studies. The article title, author keywords, and summary text words were used.

Author keyword analysis

Keywords of 30 academic studies were analysed through the VOSviewer application. Corrections were made in 65 key areas determined before the analysis that would not change the essence of the word. For example, the word 'enterprise resource planning' was written as ERP, the plural word SMEs was edited as SME. They are combined according to whether the keywords are synonymous or similar. In the word analysis phase, a total of 10 keywords were determined, of which at least 2 were repetitive. These keywords and their frequency of use are shown in Table 6.

Table 6
Keyword frequency table

Keyword	Frequency	Keyword	Frequency
Cloud ERP	17	Challenges	4
Cloud computing	12	Implementation	3
ERP	8	Saas	3
SME	5	Critical success factor	2
Adoption	4	ERP systems	2

When the first three rows are examined in terms of usage frequency, the term 'Cloud ERP' is repeated 17 times, the term Cloud Computing 12 times, and the term ERP' 8 times. On the other hand, the density map obtained through the program regarding the frequency of use of these keywords is shown in Figure 9.

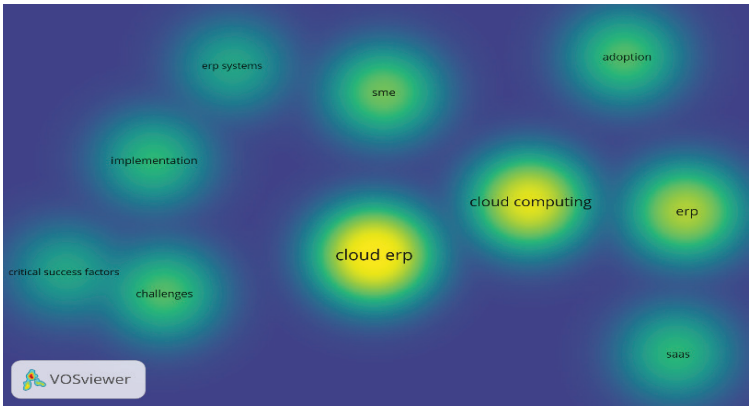

Figure 9. Keyword density map.

When the author keyword network is examined using the Vosviewer program, it is seen that the network constitutes the main centre of the relationship network on 'cloud ERP', 'cloud computing', 'ERP', 'Adoption' and 'SME'.

It is related to the frequency of each word used in the formation of the word network connection and density clusters in the keywords. It shows the most repeated word clusters

in the keyword density map. According to the density map created through keywords, the density based on 'cloud ERP', 'cloud computing' and 'ERP' is observed. It is seen that the cloud, Saas cloud service is clustered around ERP, and the subject of 'cloud computing' and 'cloud ERP' is highly dense and closely related. It can be referenced as a simple use for easy separation in user references.

The time map of author keywords based on text data is shown in Figure 10. The colouring of the words in the figure is according to the colour scale in the timeline. In other words, dark colours represent words followed by people who have been broadcasting in this field for years, and light colours represent new concepts.

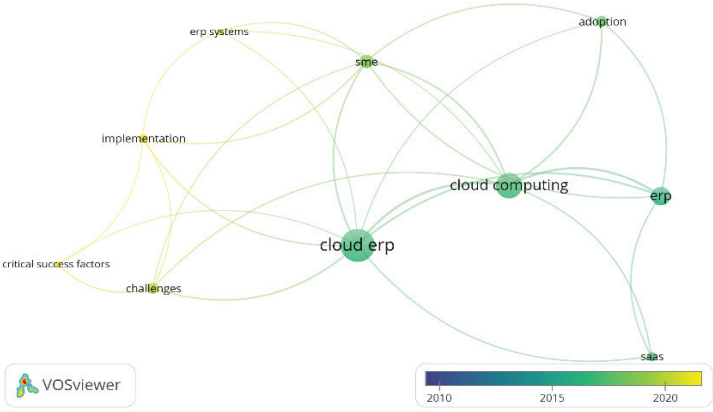

Figure 10. Time map of author keywords based on text data

The use of author keywords in publications from 2010 to the present (dark to light) is shown. In this timeline, ERP, cloud computing, cloud ERP in SME are listed as challenges and implementation, while 'critical success factors' come to the fore today.

Abstract Keyword Analysis

In the VOSviewer application, word analysis was carried out on the summary texts of the academic studies used in the analysis. A total of 698 different words were identified in the summary texts of 30 different academic studies. The number of times each of these words was used in the text was examined. As a result of this examination, it was determined that there were 20 different words with at least 5 or more repetitions. The list of these words and their repetition numbers are shown in Table 7. Challenge, factor and SME (small and medium-sized enterprises) are the three most used words.

Table 7
Abstract text word frequency table

Keyword	Frequency	Keyword	Frequency	Keyword	Frequency
Challenge	49	Literature	11	Cloud ERP adoption	6
Factor	23	Risk	10	Research model	6
SMEs	21	Business	9	Use	6
Adoption	16	Cloud enterprise resource planning	9	Cloud environment	5
Concern	16	Large organization	9	Cloud ERP implementation	5
Provider	14	Information	8	Order	5
Data	12	Security	8	-	-

A screenshot of the network map based on summary text data of the studies obtained is shown in Figure 11.

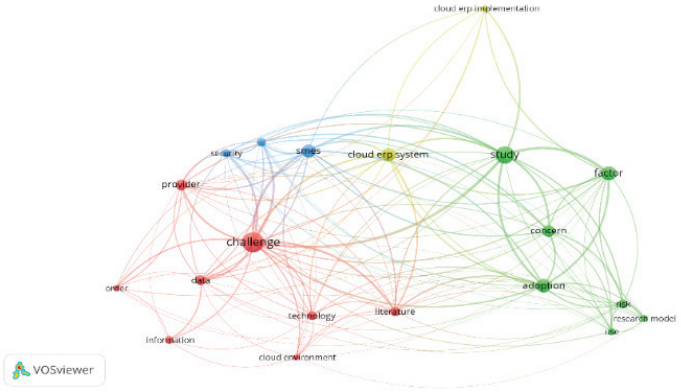

Figure 11. Abstract word network.

Challenge, factor, and SMEs are the most repetitive words, providing a network map of green, red, and blue words around these words. The strength of the relationship between words is effective in determining the colour class and proximity of the related term. The word 'Challenge' was the subject with the most connections, reached the highest frequency and stood out among the common clusters of 2.

The VOSviewer application also presents the usage intensities of the words in the texts in the form of mapping. The word density map made over the words in the abstract texts is shown in Figure 12. The reason for the brightness in the intensity is because that data is the most repetitive. The main purpose of this display is to see more clearly the areas where concentrations are experienced through word repetitions rather than the connection relationship between words.

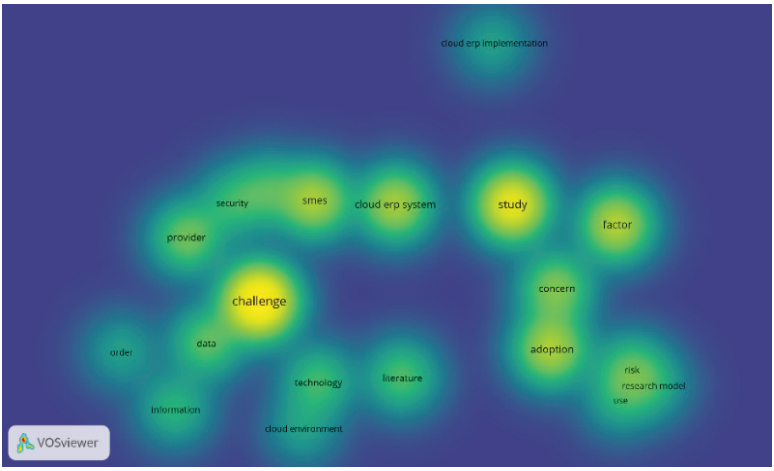

Figure 12. Abstract text word density map

When this density map is examined, it is seen that there is a concentration in the words difficulty, SME and factor due to the selection of resources compatible with the study subject. In SMEs and large organizations, it is observed that security, support, business and data areas are clustered around the challenge area. It is seen that there are concentrations around adaptation, interest, research model, risk on the part of Cloud ERP factors. Abstract text word usage time map is shown in Figure 13.

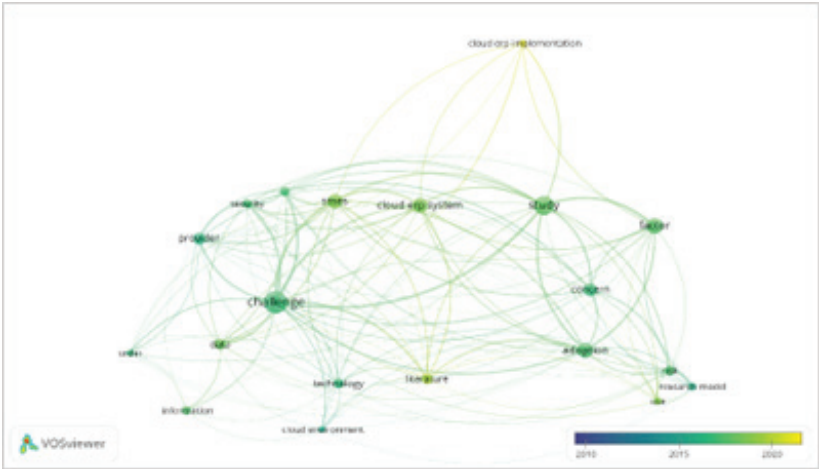

Figure 13. Time map of words based on abstract text data.

The words written in dark blue are the words in the previously published articles in this field, and the yellow words are the words belonging to the newly published articles. The words in the table in colours from green to yellow are mostly used in recent publications. Examples

of these words are ‘cloud ERP implementation’, ‘cloud ERP system’ and ‘literature’. Such time-based representations also show how the words in the studies show a trend from the past to the present, and in what direction the researches are concentrated.

Google Trend Analysis

The search trends of the users for the words ‘ERP’ and ‘Cloud ERP’ on the Google internet search engine have been examined. The analysis results obtained through the Google Trend application are shown in Figure 14.

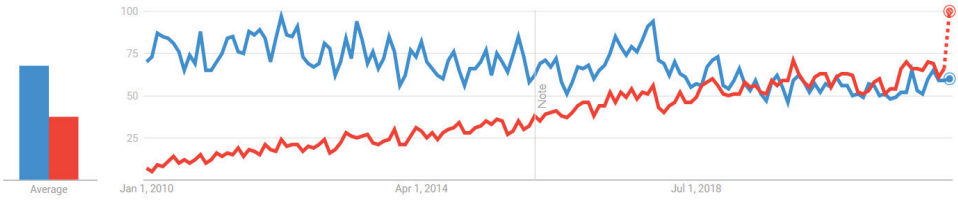

Figure 14. ERP vs cloud ERP trend analysis comparison chart.

The chart shows the search trend for the term “Cloud ERP” in red and the term “ERP” in blue. According to the results of this trend analysis, it is seen that the term ‘Cloud ERP’ has been in a continuous upward trend since it first came out, the search for the term ‘ERP’ caught on in 2018, then it had a similar trend for a while, and this increase continues to the present day. Although the popularity of ERP continues, it can be said that the term Cloud ERP stands out when it comes to ERP, especially after 2018. It is understood that this interest in Cloud ERP will continue to strengthen. ERP and Cloud ERP systems, which were 70:7 in 2010, surpassed ERP systems by 59:66 in June 2022.

Summary and Conclusion

Enterprise resource planning is an effective tool that ensures the effective use and management of existing resources to achieve the goals of the organization. If this tool is understood and applied correctly, it both brings companies to the point they want and provides customer satisfaction (Saylam, 2016). It is a very useful system for businesses. In terms of application architecture, traditional ERP applications depend directly on on-premises platforms. Cloud ERP, on the other hand, is not dependent on on-premises platforms. It is in a remote place called the cloud in the internet environment. While this architectural structure offers many advantages, it also carries some risks and difficulties due to the fact that the technology is new and not fully understood. On the other hand, its popularity is increasing day by day thanks to the many benefits it provides to institutions. According to the August 2022 Gartner report,

53% of the product-focused market uses cloud ERP. It is predicted that this ratio will increase and reach 60% in 2024. Despite such a popular and widespread use of cloud ERP, it still needs to be understood in terms of risks, benefits and challenges. Bibliometric analysis, on the other hand, contributes to the understanding of the subject by working on the publications produced by individuals or institutions in a certain field, period and region.

In this study, the benefits and challenges of Cloud ERP are analysed. The Scopus, Web of Science and Google Scholar databases were used. After determining the publications suitable for the criteria through these databases, a bibliometric analysis study was carried out. Thus, it is aimed to make inferences about the benefits and difficulties of cloud ERP with related academic studies. A road map has been tried to be drawn for its current situation and usage trend. Text mining and word analysis studies were carried out using the VOSviewer program. Data and texts were visualized using scientific mapping models. Cloud ERP and ERP trend analysis was performed using the Google Trends application. The data obtained from the analysis studies were evaluated in the findings and discussion section. As a result, cloud ERP comes to the fore with cloud technologies, and the cloud ERP application system is becoming more widespread day by day. This is confirmed by the Gartner research reports. This growing interest and trend shows that the benefits of cloud ERP outweigh its challenges. As the areas of difficulty, the obscurities of data, provider, new technology and cloud environment were associated with the literature and lack of knowledge. Data security and ERP system implementation in SMEs remain up to date.

In this study, which is considered as a cross-section of the studies in the literature, the level of interest and important subject areas for the benefits and challenges of cloud ERP were determined. In parallel with the increasing importance and use of this subject, it has been determined that it is also the subject of academic studies. The study was conducted in the English language, in prestigious databases, in limited time and space. This should be taken into account in the evaluation of findings and results. Different studies can be done with more databases and less restrictions. On the other hand, the results of this study shed light on future research and businesses that have difficulties in deciding to use this technology. Using the results of this study, researchers can also work on solutions that facilitate cloud ERP's challenge areas. They can also set new study targets for existing and less studied topics derived from text mining. Thus, by contributing more to the literature on cloud ERP, which is increasingly popular, it can help to eliminate the concerns and problems of institutions in the transition to this technology.

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RESEARCH ARTICLE

The Relationship Between Fan Passion and Second Screen Usage: The Mediating Role of Fear of Missing Out

Fatih Çelik[1], Erkan Faruk Şirin[2]

Abstract
Second screen usage by fans while watching sports events on TV has been increasing in recent years. Although second screens are frequently used in two-way communication with fans and sports clubs, few studies have examined the subject from a theoretical perspective to understand it better. This study aims to determine whether the fear of missing out (FoMO [personal FoMO and social FoMO]) mediates the relationship between fan passion (harmonious passion and obsessive passion) and second screen usage through the dualistic model of passion (DMP) perspective. For that purpose, we conducted an online survey for data collection along with fans in Turkey and analysed 300 valid responses (79.3% male, aged 18-59 years) via structural equation modelling. The results showed that harmonious and obsessive passion had no direct effect on second screen usage. However, they had indirect effect on second screen usage through personal FoMO. In addition, personal FoMO had a prediction on second screen usage. As a result, this study highlights the importance of the second screen in the sports industry and the effect of fans' passion and FoMO levels on second screen usage from the DMP view. To our knowledge, the present study provides the first empirical evidence for the mediating role of FoMO in the relationship between fan passion and second screen use.

Keywords

Sports Fans, FoMO, Televised Viewing, Dualistic Model of Passion

Introduction

The second screen has recently become a prominent behavioural habit for TV viewers such as fans (Kim, Kim, Chung & Kim, 2021). For example, according to a recent study, the majority of adults (71%) in the United States regularly (often and sometimes) use social media on the smartphone as a second screen while watching TV (Statista, 2021a). In addition, just over two-thirds of users (68%) were looking up information about what they were watching on TV via the second screen (Statista, 2021b). It was also discovered that Gen Z (16 to 21 years) were far more inclined (95%) to utilize a second screen while watching TV (Statista, 2021c). On the other hand, a previous study has revealed that a large majority of sports consumers (79%) use a second screen to engage in social media, and two-thirds of

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users (66%) watch professional football (Cunningham & Eastin, 2017). Hence, second screens have become a habitual activity among fans (Mereu, 2021).

The rise of the internet and social media platforms has caused changes in fans' motivation and habits, those who participated as spectators in sports activities (Rubenking & Lewis, 2016). Today, social media has been an important part of the lives of sports fans all over the world (Manchanda, Arora & Sethi, 2022). On the other hand, in traditional viewership, fans watch sports competitions physically together with others - in the stadium, at home, or in an outdoor environment - causing the development of socialization and teamwork (Rubenking & Lewis, 2016). Previous research shows a significant decrease in the sense of socialization and companionship for those who watch sports events alone (Buffington, 2017). Fans have started to look for new ways to overcome this problem. Sports viewers now use social media platforms such as Twitter, Twitch, Facebook, and WhatsApp via mobile phones or computers as a second screen to reach sports-related content, socialize with other fans while alone, and feel like they are together (Rubenking & Lewis, 2016). The second screen is usually thought of as a way for fans to simultaneously watch live games and interact with other fans in a virtual world (Kim, Yang & Kim, 2021; Li, Naraine, Zhao & Li, 2021).

In recent years, research on the second screen usage while watching sports competitions has been increasing (Beuckels, Ye, Hudders & Cauberghe, 2021). Thus, scholars and practitioners need to understand and capture the second screen usage mechanism and contextual variables of fans throughout sports events. Literature suggests that when second screen usage is related to a sporting event, there is a positive relationship between second screen usage and enjoyment, while there is a negative relationship when unrelated (Rubenking & Lewis, 2016; Weimann-Saks, Ariel & Elishar-Malka, 2020). Thus, second screen usage can enhance and prevent sports fans' enjoyment (Li et al., 2021; Rubenking & Lewis, 2016). Moreover, previous research has shown that second screen engagement is positively correlated with perceived social presence (Brown-Devlin, Devlin, Billings & Brown, 2021; Hwang & Lim, 2015; Lim, Hwang, Kim & Biocca, 2015; Mereu, 2021), social capital, and perceived sociability (Brown-Devlin et al., 2021). On the other hand, the second screen usage by fans during sports events increases sports channel commitment (Hwang & Lim, 2015; Lim et al., 2015), commitment to a sporting event or favourite team (Mereu, 2021), and reinforcement of team identity (Larkin & Fink, 2016). However, a study revealed that people remember fewer details during the second screen usage process (Oviedo, Tornquist, Cameron & Chiappe, 2015). In other words, second screens can distract the attention of the sports consumer from the watched/followed activity (Rubenking & Lewis, 2016; Weimann-Saks et al., 2020).

As seen above, despite the prevalence of second screen usage in sports research, empirical studies are limited from a theoretical perspective. Some theories or models, such as the stimulus-organism-response (SOR) model (Vazquez, Wu, Nguyen, Kent, Gutierrez & Chen, 2020),

social presence theory (Hwang & Lim, 2015), uses and gratifications model (Gil de Zúñiga, Garcia-Perdomo & McGregor, 2015; Su & Chen, 2020), identity theory (Larkin & Fink, 2016), disposition theory (Smith, Pegoraro & Cruikshank, 2019), and decision theory (Voorveld & Viswanathan, 2014), have been used in previous research to explain second screen usage by sports consumers. However, expanding existing literature by applying different theoretical perspectives is crucial for comprehensively understanding the social phenomenon under investigation (Fang, 2021). Thus, the dualistic model of passion (DMP) (Vallerand et al., 2003) can be applied to predict sports consumers' second screen usage process. This model is widely preferred in sports research (Teixeira et al., 2021; Vallerand et al., 2008). Therefore, it is logical to expect that DMP will explain the second screen usage mechanism of the fans.

From a theoretical approach, DMP suggests that passion for an activity/event can occur in two ways: obsessive passion, which describes people's strong desire to participate in an activity (Bélanger, Lafrenière, Vallerand & Kruglanski, 2013), and harmonious passion, which describes the willingness to freely participate in one's favourite activity (Verner-Filion, Lafrenière & Vallerand, 2012). Moreover, considering that obsessive and harmonious fan passion indicates being a sports supporter, in the second screen usage research, such supporter levels can be regarded as a variable (Smith et al., 2019). Both obsessive and harmonious passions for the fans' teams represent a psychological factor that affects their emotional expectations (Verner-Filion et al., 2012). It is important to determine whether this psychological factor has any effect on second screen usage. At the same time, the fans watch the matches on TV because digital tools like second screens have brought a new perspective to the viewing experience by allowing fans to share their passions and interests more easily (Brown, 2015; Pagani & Mirabello, 2011).

Moreover, according to previous studies, second screen usage can be associated with fear of missing out (FoMO) (Conlin, Billings & Averset, 2016; JWT, 2012; Larkin & Fink, 2016; Radic, Ariza-Montes, Hernández-Perlines & Giorgi, 2020; Reinecke et al., 2017). FoMO, which emerged with the prevalence of social media, refers to a person concerned about being unable to participate in the developments around them and being absent from them (Casale & Gordon, 2020). According to Zhang, Jiménez, and Cicala (2020), FoMO has two dimensions, personal FoMO and social FoMO: The former is when people worry about missing out on experiences they wish for themselves, while the latter is concerned about missing out on experiences that other people enjoy (Zhang et al., 2020). Therefore, fans with FoMO can be expected to use a second screen to avoid missing out on important social experiences for them, their team, and even the communities they belong to (Hadlington & Murphy, 2018).

Especially considering the sharing and transferring information on social media, fans may be concerned about missing some events/developments while watching a live sports activity

at the stadium or at home. The role of FoMO in second screen usage needs to be further investigated in terms of sports (Beuckels et al., 2021; Larkin & Fink, 2016). Because FoMO is an important concept in sports consumers' behaviour, especially in the social media marketing context (Dinh & Lee). However, there have been limited empirical studies examining the effect of FoMO on sports media consumption, such as second screen usage (Kim, Lee & Kim, 2020; Larkin & Fink, 2016; Su & Chen, 2020). In second screen usage, it is expected to consider personal phenomena such as FoMO and offer more beneficial opportunities by closely researching the direct or indirect effects of personal differences on second screen usage (Shin, 2013).

As a result, examining the relationships between fan passion and second screen usage remains unexplored. In addition to the direct effect of fan passion on second screen usage, the indirect effect via mediating variables such as FoMO needs to be investigated. Because, for sports consumers, FoMO may be a psychological factor behind fan passion behaviour (Stead & Bibby, 2017). Also, such two-sided approaches may enable us to fully grasp the second screen usage (Beuckels et al., 2021). Thus, FoMO might act as a prospective mediator between fan passion and second screen usage.

Given the conceptual dimensions of DMP (harmonious passion and obsessive passion) and FoMO (personal FoMO and social FoMO), we put forward that fan passion and FoMO may show a positive relationship with second screen usage and that FoMO may mediate the link between fan passion and second screen usage. Based on the literature gaps discussed above, through the DMP perspective, we aim to explore the relationship between fan passion and second screen usage and FoMO's mediating role in this relationship. Along with this research, it is estimated that the literature gap can both be filled and can provide clubs and practitioners with an insight into the media consumption content they develop for fans.

The rest of this study is structured as follows. First, we introduce the conceptual framework, hypothesis development, and literature review. Second, we address our methodology as well as results and discussion. Finally, we conclude this study with implications, limitations, future directions, and a conclusion.

Conceptual Framework and Hypothesis Development

Second Screen Usage

Second screen is defined as the same media consumer's multiple exposures to different media types in real-time (Pilotta, Schultz, Drenik & Rist, 2004). It is a widespread new media practice that represents one element of the mix media phenomena and emphasizes the pervasiveness of social media and connectivity in the contemporary world (Gil de Zúñiga

et al., 2015). Though TV has been a social tool since the mass acceptance of the media (Ji & Raney, 2015), the second screens have further increased this sociality tool. The advent of mobile devices, in particular, pushed media consumers to participate in second screen usage, expressed as viewers' use of a second electronic device while watching TV (Beuckeles et al., 2021; Cunningham & Eastin, 2017). It may include a wide range of activities and habits, such as checking email while talking on the mobile phone or social media while watching a sports event on TV or at the stadium (Rubenking & Lewis, 2016; Pilotta et al., 2004).

This research used the concept of 'second screen usage'. The concept of the second screen can be used similarly to terms such as hybrid media (Chadwick, 2017), simultaneous media usage (Pilotta et al., 2004), simultaneous co-viewing (Pittman & Steiner, 2021), multiple media use (Robinson & Kalafatis, 2020), screen-stacking (Hale & Guan, 2015), media multitasking (Beuckels et al., 2021), multi-screening (Segijn, Voorveld & Smit, 2016), convergent media device (Mahoney & Tang, 2021), dual screen viewing (Sodeman & Gibson, 2015), social TV (Hwang & Lim, 2015), and multi/companion screen viewing (Christodoulou, Abdul-Hameed, Kondoz & Calic, 2016). This concept is a preferred topic in numerous studies related to our research topic (see Cunningham & Eastin, 2017; Sellitto & Phonthanukitithaworn, 2017; Weimann-Saks et al., 2020).

Second screen usage has recently become a vital study topic for sports communication/marketing researchers during sports competitions. With the rapid rise of social media platforms, fans want to share their hopes, excitement, joys, and sorrows with different people simultaneously during sports competitions (Hwang & Lim, 2015; Weimann-Saks et al., 2020). In this process, they send text messages or tweets to others, provide contact with their friends and followers, create a more emotional connection with the team, and enjoy a shared experience, as well as the sense of socialization and companionship (Cruz, Romão, Centieiro & Eduardo Dias, 2018; Sellitto & Phonthanukitithaworn, 2017; Wohn & Na, 2011). According to a study, the second screen usage in sports programs during TV watching is higher than in other programs such as news, commercials, and entertainment throughout the day (Voorveld & Viswanathan, 2014). The fact that the fans are active on social media via a second screen during sports competitions acts as a 'virtual watercooler'. The virtual watercooler refers to virtual environments where similar viewers can share their feelings, thoughts, and experiences among themselves, especially by using their mobile phones as a second screen and reducing the excitement and stress of the competition (Cuff, 2017; Smith & Smith, 2012).

Given the body of knowledge on second screen usage in sports, integrating motivations for watching sports events broadcast on TV and for using second communication screens is considered a need (Hwang & Lim, 2015). According to Gantz (1981), fans' motivations to watch sports events on TV are information, winning pleasure, fun, and spending time. Similarly, TV viewers' and sports fans' most basic second screen usage motivations are excitement, con-

venience, and information (Hwang & Lim, 2015; Serim, 2015). Also, Rubenking and Lewis (2016) added pleasure and identification with the team to these motivations. Information is one of the main objectives of both traditional and new media tools. Fans who highly identify with the team are likely particularly interested in the competition or information about the competition (Cunningham & Eastin, 2017). It is argued that the fans who watch the matches live in front of the TV have a significant amount of excitement and convenience from social media usage as the second screen. Prior research found there is a positive correlation between the level of fans' second screen usage and excitement and convenience (Smith et al., 2019). In brief, the second screen gives sports fans more entertainment and excitement, team identification, social connection, escapism, sports knowledge, expression of opinion, information seeking, and content verification (Rejikumar, Jose, Mathew, Chacko & Asokan-Ajitha, 2021).

Research in the literature regarding second screen usage in sports is usually WhatsApp (Weimann-Saks et al., 2020), Snapchat (Billings, Qiao, Conlin & Nie, 2017), Facebook (Oviedo et al., 2015; Tornquist, Cameron & Chiappe, 2015; Rubenking & Lewis, 2016), and Twitter (Smith et al., 2019). With these platforms, the sports-watching experience is no more passive. Consequently, this research explains the second screen as the act of satisfying information, excitement, and convenience of fans about TV content simultaneously through platforms while watching sports-related content on TV.

In brief, second screens significantly contribute to the experience of viewing sports through sports lovers, staying in touch with friends, family, or other fans by sharing the notable moments of the ongoing competition. Rather than replacing the primary screen, the second screen has become a device that accompanies it and is used to complete the first screen experience (Cunningham & Eastin, 2017).

Fan Passion

According to Vallerand et al. (2004), passion is a strong tendency toward an activity that individuals like, feel essential, and devote time and energy to. It is considered a motivating factor in spending their time, effort, and emotions to achieve their goals (Wakefield, 2016). Since passion is the emotion that makes people's lives the most valuable, it represents the central features of people's identities (Vallerand, 2008). It also draws attention as an internal tendency resulting in external actions (Wakefield, 2016). The emergence of this intrinsic tendency is widespread among sports fans. The passion for the supporter, which gives importance to the identity of the individual and provides a robust relational connection with the teams considered the centre of the individual's identity, and thus covers the cognitive, affective, and evaluative aspects of the fan passion, is an important concept used in the sports industry (Das, Agarwal, Malhotra & Varshneya, 2019). Furthermore, fan passion is at the centre of one's personality and defines the person (Swimberghe, Astakhova & Wooldridge,

2014). According to Linden and Linden (2017), "passionate fans are the spine of any club" (p. 150). Fans who have passion are expected to be more fanatic and enthusiastic toward their teams (Choi, 2019).

The Dualistic Model of Passion

The DMP, which suggests that people tend to internalize the environmental elements they naturally consider important and make them a part of their identity, analyses passion in two factors (Vallerand, 2015). Vallerand et al. (2003) developed DMP in the form of obsessive and harmonious following activities. This DMP, which deals with individuals' passion activities in terms of organizing and integrating them with other living spaces, is the first and only model in the passion literature and is of great importance in displaying individuals' identities (Bélanger et al., 2013).

Obsessive passion, the first factor in the DMP, explains people's desire to be strongly involved in the activity (Bélanger et al., 2013). It also causes decreased people's well-being levels when they do not participate in activities (Carpentier, Mageau & Vallerand, 2012). Conversely, harmonious passion means a person wishes to freely participate in the event they love (Verner-Filion et al., 2012). It notes the wish to be strongly involved in any activity and is the result of internalization that individuals consider activity important of their own free will (Marsh, Vallerand, Lafrenière, Parker, Morin, et al., 2013). Moreover, Vallerand et al. (2008) suggested that "harmonious passion was positively associated with adaptive behaviours (e.g., celebrating the team's victory), whereas obsessive passion was positively associated with maladaptive behaviours (e.g., risking losing one's job to go to a game)" (p. 1279).

This DMP is mainly used in research on sports and fans. Obsessive passion is fans' intense and uncontrollable impulse to participate in sports events (Bélanger et al., 2013). This results in the fans feeling a stronger loyalty to their team (Das et al., 2019; Vallerand et al., 2003). On the contrary, harmonious passion is linked to autonomous internalization. That is to say, the activity does not control the individual, as it is a genuine desire to perform it without feeling any responsibility or internal pressure (Teixeira et al., 2021). This internalization occurs when the fans consider the activity important to them without any conditions. Such internalization creates the motivation to participate voluntarily in events such as second screen usage by watching TV matches. It provides a sense of volunteering and personal support in maintaining the event (Vallerand et al., 2003). To summarize, harmonious passion reflects the internalization of the desired self-identity, while obsessive passion demonstrates the internalization of the desired social identity (Das et al., 2019). Both forms of passion are present in a person's personality, but obsessive passion seems to take up a disproportionate amount of space (Teixeira et al., 2021).

Sports fans nowadays have adopted new technologies as an integral part of their passionate for sports and teams (Octagon, 2013). Especially with the development of the internet and

social media, supporter habits have further changed. Today, the second screens have brought new insight into the sports game-watching experience by letting fans share and connect with others through social networks and mobile devices (Pagani & Mirabello, 2011). While watching live matches on TV, fans look for opportunities to support their team, cheer and even express their sadness, joy, and passion (Brown, 2015). Second screen technology has given fans this opportunity. Social media's real-time interaction feature and sports fan passion are channelled through actions such as messaging, tweets, and hashtags, especially during competition moments, via second screens (O'Hallarn, Shapiro, Wittkower, Ridinger & Hambrick, 2019). Given that tribalism is one of the core elements of passion (Stavros, Meng, Westberg & Farrelly, 2014), it is likely that fans will use a second screen to interact with their teammates during a live sports event as a sign of tribalism. Hence, fans may not feel satisfied when they cannot interact with their team and other fans on social media, especially in line with the passion they experience during live matches (Stander, 2018).

Harmonious passion explains the fan's strong desire to participate in sport-related events with their free will through tools such as the second screen (Marsh et al., 2013). Participation in second screen activities with a harmonious passion occupies an essential but non-pressing place in one's identity. Therefore, it is expected that the person will have few problems with other activities in his life (Vallerand et al., 2008). Harmonious passion can lead the fans to participate freely in events such as the second screen usage during the competition, as the fans are identified with the activity in question. Nevertheless, obsessive passion results from uncontrolled internalization and emerges as an uncontrollable desire to join in a popular activity (such as watching TV matches) (Vallerand, 2010). Wakefield (2016) has suggested that it may be possible to argue that harmonious passion and obsessive passion significantly predict fans' media behaviour, such as second screen usage. Building on the arguments mentioned above and considering the two conceptual dimensions of DMP (harmonious passion and obsessive passion), we suggest the following hypotheses:

H$_1$. *The harmonious passionate of the fans positively predicts their second screen usage.*

H$_2$. *The obsessive passionate of the fans positively predicts their second screen usage.*

Fear of Missing Out

Today, people are worried about missing developments due to their exposure to much information and their ability to consume all information sources (Larkin & Fink, 2016). FoMO is characterized by a need to remain constantly connected with what others are experiencing. It is also defined as a persistent anxiety that others may be enjoying gratifying experiences from which one is missing (Przybylski, Muruyama, DeHaan & Gladwell, 2013). FoMO is also anxious to miss an experience that can help one achieves a personal or social goal. It is caused by an individual's desire to satisfy his curiosity, satisfaction with discovering something new and seeking innovation and diversity (Zhang et al., 2020).

Although FoMO is a behaviour that could be observed among people before social media, it has become widespread with social media. Considering psychological requirement satisfaction, general mood, and life satisfaction, FoMO plays a vital role in individuals online on social networking sites (Przybylski et al., 2013). Moreover, Zhang et al. (2020) associated FoMO with the self. They focused on evaluating FoMO as two dimensions, personal FoMO and social FoMO, as in the self-concept theory (Rosenberg, 1979). "Personal FoMO refers to the FoMO on experiences that can maintain or enhance the private self. Social FoMO relates to the FoMO on experiences that can maintain or enhance the public self" (Zhang et al., 2020: p. 1630).

Although social media users experience some negative experiences like abuse, addiction, and social media fatigue with their excessive use, they feel pressured to enter social media due to FoMO. The primary reason is that consumers get FoMO when they see current material from brands, friends, family, news organizations, sports teams, or team players they support (Bright & Logan, 2018). Especially for viewers who follow a sports game on TV as the primary screen with higher-up of pleasure, FoMO can cause fans' social media use as the second screen.

Given the relationships between fan social anxiety and second screen usage, while watching a live sports event on TV (Becker, Alzahabi & Hopwood, 2013), it is likely that FoMO is primarily a driver of second screen usage by fans (Seddon, Law, Adams & Simmons, 2021). Although watching sports competitions leads to pleasure for the fans, fluctuations in this feeling may occur in situations such as the opponent's team taking the lead or scoring goals, the player in the team being out of the game by seeing a red card, and the pleasure leading to anxiety or tension (Peterson & Raney, 2008). Moreover, nowadays, the fans have a feeling of FoMO for the news and developments of the team they support as another type of social anxiety or fear during the competition. In other words, the fans' efforts to follow their teams through the second screen during the competition are motivated by FoMO (Larkin & Fink, 2016). In this process, part of the pleasure of watching sports competitions against TV encourages the ability to talk to friends about TV content and participate in an interactive chat, especially through social media (Conlin et al., 2016).

According to Su and Chen (2020), FoMO, social success, and social media are the foremost factors affecting TV and mobile phone consumption (as the second screen). Users of mobile phones may be concerned about losing out on what is occurring on social media and TV, particularly during live broadcasts such as sports games. Audiences mostly try obtaining information about the competition through two screens by watching the match on social media and TV via smartphones to 'lag' from their teammates due to FoMO's (Su & Chen, 2020). Prior studies have suggested there is a positive relationship between FoMO and excessive smartphone use (Wegmann, Oberst, Stodt & Brand, 2017; Zhou, 2019). Therefore, fans with

high FoMO may overuse their smartphones as a second screen to satisfy their desire to stay connected while watching live sports events on TV (Rozgonjuk, Sindermann, Elhai & Montag, 2020; Servidio, 2021). In addition, they have not only FoMO about experiences other fans enjoy (social FoMO) but also about experiences they wish for themselves (personal FoMO) (Zhang et al., 2020). Personal FoMO may relate to the experiences of fans in their inner world, which can lead to second screen usage. Also, the social connection that sports consumers form through the second screen emphasizes anxiety about not being included in a larger group (i.e., social FoMO) and the need to create or develop a sense of connection (Ji, 2019). The desire to belong to their team and team members and the fear of not being included in this group, in another saying, social FoMO plays an important role in social media consumption against TV on the second screen (Kang, Cui & Son, 2019). As a result, previously studies suggested that higher FoMO levels of fans may lead them to be more inclined toward second screen usage (Conlin et al., 2016; Przybylski et al., 2013; Radic et al., 2020; Reinecke et al., 2017). Taking into account the two conceptual dimensions of FoMO (personal FoMO and social FoMO), we expect FoMO to be a significant antecedent of second screen usage:

H$_3$. *Personal FoMO positively predicts fans' second screen usage.*

H$_4$. *Social FoMO positively predicts fans' second screen usage.*

The mediating role of fear of missing out

According to recent studies (Beyens, Frison & Eggermont, 2016; Dempsey, O'Brien, Tiamiyu & Elhai, 2019; Wegmann et al., 2017; Zhang et al., 2020), FoMO has been proposed as a mediator variable in the usage of internet communication apps. Previous studies have revealed that FoMO mediates the relationship between social media interactions and individual differences such as needs, emotions, motivations (Alt, 2015; Przybylski et al., 2013; Wegmann et al., 2017).

From the sports industry perspective, the dedication of the person's heart, mind, body, and soul to a team shows 'fan passion' (Vallerand et al., 2003). When fan passion is assessed along with second screen usage and FoMO, a fan passionate about his team feels powerful positive feelings about the clubs and their athletics (heart). He/she often thinks about several ways of the team (mind), like his team, his athletics, his team's competitions and statistics, and other fans or viewers' opinions about the team or the competition. It also takes considerable time and energy to follow, watch, listen, participate in competitions, and especially read or interact with those shared on social media (body). According to other areas, he/she prioritizes the team in his life and believes that life is incomplete without activity or that FoMO lives in the team and competition (spirit) (Wakefield, 2016).

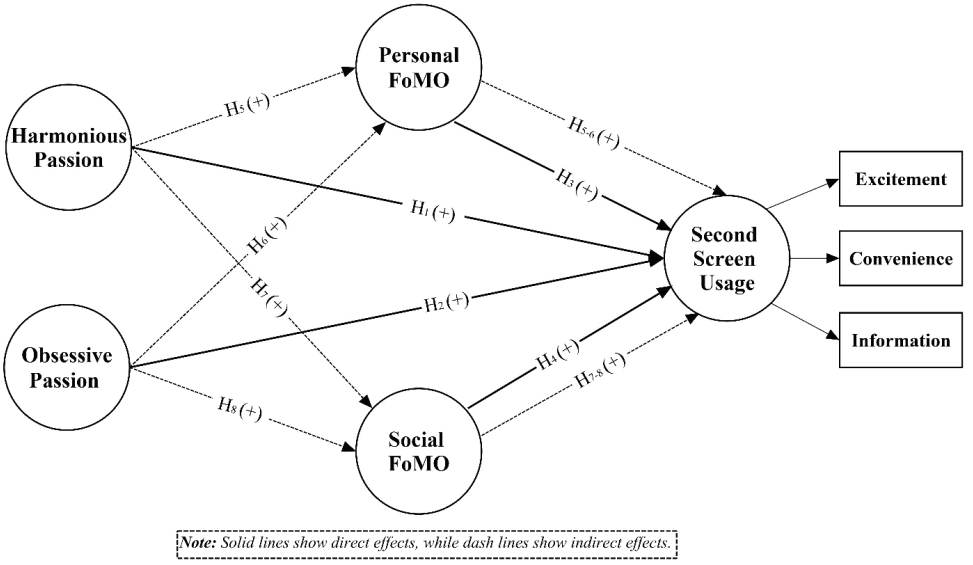

Figure 1. Proposed research model

Based on the above narrative, we expected that FoMO might be a mediating variable in the research model proposed in this study (see Fig. 1). Moreover, sports teams can encourage sports consumers to use a second screen through FoMO, leveraging the passion that exists among loyal fan to provide meaningful and rewarding experiences and greater satisfaction (Stander, 2018). Besides, fans with passion may participate in social networking sites as a second screen while watching the activity they are passionate about, such as watching matches due to internal possibilities like FoMO. This can hamper the individual from entirely focusing on the fundamental (primary) duty he/she is passionate about (Vallerand et al., 2008). Considering that fans with high FoMO levels have more impulses to control their social media accounts while watching a match against TV as a second screen (Abel, Buff & Burr, 2016 Conlin et al., 2016; Radic et al., 2020), this impulsivity situation can be considered an underlying issue personality trait. It can be said that the positive relationship between impulsivity and obsessive passion is much stronger than harmonious passion (Orosz, Zsila, Vallerand & Böthe, 2018). The idea of controlling social media as a second screen to alleviate FoMO levels of fans during the competition is parallel to obsessive behaviour patterns (Richter, 2018). We, hence, considered FoMO as a mediator in this research. As a result, we might hypothesize that not only harmonious and obsessive passion will directly predict second screen usage of fans' but also indirectly through personal FoMO and social FoMO. Based on the present arguments given here, we propose the following hypotheses:

H$_{5.}$ Personal FoMO mediates the relationship between harmonious passion and second screen usage.

$H_{6.}$ Personal FoMO mediates the relationship between obsessive passion and second screen usage.

$H_{7.}$ Social FoMO mediates the relationship between harmonious passion and second screen usage.

$H_{8.}$ Social FoMO mediates the relationship between obsessive passion and second screen usage.

Method

Research Context

Over the past decade, social networking sites have led to the growth of fan engagement. The literature claimed that collectivist nations such as Turkey were more actively involved with social media and engaged in group-oriented behaviours (e.g., fan engagement) (Akdevelioglu & Kara, 2020; Hartzel, Marley & Spangler, 2016). Recent reports claim that Turkey has 69 million social media users and 78 million mobile phone users (Kemp, 2022). In addition, while the average daily social media usage time was 3 hours, the mobile phone was 4.24 hours, and TV watching was 3.31 hours. Moreover, about a quarter (27%) of people in Turkey have used social media because of following sports, and the type of social media accounts followed have been 27.5% of sports people and teams.

Furthermore, a previous study suggested that Turkey's second screen usage rate was 94%, which was above the world average (82%). In addition, mobile phones had the most preferred (76%) second screen (IAB Turkey, 2017). Based on these ratios and given that the main reason TV viewers use a second screen is to get the latest/up-to-date information about sports (Hwang & Lim, 2015), it is reasonable to conduct a study on second screen usage in the context of sports consumers in Turkey. Consequently, we conducted this research in the context of Turkey. We collected data from fans of teams in Turkey, such as Galatasaray, Fenerbahçe, Beşiktaş, Trabzonspor, and others, because these teams were the most prominent sports clubs in terms of the number of fans, championships, and followers on their social media accounts (Çelik, 2019; Üçüncüoğlu, 2021).

Participants and Data Collection

We used the cross-sectional survey design in the current study. Surveys may be used to estimate behaviour and assist a researcher in identifying variables and building' values and relationships (Newsted, Huff, and Munro, 1998). We collected the data through an online survey. With the growing popularity of the Internet and social networking sites, online surveys have become increasingly popular and are faster and less expensive (Ferreira & Fernandes, 2021).

The online survey was performed using the Google Forms platform, containing a knowledge sheet, permission form, and self-report questions to determine suitability (Throuvala et al., 2021). To eliminate social desirability response bias and ascertain the data collection from just those respondents engaged in the research, survey participation was voluntary and anonymous (Dhir, Talwar, Kaur, Budhiraja, & Islam, 2021).

Online survey data were collected through social media platforms (WhatsApp, Twitter, Facebook, etc.) by sharing survey links (URLs) with fans. Data collection was conducted between February 10-25, 2020 and 451 fans participated. For this study, the survey could only be completed by participating fans who met the following inclusion criteria: (a) being at least 18 years old, (b) must live in Turkey, and (c) having at least once so far used the second screen while watching the sports event on TV. In total, 300 individuals who met the inclusion as mentioned above criteria completed the online survey.

Most of the participants in this study, which focused on using social media as the second screen during the sports competition, were male fans (79.3%). The mean age of the respondents was 25.02 (*SD* = 7.15; 18 to 59 age range). Additionally, 59.3% of the fans in the research had an undergraduate degree level, 25% had an associate degree, 7.7% had high school level, 7.7% were high school graduates, and 3% had primary education. Moreover, the average monthly income of the fans was $389.75 (*SD* = 449.48, $0-$3,267.01), and 36.3% supported Galatasaray, 25% Trabzonspor, 18.3% Fenerbahçe, 17.3% Beşiktaş and 3% supported other teams.

Measurements

The online survey was divided into two sections: One with a questionnaire covering all scales and 36 self-reporting items, and the other with some demographic information (age, gender, income, education, and supported team). Each scale used in the survey was collected from different studies and brought together. For this study, we used a 7-type Likert scale with the items "strongly disagree" (1) and "strongly agree" (7).

Second screen usage scale: For the second screen usage scale in sports, we preferred the scale conducted by Hwang and Lim (2015) due to its high validity-reliability. The second screen usage scale formed three factors: excitement, convenience, and information. While the excitement factor consisted of four items (*M* = 4.813, *SD* = 1.520, Cronbach's a = .880), convenience comprised six items (*M* = 5.454, *SD* = 1.329, Cronbach's a = .940). Finally, information factors had four items (*M* = 5.338, *SD* = 1.287, Cronbach's a = .880).

Fear of missing out scale: For the FoMO scale, the scale developed by Zhang (2018), which has a high reliability-validity and is the most current FoMO scale, was adapted and modified to the fans and used in this research. This scale developed two sub-dimensions:

Personal FoMO comprising five items (M = 4.621, SD = 1.787, Cronbach's a = 940) and social FoMO comprising four items (M = 2.441, SD = 1.741, Cronbach's a = .950). Unlike the FoMO scale (Przybylski et al., 2013), which is the first in the literature and widely used in the studies, another reason for using this scale is that it is treated as "fear of missing an experience that can help an individual achieve a personal or social goal by removing all boundaries of FoMO".

Fan passion scale: Finally, the fan passion scale, another variable in the research model, developed by Vallerand et al. (2003), is widely employed in the literature and has high validity-reliability. This scale is the basis for measuring how a person's attachment to the heart, body, mind, and spirit affects his passion for an activity or object (Wakefield, 2016). The passion scale consists of a total of two factors: seven obsessive passion items (M = 4.256, SD = 1.804, Cronbach's a = .940) and six items of harmonious passion (M = 4.989, SD = 1.635, Cronbach's a = .940).

In this study, the translation of items in these scales from English to Turkish was carried out by two academicians who are English experts. These translations were then translated back to English by two different language experts. It was compared with the items in the original scales, and language experts made the necessary corrections. Moreover, to check the content validity of the scales, the items were revised by two academicians who specialized in sports and communication. After implementing a few experts' recommendations, we conducted a pilot study with 100 participants through an online survey. In the pilot data's statistical analysis, Cronbach's alpha scores for all scales were above .74. It is understood that these rates are sufficient for the reliability of the scales. Alternatively, it has been revealed that the item-total correlation coefficient of the scales is appropriate (> .30) and has an item discrimination feature.

Data Analysis

We used structural equation modelling (SEM) to predict the proposed model in this study since our model has offered multivariate relationships of the antecedents and outcomes (Hair, Black, Babin & Anderson, 2019). To test the research model, we utilized the two-stage method suggested by Anderson and Gerbing (1988). In the first stage, we investigated the measurement model to ensure the reliability and validity of the scales used. Then in the second stage, we analysed the structural model to test the hypothesis.

Moreover, we conducted a mediation analysis to determine whether personal and social FoMO indirectly affected the relationship between harmonious and obsessive passion and second screen usage. We used the modern mediation testing approach, which is common in the literature and criticizes the traditional mediation analysis (Hayes, 2009; MacKinnon, 2008; Rucker, Preacher, Tormala & Petty, 2011). Moreover, no classification was made for the

emerging mediation (such as partial or full mediation); only the indirect effect was examined to determine whether it was statistically significant. We performed bootstrapping analysis using 5,000 subsamples (Hair et al., 2019). We look at the lower limit confidence interval (LLCI) and upper limit confidence interval (ULCI) values in the 95% confidence range to ascertain if the indirect effect is significant after the bootstrap test; these values should not cover zero (0) (Hayes, 2018; Rucker et al., 2011). Finally, in this study, we performed all statistical analyses using SPSS 26.0 and Mplus 8.3 package programs.

Results

Descriptive Statistics

We also evaluated mean descriptive statistics, standard deviation, standard error with skewness, and kurtosis to provide the normality of the data. The optimum range for skewness and kurtosis is +1.5 to –1.5 (Tabachnick and Fidell, 2013), and both for all constructs were determined to be within this range. Table 1 presents the descriptive statistics of the variables' items.

Table 1
Descriptive Statistics

Variables	Mean	Standard Error	Standard Deviation	Skewness	Kurtosis
Second Screen Usage	5.202	.072	1.243	-.837	.291
Excitement	4.813	.079	1.520	-.511	-.643
Convenience	5.454	.077	1.329	-.944	.268
Information	5.338	.074	1.287	-.982	.830
Personal FoMO	4.621	.103	1.787	-.486	-.809
Social FoMO	2.441	.101	1.741	1.059	-.069
Obsessive Passion	4.256	.104	1.804	-.099	-1.184
Harmonious Passion	4.989	.094	1.635	-.726	-.399

Measurement Model Analysis

We conducted confirmatory factor analysis (CFA) through the Mplus 8.3 package program to check the measurement model (Muthén & Muthén, 2017). Because of the high intercorrelations between the three sub-dimensions of second screen usage, we examined it with an alternative, second-order factor model (Throuvala et al., 2021). We analysed the second-order structure with other first-order structures in line with the recommendations of Awang (2012). Hair et al. (2019) suggest that the scale should be specified for the second-order construct like the first-order constructs.

The proposed structural model had acceptable goodness of fit values (χ^2 [581, N = 300] = 1607.407; $p < .001$; $\chi 2/df = 2.76$; CFI= .90; TLI = .90; SRMR = .06; RMSEA = .08) in the literature (Hu and Bentler, 1999; MacCallum, Browne & Sugawara, 1996). It was revealed

that the factor loadings of all structures were significant ($p < .001$) and above the threshold value of .600 (ranging from .657 to .981) in the literature (Hair et al., 2019). Constructs names, scale items, and standardized factor loadings are shown in Table 2.

Table 2
Scale Reliability and Validity of Constructs

Constructs	Item	Factor Loading*	Cronbach's Alpha	CR	AVE
Second Screen Usage			.950	.910	.776
	EXC	.680			
	CON	.950			
	INF	.981			
Excitement			.880	.882	.654
	EXC1	.671			
	EXC2	.737			
	EXC3	.900			
	EXC4	.902			
Convenience			.940	.938	.718
	CON1	.737			
	CON2	.834			
	CON3	.895			
	CON4	.908			
	CON5	.878			
	CON6	.819			
Information			.880	.878	.645
	INF1	.877			
	INF2	.832			
	INF3	.694			
	INF4	.799			
Personal FoMO			.940	.939	.755
	PER1	.864			
	PER2	.894			
	PER3	.919			
	PER4	.853			
	PER5	.812			
Social FoMO			.950	.954	.840
	SOC1	.854			
	SOC2	.925			
	SOC3	.954			
	SOC4	.929			
Obsessive Passion			.940	.939	.690

Constructs	Item	Factor Loading*	Cronbach's Alpha	CR	AVE
	OP1	.836			
	OP2	.907			
	OP3	.914			
	OP4	.779			
	OP5	.851			
	OP6	.828			
	OP7	.675			
Harmonious Passion			.940	.938	.719
	HP1	.869			
	HP2	.871			
	HP3	.889			
	HP4	.895			
	HP5	.883			
	HP6	.657			

Notes: All items are measured using a 7-point Likert scale (1) "strongly disagree" - (7) "strongly agree"). Also, all items = $p < .001$.

* standardized values.

Abbreviations: EXC = Excitement, CON = Convenience, INF = Information, PER = Personal FoMO, SOC = Social FoMO, OP = Obsessive passion, HP = Harmonious passion

We analysed the proposed model for internal consistency reliability, convergent, and discriminant validity. First, for internal consistency, Cronbach's alpha and composite reliability (CR) values are expected to be above .70 for all constructs (Hair et al., 2019). This study found that the internal consistency reliability of the constructs is high (Table 2). Second, factor loadings, CR, and average variance extracted (AVE) were estimated for convergent validity. Provided convergent validity, a threshold value of factor loadings, CR, and AVE should be greater than .60, .70, and .50, respectively (Fornell & Larcker, 1981; Hair et al., 2019). Our results showed that all item factor loadings, CR, and AVE were well above the recommended threshold, affirming the convergent validity of the measurement constructs (see Table 2).

Lastly, to ensure the discriminant validity of constructs, AVE's square root values for all factors are higher than the correlation value between the factors, the correlation between the constructs is below .80, and maximum shared squared variance (MSV) values are lower than AVE (Fornell & Larcker, 1981; Kline, 2016). Table 3 shows that AVE's square root values for all components were larger than the correlation value between the variables, the correlation between the constructs is below .80, and MSV values were lower than AVE, demonstrating that discriminant validity was provided.

Table 3
Correlations and Discriminant Validity

Factors	MSV	1	2	3	4	5
1.SSU	.120	**(.881)**				
2.PER	.498	.347**	**(.869)**			
3.SOC	.003	-.160*	.170*	**(.916)**		
4.OP	.615	.191*	.706**	.049	**(.831)**	
5.HP	.615	.266**	.694**	-.054	.784**	**(.848)**

Notes: Values in parentheses indicate the square root of the AVE.
Significance level: *$p < 0.01$, ** $p < 0.001$.
Abbreviations: SSU = Second screen usage, PER = Personal FoMO, SOC = Social FoMO, OP = Obsessive passion, HP = Harmonious passion

Structural Model Analysis

After analysing the measurement model, research hypotheses were tested on the latent variable structural model, in which obsessive and harmonious passion are exogenous variables with personal FoMO, social FoMO, and second screen usage endogenous variables. The goodness of fit values of the structural model created to test the hypotheses showed an acceptable level in the literature (χ^2 [582, N = 300] = 1623.674; $p < .001$; $\chi 2/df = 2.79$; CFI = .90; TLI = .90; SRMR = .07; RMSEA = .08). Furthermore, the estimation power of the model was analysed using R^2 values, which harmonious and obsessive passion explain 55% variance in personal FoMO. In contrast, ones explain only 3% variance in social FoMO. These four constructs together explained 20.3% variance in second screen usage. Table 4 also contains the analysis results.

According to the analysis findings, it was found that harmonious passion had no significant direct prediction on second screen usage ($\beta = .083$, $p > .05$). Similarly, obsessive passion also had no significant direct prediction on second screen usage ($\beta = -.183$, $p > .05$). Therefore, $H_{1,2}$ was not supported. Furthermore, personal FoMO significantly positively predicted second screen usage ($\beta = .449$, $p < .01$), and thus H_3 was supported. However, social FoMO had a significant negative prediction on second screen usage ($\beta = -.212$, $p < .01$) but is in the opposite direction expected, hence H_4 was not supported.

Table 4
Results of the Direct, Indirect and Total Effects, and Hypothesis Testing

Direct Effect	***β***	**S.E.**	***p***			**Hypothesis supported**
HP→SSU	.083	.106	.432			H_1 not supported
OP→SSU	-.183	.105	.080			H_2 not supported
PER→SSU	.449	.086	.000			H_3 supported
SOC→SSU	-.212	.057	.000			H_4 not supported*
Indirect Effect				**95% Confidence Interval**		
				LLCI	**ULCI**	
HP→PER→SSU	.160	.054	.003	.054	.265	H_5 supported

Indirect Effect	***β***	**S.E.**	***p***			**Hypothesis supported**
OP→PER→SSU	.192	.067	.004	.061	.324	H_6 supported
HP→SOC→SSU	.050	.028	.074	-.005	.105	H_7 not supported
OP→SOC→SSU	-.051	.028	.064	-.105	.003	H_8 not supported
Total Effect						
HP→SSU	.293	.141	.037	-.017	.569	
OP→SSU	-.042	.131	.751	-.299	.215	

Note. Bootstrap = 5000

* H_4 was statistically significant but in the opposite direction than expected.

Abbreviations: SSU = Second screen usage, PER = Personal FoMO, SOC = Social FoMO, OP = Obsessive passion, HP = Harmonious passion, LLCI = lower limit confidence interval, ULCI = upper limit confidence interval

We conducted a mediation test to determine whether personal and social FoMO indirectly affects harmonious and obsessive passion and second screen usage. The analysis results are presented in Table 4. First, personal FoMO had a significant indirect effect from harmonious (β = .160; LLCI = .054 – ULCI = .265) and obsessive passion (β = .192; LLCI = .067- ULCI = .004) to second screen usage. These results provide that $H_{5,6}$ was supported. However, the indirect links from harmonious (β = .050; LLCI = -.005 – ULCI = .105) and obsessive passion (β = .051; LLCI = -.105 – ULCI = .003) to second screen usage via social FoMO were not statistically significant. Hence, $H_{7,8}$ was not supported.

Discussion

This research aimed to investigate the mediating role of FoMO in the relationship between fan passion and second screen usage motivations of fans based on the theoretical basis of DMP with an SEM study and expand existing literature. Nowadays, fans who are particularly passionate about their team have a high degree of need to share their passion with others and interact with them using second screens via mobile devices and social media platforms during competition moments due to several internal impulses such as FoMO (Pagani & Mirabello, 2011; Vallerand et al., 2008). Social media, in particular, has enabled fans to connect, share, collaborate, and interact with other fans or their teams (Hussein, Mohamed & Kais, 2021).

We obtained several important results in this study. First, the study examined whether the harmonious and obsessive passion of the fans predicts second screen usage. Unexpectedly, harmonious and obsessive passion had no significant direct prediction on the second screen usage of fans. Considering that there is a feeling softer than obsessive passion, harmonious passion seems familiar for fans to use their mobile phones and interact with their teams and others as a second screen usage against the TV, which is the primary screen at the moment of sports competition (Das et al., 2019; Wakefield, 2016). However, no such relationship has been revealed directly in current research. Nevertheless, obsessive passion fans tend to follow the teams they constantly support and be distracted under all circumstances (Carpentier et al.,

2012; Vallerand et al., 2008). Also, the fact that the fans focus more on the sports competition broadcast on TV and keep their eyes on the competition may explain the significant relationship between obsessive passion and second screen usage. It is suggested that fans who are both harmonious and obsessive passionate remember more details on a single screen rather than a dual screen (Oviedo et al., 2015). This is why it can be said that passionate fans do not directly prefer second screen usage during sports competition moments because TV content is more clearly understood.

Second, the relationships between fans' FoMO levels and second screen usage during the sports competition were examined. Unsurprisingly, we found a significant relationship between FoMO and second screen usage. It can be stated that the personal FoMO experience of the fans is an important antecedent variable in second screen usage. Due to personal FoMO, fans may check-in on social media via second screens to adapt to the live sports broadcast on TV (Hutchinson, 2013). This result aligns with previous research findings (Abel et al., 2016; Conlin et al., 2016; JWT, 2012; Kang et al., 2019; Larkin & Fink, 2016; Su & Chen, 2020). On the other hand, current literature suggests that fans follow information about the match and team on social media via cell phone, both as a primary screen and as a second screen, to 'stay away' from their teammates due to their social FoMO (Hadlington & Murphy, 2018; Kang et al., 2019; Reinecke et al., 2017; Su & Chen, 2020). However, we found that the significant relationship between social FoMO and second screen usage was negative. The reason for the opposite direction relationship may be: If a fan who experiences social FoMO feelings is more susceptible to being influenced by one's peer groups in terms of the team or match-related behaviour, they might react more negatively to second screen usage and so are more likely to avoid such usage (Chinchanachokchai & De Gregorio, 2020). As we stated during the hypothesis development process, we expected a positive relationship. Moreover, if empirical studies reveal different or unexpected results in the relationships between variables, researchers should consider that there may be important mediators and moderators in these relationships (Fardouly et al., 2022). Therefore, future research should incorporate potential variables that mediate or moderate the relationship between social FoMO and second screen usage into their research models. Consequently, for as long as social media via second screens is important to how fans talk about TV, FoMO will keep impacting what fans watch and how (Maxwell, Tefertiller & Morris, 2021).

Finally, based on the DMP, we examined the mediation role of FoMO between relationship fan passion and second screen usage. Accordingly, it has been revealed that personal FoMO mediated the relationship of both harmonious and obsessive passion on fans' second screen usage. The direct, not significant relationship between fan passion and second screen usage has turned into a significant relationship with the indirect effect of personal FoMO. Controlling social media using second screens to alleviate FoMO levels during sports competition is like obsessive behaviour patterns (Richter, 2018), and impulsivity has a stronger

positive relationship, especially with obsessive passion (Orosz et al., 2018). This significant indirect effect of personal FoMO is consistent with its conclusion that it mediates the relationship between needs, emotions, motivations, and social media interactions (Alt, 2015; Przybylski et al., 2013; Wegmann et al., 2017). However, this study did not reveal the mediating role of social FoMO in the relationship between the sub-dimensions of fan passion and second screen usage. During the sports competition, passionate fans prefer second screen usage in line with personal FoMO levels, while social FoMO does not play an active role in this relationship. Although socialization is a need for fans as it is for other individuals, it can be said that fans who go through social FoMO while watching the sports competition likely do not prefer the use of second screens to avoid missing important moments in the competition. At this point, it seems that the desire not to miss exciting moments and positions in the competition precludes socialization**.**

Practical Implications

The findings of the current research also ensure some notable practical contributions. First, today, the viewers' use of more than one screen is an important development that sports teams and marketers should consider (Rubenking & Lewis, 2016). Fans no longer not only watch sports content but also wonder what other viewers are saying, interacting with them. In other words, they exhibit social behaviour, from passivity to activity. Today's active social behaviour while watching sports competitions on TV mainly occurs on social media using the second screen. Therefore, it is inevitable for clubs to use their official social media accounts during sports competitions effectively. Especially considering the second screen usage motivations such as excitement, convenience, and information, club officials must prepare social media content in this direction. While entertaining content causes more interaction, conveying instant information about the team or competition to the fans will enable the accounts to gain more followers. In addition, marketers should now prepare their ad content considering the second and even third screens. In a marketing world dominated by an understanding of "you must be where your target audiences are", second screens offer an important and alternative opportunity. As a result, the second screen will move in the same direction as technology increases day by day. With this process, it is possible to say that the second screen opportunities and applications will also be carried on smartwatches, glasses, TV, and game consoles. Therefore, it is predicted that the second screen will be incomplete for users in the future, and the usage of at least three screens will become widespread in the world of marketing, communication, and sports (IAB Turkey, 2017).

Second, social media usage has increased gradually in modern society through the first and second screens. Thus, practitioners should realize the relationship between FoMO and social media usage. The importance of understanding this relationship will help marketers' efforts to interact with consumers and better understand them. Given the growing importance

of FoMO in marketing, it is inevitable for FoMO marketers to influence market segmentation decisions and social media strategy (Abel et al., 2016). Moreover, fans with high FoMO levels have more social and interaction needs from the club's perspective. To meet these requirements, fans use more technology to be 'up to date' on social networking sites (Rozgonjuk, Elhai, Ryan & Scott, 2019). In this process, clubs should create more effective and impressive social media content and emphasize their interaction to reach their supporters and meet their needs.

Finally, since fans with a high passion for the fan are at the centre of commercial and public discourse on sports and fun, club social media experts are encouraged to direct this passion to well-designed social media campaigns (Wakefield, 2016). Sports managers and clubs should care about DMP, which, as far as we know, is the first and only model in the passion literature. Furthermore, it may be more suitable to evaluate separately the obsessive, passionate fans who feel obliged to watch or follow the club's competitions they support and the harmonious passionate fans who want to participate in their favourite activities by the club managers. As harmonious passionate fans care more about their identity, club managers should often try to reach out to them with more personal messages and content. On the other hand, considering that obsessive fan passion cares about social identity very much, managers should prepare and share their content for fan groups that show more social identity at this point. Club managers are also expected to diversify their second screen activities and efforts to reach these fans, especially considering that harmonious passionate fans use the second screen freely during the game viewing. Furthermore, because obsessive passionate fans have hatred and hostility toward their rivals, managers should convey the goal and spirit of 'fair-play', which is valid among the clubs, especially to the fans. In conclusion, sports practitioners should not forget that FoMO as a possible driver behind harmonious and obsessive passion behaviour, is a factor that increases the frequency of use of social networking sites by fans.

Limitations and Future Directions

Despite all these contributions to the current work, there were also some limitations. First, this study's assessment tools were specific to the simultaneous participation of fans watching a sports event on TV on social media as a second screen. Therefore, information about people who did not participate in social media as a second screen was not collected during sports competitions. Future research should be able to work in the home, stadium, or mass areas (cafe, etc.) and should address the subject in terms of personal or social space by distinguishing the second screen usage behaviour while watching sports competitions. Second, TV was accepted as the primary screen in the research, while social media was adopted as the second screen. Sometimes there can be changes in this situation. The primary screen can be social media, while the second screen can be TV. This is a matter that needs to be investigated. Third, this study's female fans were not sufficiently represented, as they only comprised

about 20% of the participants. Previous sports research suggested that females and males have different sports consumption motivations (James & Ridinger, 2002). Therefore, future research might perform a study in which female fans' participation is higher.

Fourthly, we collected data through self-report scales using a convenience sampling technique in this study. Thus, the representativeness of the sample was limited. Also, we cannot make causal implications on empirical findings due to the cross-sectional nature of the current study design. Future research might use a more representative sample and experimental or longitudinal design. Fifth, we did not examine the relationship between fan passion and FoMO separately, although it is in the same model. To our knowledge, there is no empirical study based on this relationship. Future research may examine this relationship. Another limitation was that the Covid-19 pandemic had not yet emerged in Turkey when the data were collected in this study. Considering that the pandemic can significantly impact fans' attitudes, motivations, and behaviour, future research should be conducted to examine this effect of the pandemic. Lastly, we based this study on the theoretical nature of DMP. Future researchers can examine the model proposed in this study with a different theoretical perspective, such as social comparison (Festinger, 1954) and the technology acceptance model (Davis, 1989).

Conclusion

Despite all its previously mentioned limitations, this research ensures the first empirical evidence on the mediating role of FoMO in the relationship between fan passion and second screen usage. Based on theoretical insights from studies on sports media consumers, this study expands the framework of second screen usage via the DMP perspective. While harmonious and obsessive passionate fans do not feel pressured to use a second screen during the competition, with increased levels of personal FoMO, they may feel the pressure and obligation to control information about the club they support. Especially personal FoMO might now be considered in the literature as an important concept explaining the relationship of passion behaviour in the sport with second screen usage.

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Appendix

Appendix A
List of model variables and items

Variables	Items
Excitement (EXC)* (Hwang & Lim, 2015)	
EXC1	I enjoy reading the reactions of other viewers, which peps me up.
EXC2	I enjoy using social networking sites (SNSs) while watching sports competitions on TV.
EXC3	it is exciting to interact with others on SNSs while watching televised sports competitions.
EXC4	it is fun to interact with others on SNSs while watching televised sports competitions.
Convenience (CON)* (Hwang & Lim, 2015)	
CON1	SNSs allow me to find what I want to know with less effort.
CON2	using SNSs is the most effective way to receive answers to game-related questions.
CON3	it is easy to receive game-related information through SNSs.
CON4	SNSs enable me to stay up to date with game-related info.
CON5	transmitting and sharing game-related information is fast and expedient with SNSs.
CON6	sharing game-related information on SNSs saves me a lot of time.
Information (INF)* (Hwang & Lim, 2015)	
INF1	SNSs help me to obtain more knowledge about sports games.
INF2	SNSs provide helpful information about athletes and their performances in sports games.
INF3	SNSs increase my understanding of televised sports.
INF4	SNSs help me to receive specific information about a situation while watching the game.
Personal FoMO (PER) (Zhang et al., 2020)	
PER1	I feel anxious when I cannot attend the competition with my team.
PER2	When I miss my team's competitions, I feel incomplete compared to other fans.
PER3	I feel anxious when I miss them because my team competitions are important and fun.
PER4	I feel upset when I miss the competition of my team for reasons I do not have.
PER5	I feel regret when I miss the competition of my team.
Social FoMO (SOC) (Zhang et al., 2020)	
SOC1	I think that the social group I took part in when I missed the competition of my team saw me as a minor person.
SOC2	When I miss my team's competitions, I think I am unworthy of my social group.
SOC3	When I miss the competition of my team, I feel excluded by my social group.
SOC4	I feel that I have been ignored/forgotten by my social group when I miss my team's competitions.
Obsessive Passion (OP) (Vallerand et al., 2003)	
OP1	I cannot live without following my team.
OP2	My passion for my team is so strong that I cannot overcome it
OP3	I cannot imagine living a life without following my team.
OP4	I am emotionally attached to following my team.

OP5	I have trouble controlling my need to follow my team.
OP6	I have almost obsessive feelings about following my team.
OP7	My mood depends on my ability to follow my team.
Harmonious Passion (HP) (Vallerand et al., 2003)	
HP1	Various experiences that I had while following my team allow me to enjoy.
HP2	Discovering new things about my team makes me appreciate it more.
HP3	My team is compatible with my favourite features.
HP4	My team is compatible with other activities in my life.
HP5	My team makes me experience unforgettable memories.
HP6	I still cannot control my ambition while following my team.

Note: *The items in these factors have preliminary statements: "I use social networking sites (SNSs) while watching sports competitions/ events on TV because..".

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RESEARCH ARTICLE

Understanding Supervisor's Crab Syndrome in the Private Security Sector: A Mediation Model

Burcu Üzüm[1], Osman Seray Özkan[2]

Abstract
This research is based on the conservation of resources theory. It aims to examine the mediator role of relational energy in the effect of supervisor's crab syndrome on employee work effort. This research, focusing on the crab syndrome and relational energy, a new phenomenon in the literature, differs from other research in terms of the concepts it deals with. The design of the empirically designed research has been formed through the scanning model. The research sample consists of 221 private security employees reached by employing the convenient sampling method. The SmartPLS software has carried out the research's measurement and structural model tests. Reliability and validity tests have been performed in the measurement model, while research hypotheses have been tested to reveal causal relations in the structural model. According to the research results, it has been determined that relational energy has a mediator role in the effect of supervisor's crab syndrome on employee work effort. The contributions and limitations of the research have been discussed, and suggestions for future research are given.

Keywords

Conservation of Resources Theory, Supervisor's Crab Syndrome, Relational Energy, Work Effort, Mediator Effect

Introduction

The conservation of resources theory (COR) can reveal the behaviors of individuals towards their tendency to maintain their welfare. COR includes efforts to conserve what is available or achieve what is not (Hobfoll et al., 2018). All these efforts may have positive or negative reflections on the individuals who interact with one another or the work environment. There has been a significant increase in the number of studies examining the antecedents and subsequents of negative behaviors in organizations throughout recent years. The fact that "negative" behaviors become phenomena is due to the behaviors that are exhibited to retain power or lose power, that the practitioner, who takes reference from "moral licensing", does not consider objectionable (Jordan et al., 2011), that is condemned in terms of its consequences and creates victimization (Linstead et al., 2014; Schilpzand et al., 2016). Moral licensing

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provides the basis for the effort to retain resources to be considered "reasonable," even if unethical (Jordan et al., 2011). Resource retention begins with the competition that pervades organizational life (Yip et al., 2018). Swab and Johnson (2019), who defined competition as a situation and preference issue arising from individual differences that shape interpersonal relationships, stated that competition had an interactional context within the triangle of process, personality, and situation. As a concept in which personality traits are examined, it is difficult to consider the crab syndrome independently of interpersonal relationships (Uzum et al., 2022). Uzum et al. (2022) presented empirical research results that grounded the crab syndrome in a social context through the visor of social comparison, and a psychological context as a type A-type B personality.

Although there are researchers who define the crab syndrome (Bulloch, 2013; DeGruy, 2003; McPhail, 2010; Özdemir and Üzüm, 2019), psychology, sociology, anthropology, organizational behavior literature is encountered in which its structure is tried to be determined by phenomenological research (Miller, 2019), but empirical researches (Üzüm and Özdemir, 2020; Uzum et al., 2022) are almost absent.

COR also has the power to illuminate positive business behaviors through leader-member relationships. Bilateral relationships between the leaders and the members are crucial mechanisms that affect the development of followers' attitudes and behaviors (Cole et al., 2012). Owens et al. (2016) referred to the process of "transfer of emotions, thoughts, experiences", in which such a mechanism is used based on individual relations, as relational energy. Although there are few studies in which leadership behaviors are considered with relational energy (Amah, 2018; Owens et al., 2016; Wang et al., 2018; Yang et al., 2019), it can be pointed out that certain unknowns, which have the potential to increase both organizational and individual resources, regarding relational energy, exist. It is possible to reach research results that indicate the evidence of the interaction between individual psychology and performance, in which leadership style is associated with individual psychology (Ployhart and Hare, 2014). However, it is seen that negative leadership behaviors adversely affect employees' attitudes toward their work (Nasser et al., 2016), for instance, abusive supervision weakens work effort (Dedahanov et al., 2021), whereas low leader-member interaction leads to low work effort (Wheeler et al., 2012). Yeo and Neal (2004: 232) defined work effort as "the amount of resources spent on work". Work effort covers the entire outcomes of employee attitude, behavior, and performance (Wheeler et al., 2012). Work effort aims to reach what is valued, it is motivated based on psychological need, and influenced by leader-member interaction (Vroom, 1964). It is seen that there are many points that need to be clarified regarding the concept of crab syndrome, a new phenomenon. From this point of view, the study aims to examine the effect of perceived supervisor crab syndrome on employees in the research. None of the research studies examining negative supervisor behaviors have addressed the supervisor's crab syndrome and its outcomes. Moreover, identifying the antecedents of relational energy

and work effort and exploring the mediating role of relational energy in the relationship between supervisor crab syndrome and work effort constitute another aim of the research. This research study indicates the feature of being a pioneer in terms of the concepts it covers and makes inferences by revealing the relationship of the concepts which it points out.

Theoretical and Conceptual Framework

COR

People make efforts for surviving, achieving some things, be accepted by others, and feel psychologically comfortable. The efforts are focused on obtaining the "valuable one." The COR theory gives the name "resources" to things that are considered valuable, however, they can be both a means and a purpose (Hobfoll and Ford, 2007). For example, making more money may be the ultimate goal while building a solid career can be the means to keep it going. The resources are divided into four categories by Hobfoll (2001a), regardless of considering whether used as a purpose or a means. Object resources are defined as physical property, such as a house or car. Status resources refer to the social conditions, such as marriage, and the resources that make situations, such as status and money, better. Personal resources include the ability to overcome stress and increase the resources or traits, such as self-esteem. Furthermore, information or social relations that can be used to obtain other resources can also be considered energy sources.

Life History Theory

Vital strategies are formed to keep welfare in balance. These strategies can be explained by the life history theory. Today's researchers make use of this theory to explain human behavior although it has come to the fore as a research topic in evolutionary biology (Griskevicius et al., 2011; Davis and Werre, 2008). The theory suggests that there is a need for a rapid survival strategy by increasing the probability of survival in the face of unpredictable living conditions (Brumbach et al., 2009). Rapid survival ensures the same amount of resources is shared among many individuals (Griskevicius et al., 2011). In other words, the amount of resources per person increases as the number of individuals decreases. The crab syndrome aims to increase the quality of life by eliminating competition and being willing to take a larger share of scarce resources (Üzüm et al., 2021).

Crab Syndrome

Crab syndrome is sociologically defined as the actions of white-skinned individuals to interfere with the achievement of black-skinned individuals (DeGruy, 2003). Hobfoll and Ford (2007) interpreted this situation as a cultural feature of COR. According to Bulloch (2013),

it is the mentality that forces everyone to keep them down by preventing them from reaching the top. McPhail (2010) summarized it as "wasting the oppressed groups or individuals". It is possible to state that the essence of the notion is to eliminate competition and strengthen resource access by keeping others below. These are actions that ensure welfare is kept at a high level (Özdemir and Üzüm, 2019; Üzüm and Özdemir, 2022).

Relational Energy

Another assumption of the COR theory involves the usage of social networks to multiply energy resources. Social networks are used to strengthen motivating energy sources, such as acquiring and being accepted by the environment (Buchwals and Schwarzer, 2010). Relational energy serves this opinion, and it can be transmitted and multiplied through social relations. Relational energy, serving this view, can be transmitted and multiplied through social relationships. Amah (2018) asserted that relational energy, which he defined as an organizational resource, "can be increased by positive interactions among employees and used when desired" and it is transferred from the individuals who share it. Owens et al. (2016) defined this phenomenon as relational energy.

Work Effort

In line with the employment contract, it is expected that the employees will make efforts toward the organizational goals (Gould-Williams, 2004). In this context, the effort is considered as the power made for reaching the "goal". Work effort can be defined as the effort made by the employee in the organizational environment (Trendowicz and Ross, 2014) and the increase in resources by exerting more effort than expected (Behling and Starke, 1973). Productivity, which is an indication of strengthening work effort, increases with the provision of skills and functional effectiveness (Green, 2004). Performance can be improved by providing optimal skill and motivation, and performance is positively associated with work effort (Vroom, 1994; Wheeler et al., 2012).

Hypothesis Development

Crab syndrome feeds on emotions such as jealousy, fear, and anxiety (Soubhari and Kumar, 2014), and these emotions belong to human nature. Whether it is an employee or a supervisor, the crab syndrome may not distinguish among positions. The stress caused by the loss of resources (Hobfoll et al., 2018) may be transformed into a structure that desires to sabotage others' success by predicting being unrivaled (Özdemir and Üzüm, 2019). According to crab syndrome, the supervisor may aim to maintain his/her superiority in this manner by wishing to keep organizational resources in his/her own hands. In this regard, the supervisor may wish to collect the praise by emphasizing that he/she is the source of success. He/she may consider the employees as competitors in the future.

Swab and Johnson (2019) stated that competition feeds on relational dynamics and affects them. Propagation of resources may be possible with the effective use of interpersonal relationships (Cole et al., 2012). The more positive the leader-member interaction, the stronger the energy level of the employees (Atwater and Carmeli, 2009). It is stated that destructive leadership, which acts towards establishing superiority and holding power, and increasing personal resources, harms organizational outputs (Schyns and Hansbrough, 2010). While the negative behaviors of the supervisor create a high level of negativity in the employees, they reduce the energies of the employees (Giumetti et al., 2013). It can be claimed that the crab syndrome, which can be considered one of the adverse supervisor behaviors, would also decrease relational energy. The hypothesis based on this assumption is presented below:

H_1: Supervisor's crab syndrome negatively affects relational energy.

It is seen that leadership styles affect both individual and organizational outputs. For instance, transformational leadership appears to improve employee performance (Wang et al., 2011), whereas trust in the leader enhances employee performance and organizational citizenship behavior (OCB) (Legood et al., 2021). It is stated that the negative qualities of the leader inhibit the role performances, creativity, and OCBs of the employees (Naseer et al., 2016), and create a lower level of task performance (Xu et al., 2012) as a result of the interpersonal relationships (Lian et al., 2012; Kernan et al., 2011) that deal with low-level leader-member interaction. Work effort, as an output that can be managed by a leader or manager (Kmec and Gorman, 2010), corresponds to work engagement (Bakker and Demerouti, 2017) and increased well-being (Brissette et al., 2002) when managed correctly. Otherwise, if supervisor behaviors are perceived differently by employees, it would be a waste of effort to expect positive outputs. For example, an abusive supervisor leads to both low performance (Harris et al., 2007) and low work effort (Dedahanov et al., 2021). However, the employees may exhibit withdrawal behavior to put an end to this situation if they think that they consume more resources emotionally or physically for the sake of earning (Hobfoll, 1989). Employees can consciously reduce their performance and work efforts (Anjum et al., 2021), and kill the time they spend at work outside of work productivity in order to minimize the loss of resources (Pearson et al., 2000). It is inevitable to experience a decrease in productivity, owing to the withdrawal behavior of the employees (Tepper et al., 2017). The hypothesis developed in this regard is given below:

H_2: Supervisor's crab syndrome negatively affects employees' work effort.

People focus on experiencing positive emotions, such as being happy and satisfied. Acting in line with this goal requires her or him to have control over her or his life and enables her or him to establish useful relations (Huppert, 2009).

COR predicts that resources can be enhanced through social ties and relationships (Buchwals and Schwarzer, 2010). In this way, while the energy caused by social relations is inc-

reased to experience positive emotions (Amah, 2016), the energy in the organization is also increased (Enhratd, 2014). Obtaining positive experiences is effective in exhibiting positive behaviors (Owens et al., 2016). Employees with high relational energy levels have a stronger desire to achieve organizational goals and job satisfaction (Cole et al., 2012). The leader should act in a way that improves the attitudes and behaviors of the followers in bilateral relationships (Sue-Chan et al., 2011). Positive relationships with the leader increase the energies of the employees (Atwater and Carmeli, 2009), and this impact manifests itself in employees' performance (Owens et al., 2016). It is known that relational energy is affected by the sense of trust, and when the relationship between them is positive, employees exhibit higher service performance (Fan et al., 2021). In fact, it can be claimed that relational energy affects the well-being of customers in service creation, in short, it enhances the welfare of all stakeholders (Shulga et al., 2022). Relational energy may become a source of motivation for employees to increase their resources based on human relationships that provide resource increase and shapes the work output of the employee (Xiao et al., 2020). Leader behavior that supports resource gain (relational energy) is expected to enhance work effort. The hypothesis developed in this regard is as follows:

H_3: Relational energy positively affects employees' work efforts.

The Mediating Role of Relational Energy

Although it is well-known that leader and member relationships affect the development of employees' attitudes and behaviors (Cole et al., 2012), the leader assumes an energizing role (relational energy) in these relationships and plays a strengthening role in employee performance (Owens et al., 2016), however, it seems that the mediating effect has not been tested much. Yang et al. (2019) stated that spiritual leadership enhances job performance and relational energy assumes a mediator role in this relationship. In compliance with the findings of researchers who stated that relational energy was closely associated with leadership (Baker, 2019), and that relational energy led to positive results (Cole et al., 2012; Owens et al., 2016; Amah, 2018; Wang et al., 2018), it is assumed that energy can play a mediating role between supervisor's crab syndrome and work effort. Sharing experiences may mitigate negative impact, whereas giving the other individual the opportunity to experience a situation with empathy and make inferences regarding how to behave upon encountering a similar situation (Baker, 2019). Individuals attain resource gains by using the relational energy source without consuming their own personal resources (Hobfoll, 2001a). As a result, even one's negative experience may lead to positive gains for another. As such, relational energy may create a force that can counteract the negative feedback of work effort toward the supervisor's crab syndrome.

H_4: Relational energy has a mediator role in the relationship between the supervisor's crab syndrome and the work effort of the employee.

Methodology

This research is empirical, and its design is formed by considering the scanning model. The SmartPLS program was used in the measurement and structural model tests of the research since the data distribution of the research was not normal (Kolmogorov-Smirnov and Shapiro Wilk; $p<.05$) (Hair et al., 2017). In this part, there were the universe in which the research was conducted and the sampling, the data collection tools used, the characteristics of these tools, and the analysis of the data collected during the research.

Sample and Procedure

The universe of the research consists of the non-management personnel in the private security sector in Bursa, and the sample comprises the participants selected by the convenience sampling method in this sector. This research was approved by the Ethics Committee of the Kocaeli University of Social Sciences with code of ethics 2022/04.

The data for the research studies were obtained by the questionnaire method, and it consists of two parts. There are questions about the demographic (gender, marital status, education level, age, and experience) data of the employees in the first part. There are scales whose reliability and validity were tested in order to measure the variables in the research model (supervisor's crab syndrome, relational energy, and work effort) in the second part.

The questionnaire used in the research was created via Google Forms and delivered to private security officers through companies operating in the sector. Research data were collected between 03-31 March 2022 by an online survey method. During the data control and purging phase, it was observed that 221 data were suitable for analysis since 19 participants did not answer the attention questions correctly. The sample size was determined as ten times the number of items in the scale (Bryman and Cramer, 2001; Hair et al., 2014). In line with this information, it was evaluated that the 221 data obtained would be sufficient to reveal the relations between the variables and to test the hypotheses.

It is seen that 86% of the participants are male, 13% are female, 72% are married, and 27% are single when the demographic characteristics of the participants are considered. Also, 62% of them are high school graduates while 36% are associate degree graduates. The average age is 37.10, and the average professional experience is 15.75.

Measures

The scales of the variables in this research were formed through the statements that led to multiple-choice answers. Participants were asked to respond to each of the fourteen statements formed with a 5-point Likert-type scale as "1=Strongly Disagree" and "5=Strongly

Agree". It is obligatory to answer all questions in the survey form created via Google Forms in order to prevent data loss.

Supervisor's Crab Syndrome: The supervisor's crab syndrome scale, which was developed by Üzüm and Özdemir (2020), consists of five items, and a single factor was used. The participants were asked to evaluate their supervisors based on the statements in the scale. A sample item is "Employees outstripping him/her frightens my leader."

Relational Energy: The scale, which was developed by Owens et al. (2016) and was adapted into Turkish by Özkan and Üzüm (2022), was preferred in determining the relational energy levels. The scale consists of five items and a single factor. A sample item is "I feel invigorated when I interact with my supervisor."

Work Effort: The five-stage technique, which was introduced by Brislin (1980), benefited the translation process of the scale. The work effort scale, which was developed by Zhang et al. (2020), was used. It consists of four items and a single factor. The participants were asked to evaluate themselves based on the statements in the scale. A sample item is "I try to work as hard as possible."

Control Variables: The selection of control variables is an important consideration in the development of the research model (Bono and McNamara, 2011). Demographic variables, which were thought to be related to work effort, and were the result variable of the research, were used as control variables in this research. However, the effects of these variables could not be controlled since they did not exhibit a significant relationship with the outcome variable.

Findings

The mean, standard deviation, and correlation values for the variables of the research were presented in Table 1.

Table 1
The Mean, Standard Deviation, and Correlation Values

Variable	Mean	SD	1	2	3
1. Supervisor's Crab Syndrome	2.52	0.94	1		
2. Relational Energy	3.28	1.25	-.44**	1	
3. Work Effort	3.37	1.06	-.40**	.78**	1

Note: n = 221; **p<.01; SD = Standard Deviation

According to the findings, there are negative and significant relations between supervisor's crab syndrome, relational energy, and work effort. On the other hand, there is a positive relationship between relational energy and work effort.

Measurement Model

The measurement model consists of three latent variables and fourteen indicators of these variables. Reliability and validity analyses of the structures in the model were conducted before testing the hypotheses of the research. Within the scope of reliability and validity, the internal consistency reliability, convergent validity, and discriminant validity were evaluated, and the results are given in Table 2.

Table 2
Reliability and Validity Findings of the Measurement Model

Structures	**Item**	**Factor Load**	**Cronbach's Alpha**	**CR – AVE**
Supervisor's Crab Syndrome	SCS1	.92	.95	(.95) - (.84) (CR>AVE)
	SCS2	.89		
	SCS3	.94		
	SCS4	.89		
Relational Energy	RE1	.93	.96	(.96) - (.84) (CR>AVE)
	RE2	.94		
	RE3	.91		
	RE4	.89		
	RE5	.91		
Work Effort	WE1	.94	.92	(.92) - (.75) (CR>AVE)
	WE2	.87		
	WE3	.86		
	WE4	.78		

Fornell-Larcker Criterion			
	Supervisor's Crab Syndrome	Relational Energy	Work Effort
Supervisor's Crab Syndrome	*(.91)*	-	-
Relational Energy	-.43	*(.92)*	-
Work Effort	-.41	.83	*(.86)*

Heterotrait-Monotrait Ratio Criterion			
	Supervisor's Crab Syndrome	Relational Energy	Work Effort
Supervisor's Crab Syndrome	-	-	-
Relational Energy	.43	-	-
Work Effort	.41	.83	-

Note: CR = Composite Reliability; AVE = Average Variance Extracted

Hair et al. (2017) stated that the Composite Reliability (CR) or Average Variance Extracted (AVE) coefficients of items with factor loading values between .40 and .70 should be

examined, and if they are below the threshold values, these items should be removed from the measurement model. Therefore, the 5th item was removed from the supervisor's crab syndrome scale in the measurement model, as a result of the analyses. It was seen that the lowest factor load value was .78, the lowest AVE value was .75, the lowest CR value was .92 and the lowest Cronbach Alpha value was .92 in Table 2 after subtraction. Within the scope of these values, it can be said that the internal consistency and convergent validity of the supervisor's crab syndrome, relational energy, and work effort scales are ensured (Hair et al., 2011; Hair et al., 2019).

The criterion suggested by Fornell and Larcker (1981) and the criterion of the Heterotrait-Monotrait Ratio (HTMT) proposed by Henseler et al. (2015) were used for cross-loading in determining the discriminant validity. It was observed that there was no overlap between the items measuring the research variables when cross loading table was checked out. According to the Fornell and Larcker (1981) criterion, the square root of the AVE values of the structures in the research should be higher than the correlation coefficients between the structures in the research. It is seen that the square root of the AVE value of each structure is higher than the correlation coefficients with other structures when the values in Table 2 are examined. However, the fact that the HTMT coefficients are below the limit value (<.90) indicates that the structures are separate factors from each other (Henseler et al., 2015; Hair et al., 2019).

Structural Model

The results of the structural model performed with the help of the SmartPLS software are shown in Table 3 following the measurement model of the research.

Table 3
Values of the Structural Model

Model Summary	**R^2**	**Q^2**	**f^2**	**VIF**
Relational Energy	.18	.14	-	-
Work Effort	.69	.49	-	-
Supervisor's Crab Syndrome → Relational Energy	-	-	0.22	1.00
Supervisor's Crab Syndrome → Work Effort	-	-	0.01	1.22
Relational Energy → Work Effort	-	-	1.73	1.22
Total Effect	**β**	**Std. Dev.**	**t-value**	**p-value**
Supervisor's Crab Syndrome → Work Effort	-.41	0.06	6.35	***
Direct Effect	**β**	**Std. Dev.**	**t-value**	**p-value**
Supervisor's Crab Syndrome → Relational Energy	-.43	0.06	6.75	***
Supervisor's Crab Syndrome → Work Effort	-.06	0.05	1.06	.288
Relational Energy → Work Effort	.80	0.03	25.28	***
Indirect Effect	**β**	**CI (95%)**	**Result**	
Supervisor's Crab Syndrome → Relational Energy → Work Effort	-.34	(-.454; -.238)	Accept	

Note: ***p<.001; R^2 = Explained Variance; Q^2 = Predictive Relevance; f^2 = Effect Size; VIF = Variance Inflation Factor; CI = Confidence Interval; Coefficients are standardized (β)

It is thought that there is no linearity problem between the structures since the VIF coefficients are below the threshold value of 5 (Hair et al., 2014). It is understood that the supervisor's crab syndrome has a medium size impact on relational energy while it has a high size impact on relational energy work effort when the effect size coefficients (f^2) are examined (Cohen, 1988). The Q^2 coefficients calculated for the endogenous variables are greater than zero, and thus it can be said that the relevant variables have predictive power (Chin, 1998). It is seen that the exogenous variable explains the relational energy is 18% and the work effort is 69% when the R^2 values in the table are taken into consideration.

The relational energy variable, which is the mediator variable, was removed from the research model, and the significance of the path coefficients was tested in order to investigate the mediator effect in the first step. As a result of the analysis, the effect of supervisor's crab syndrome on work effort (H_2) was found to be significant (β=-.41; $p<.001$).

The mediator variable was included in the model, and the significance of the path coefficients was evaluated in the second stage. As a result of the analysis, it was detected that the effect of supervisor's crab syndrome on relational energy (H_1) was significant (β=-.41; $p<.001$), and the effect of relational energy on work effort (H_3) was significant (β=.80; $p<.001$).

According to Baron and Kenny (1986), firstly, the effects of the independent variables on the dependent variables must be significant to mention a mediator effect. Moreover, the effects of independent variables on mediating variables and mediating variables on dependent variables should be significant when mediator variables are included in the model.

Accordingly, it can be said that there is a mediator effect since the work effort of the supervisor's crab syndrome is significant in the model without the mediator variable, the relational energy of the supervisor's crab syndrome in the model with the mediator variable and relational energy has significant effects on work effort. The significance of the indirect effect should be tested through the "Sobel" test after detecting the mediator effect, however, the bootstrap confidence interval method was used, instead of the "Sobel" test in the research, due to the fact that the distribution of the indirect effect is often not normal (Stone, 1990) and the criticisms, such as the low reliability of this test (MacKinnon et al., 2004; Preacher and Hayes, 2008). It can be said that the indirect effect is significant since the calculated confidence interval values do not include a zero (0) value (MacKinnon et al., 2004).

The Variance Accounted For (VAF) value suggested by Hair et al. (2017) was used to analyze the feature of the mediator effect. The size of the VAF value helps determine whether the mediator effect is the partial or full mediator. According to Hair et al. (2017), if VAF is > 80%, there is a full mediator effect while if VAF is between %20 and %80, there is a partial mediator effect. However, if VAF is < 20%, there is no mediator effect. In the research model, VAF is calculated to be 82% in the Supervisor's Crab Syndrome → Relational Energy → Work Effort path where the indirect effect was significant. This result showed that relational

energy has a full mediator role in the relationship between the supervisor's crab syndrome and work effort. This finding supported Hypothesis 4 of the research.

It was detected that the change of the supervisor's crab syndrome in work effort was to be 16% while the independent and mediator variable explained in the mediated model was 69% when the R^2 values of the tested models were taken into consideration. This increase in R^2 (53%) indicates the presence of a mediator effect in the mediational model.

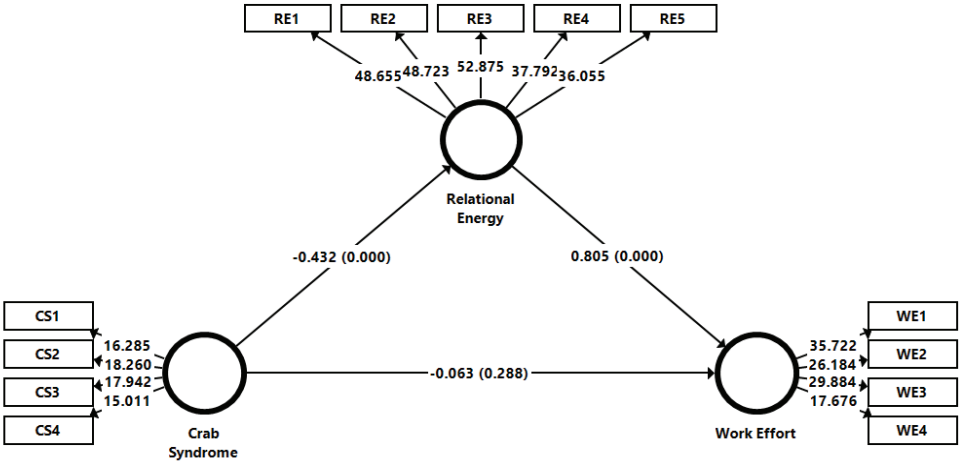

Figure 1. Structural model and coefficients

Discussion

Both supervisor and subordinate develop behavioral strategies focused on maintaining and expanding their resources (Hobfoll et al., 2018). In this research study, it is revealed that the extent to which the leader, on the one hand, motivates his/her followers for positive behaviors, on the other hand, can disrupt the working atmosphere due to the predominance of his/her own personal ambitions. Taylor et al. (2012) reported that incivility behaviors in the workplace reduced the emotional commitment of employees and led to avoidance of extra-role behaviors. Another deduction of the research is that supervisor's crab syndrome reduces work effort. A conclusion in line with the negative supervisor behavior literature (Harris et al., 2007; Dedahanov et al., 2021; Xu et al., 2012) is drawn. Behavioral strategies, which are built to increase positive emotions in human nature (Huppert, 2009), are transformed into relational energy that will ensure happiness and satisfaction through social interaction (Enhardt,

2014; Amah, 2016). It has been determined that subordinates get higher energy from their interactions with the supervisor who exhibits positive behavior and are more focused on their work (Giumetti et al., 2013). A similar deduction is made by Kjelberg et al. (2010), and it was found that energy reduced the stress level to a reasonable level. In this research study, it is determined that relational energy contributed to the increase of resources and increased work effort, and it is seen that it supported the previous research results. Tummers and Bakker (2021) emphasized that the leader assumes a crucial role in enhancing employee efforts to conserve resources. It was also argued that energy is affected by leader behaviors and the environment (Bedawy, 2015). As a result of this research, it is seen that relational energy supports the conservation of personal resources (Hobfoll, 2001b). Yang et al.'s (2019) perceived quality leadership behaviors enhance performance and it is stated that relational energy mediates this relationship. Another finding of this research is that relational energy has a mediator role in the impact of supervisor behaviors on employee work effort. As the final result of this research, it is proven that the supervisor's crab syndrome reduces the relational energy and work effort of the subordinates, but the relational energy takes the current situation to another level.

Implications

Theoretical Implications

With this research, a model, which integrates relational energy into the impact of supervisor's crab syndrome on work effort, and explains these relations, is tested. Upon considering the concepts it examines, this study makes important contributions to the crab syndrome and relational energy literature. The first contribution of the research is the investigation of the crab syndrome from the scope of the supervisor, which has quite a limited empirical research scope. The second contribution involves the fact that the crab syndrome appears to be one of the antecedents of relational energy. The third contribution is to determine relational energy as the antecedent of work effort, whereas the fourth contribution is to explain the relationship between crab syndrome and work effort through relational energy. Especially by illuminating the unknowns about the crab syndrome, the scope of the unknown regarding the mediating role of relational energy is broadened. The relationship between the variables that are the subjects of the research could be supported by the COR.

Practical Implications

It is stated that well-being and high self-esteem have a negative impact on crab syndrome (Üzüm et al., 2021; Uzum et al., 2022). Crab syndrome has the potential of causing the encounter with negative outcomes. Therefore, the crab syndrome has the ability to cause confrontation with negative outcomes. It is possible to express that it creates a negative change in the quality of the person's relationship with her or his environment and in the business life of

the individuals she or he keeps in her or his target. For this purpose, it is also recommended that human resources provide psychological support to each individual affected by the stated results, regardless of employee or supervisor.

Ployhart and Donald (2014) stated that exploring the world of organizational behavior offers a competitive advantage and strategic opportunity. In order to take advantage of this opportunity, common use of resources should be encouraged by dispersing competition from individual to the group, conflict becomes inevitable when competition remains individual-based, and performance can be enhanced when remains team-based (Swab and Johnson, 2019). It is also thought that the crab syndrome may promote positive outcomes in the organizational atmosphere, with the researchers' emphasis on "sharpening the steel with steel". It is recommended that human resources management develops programs that can identify employees with the crab syndrome mentality and manage them to their goals.

Kim et al. (2020) expressed that business efforts could change direction on the axis of satisfaction, and negatively affected psychology caused a cost burden. In this regard, human resources practices that would encourage the establishment of better quality social relationships (relational energy) between managers and subordinates can be put into effect. Moreover, reminder policies can be conducted to balance individual and organizational resource acquisition as well as retaining individual resources. It is stated that competition is motivating for success and performance (Yip et al., 2018). Nevertheless, the supervisor's view of the employees as his/her competitors may prevent him/her from raising potential candidates for success in the future. This may be caused by the supervisor having the power to access and allocate organizational resources (Yang et al., 2019). Therefore, it is recommended that the supervisor should supervise himself/herself and be supervised by employees or customers (Harris et al., 2007).

Limitations and Suggestions

This research, which was designed to evaluate the supervisor's crab syndrome, was performed on employee perceptions. Research data were obtained cross-sectionally from a single source. Obtaining data from different sources (leader-customer-colleagues etc.) at certain time intervals and from a larger sample group would render the research results more reliable. The scope of the research is limited to the concepts of supervisor's crab syndrome, work effort, and relational energy. Besides work effort, multiple behavioral outcomes, such as organizational citizenship, work stress, intention to leave, and organizational commitment can also be examined for future research studies. Whether supervisor's crab syndrome differs across cultures can also be examined in a cultural context. Practices in enterprises with less hierarchical levels may provide a better understanding of the crab syndrome, which prioritizes the competitive factor. The research study is conducted in the service sector (private security). It

takes its place in the literature as a rare empirical example that reveals the supervisor-member interaction on the basis of the sector to which the sample is subject (Scheerlinck et al., 2020). Nonetheless, each sector has its own specific characteristics. It is thought that crab syndrome in the production sector, R&D, or informatics sector would lead the individual to better results. It is recommended to examine the supervisor's crab syndrome in an intergroup manner, and it is thought that it would strengthen teamwork and motivate collective work as well as reach a common goal in intergroup competition (Swap and Johnson, 2019).

Conclusion

This research study, based on COR and supported by the life history theory, defines the relationship between the supervisor's crab syndrome and work effort along with the mediator role of relational energy. Economic uncertainty and competition also reveal themselves in business life (Chen and Yang, 2012). Crab syndrome is a response to the conservation of resources (Uzum et al., 2022). Competition-oriented vital and organizational conditions in the 21st century have started to take people under the influence of the crab syndrome.

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RESEARCH ARTICLE

Forecasting and Evaluation of Non-Performing Loans in the Turkish Banking Sector

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Abstract
In recent years, there is an increasing trend in non-performing loan levels in Turkey which causes stress both on the real and financial sectors. Increasing non-performing loan volumes are an indication of problems in sectors or the general economy. It is also closely related with the stability of the banking system. It is therefore important for regulatory/supervisory institutions and banks to be able to predict problematic loan levels successfully, for better policy making and management. For this purpose, non-performing loans to credit ratio in Turkey for the dates between the first quarter of 2015 and fourth quarter of 2019 were forecasted with two machine learning methods, namely random forests and boosted trees, by using data starting from the first quarter of 2003. Lagged values of several macroeconomic, bank-specific and uncertainty factors are included as determinant variables in the analyses. Methods provide insight about the relationship of included variables with non-performing loans. Our results indicate partial dependencies and positive relationship between non-performing loans and inflation, interest rate and capital adequacy ratios, and negative relationship with credit to gross domestic product ratio.

Keywords

Banking Regulations, Financial System, Time-Series Forecasting, Machine Learning

Introduction

A well-functioning financial market transfers funds from people who have an excess funds and do not have a productive use for them to those who have a shortage of funds. In the modern era, efficiency of this transfer process fuels real economic activity, therefore, soundness of the financial system has vital importance for sustainable economic growth. The structure of financial markets and efficiency of financial intermediation have direct impact on the economic conditions of different countries (Mishkin, 2007).

A significant development has been achieved in the financial system of Turkey with the implementation of a reform package after 2001, in response to the infamous banking crisis in that year. Indeed, there are still some structural problems in the financial system, like

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inadequate inclusion of non-bank financial institutions to the system and insufficient volume of capital markets. The largest share in the financial sector belongs to banks (around 85%) (Banking Regulation and Supervision Agency of Turkey, 2019). For this reason, the health of Turkish banking system and banks' strong balance sheets are important for the whole economic system.

There are various factors, which would affect financial the health and the balance sheet structure of the banking system. Credit risk, which is one of the most important among those factors, must be managed by banks along with other risk factors like market risk, foreign currency risk and operational risk.

Non-performing loans (NPLs) are one of the most important indicators of the financial health of banks and constitute the main measure of credit risk in the banking system (Kjosevski, Petkovski, & Naumovska, 2019). A balance sheet item can be defined as a loan that is several (three in Turkey) months overdue or in default, and has direct effect on bank performance, liquidity, and profitability. .

NPL volume of a bank is an especially important component within its credit management processes (Poudel, 2012) and are closely monitored by bank management and regulators due to implications on bank performance and overall economy. Insolvency of banks is closely related with asset quality deterioration. One of the reasons of asset quality deterioration of banks are NPLs.

Financial stability of the banking system in a country has always been affected by the NPL volume. It has a direct negative effect on banks' balance sheets by decreasing the loanable funds, decreasing profitability, and creating indirect burden for all parties in the economy, specifically for borrowers, lenders, and intermediaries. It also has a strong relationship with banking crises. Reducing problematic loan volume has a positive impact on the medium-term economic performance of a country (Balgova, Nies, & Plekhanov, 2016; Ozili, 2019). It is normal to observe fluctuations in NPL volumes in a country, especially due to business cycles or shocks that disturb regular economic activity. But real danger arises if there is a positive trend in the volumes, parallel to low/negative growth, high unemployment and credit booms.

This study attempts to build a reliable forecasting model, by using several macroeconomic, bank-specific and uncertainty indicators. The main objective is to understand if it is possible to forecast future non-performing loan to credit ratios (NPL ratio) by using these indicators as leading variables, and if so, to what extent. Successfully forecasted NPL ratios may provide valuable information and chance to policy makers to respond situations more proactively. As a secondary objective, by using information provided by implemented models, important variables on forecasts are determined. It is important to note that it will not be possible to interpret these information as "causal inferences"; but more like "signal infe-

rences". The analysis period starts from the beginning of 2003 and ends at the end of 2019, just before global pandemic crisis started. So, the effect of the pandemic on NPL ratios is not investigated in this analysis.

From this point on, the study continues with an examination on how the NPLs evolved after the stabilization program (namely "Transition to the Strong Economy Program") initiated in the Turkish Banking system. Then, literature is given on the choice of determinant variables of NPL ratios along with several prediction attempts on NPLs in Turkey and other countries. Next, a brief rationale for our model preference is given, and after, the methodology section provides more information on the data, implemented methods and how the performance of methods is evaluated. Results are presented, interpreted and discussed along with policy recommendations and comparisons with the literature.

Evaluation of Non-performing Loans in the Turkish Banking System

Turkey experienced two banking sector crises in November 2000 and February 2001. However, even before the crisis period, the previous years were also very unstable for the Turkish economy. Nearly the whole 90s passed with high inflation and uneven growth rates. In Figure 1, NPL ratios are given for the period between 1988 and 2019, as annual data.

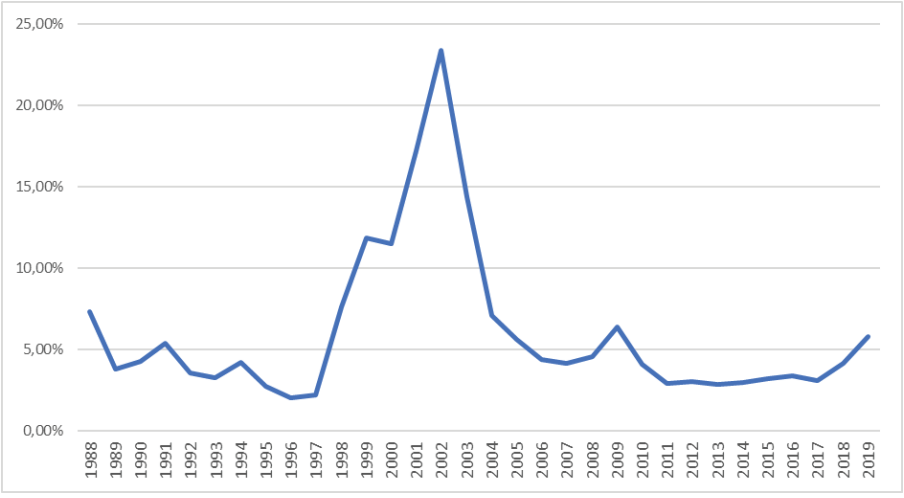

Figure 1. NPL to credit ratio in Turkey (1988-2019)

Own elaboration by using data from CBRT

The main weakness of Turkish economy in 90s was high public debt levels. In those years, the financial system in Turkey was in a developing stage. In 1989, restrictions on capital movements and foreign borrowing by residents were removed. This liberalization enabled

more capital inflows to Turkey. But capital inflows were mostly speculative, and investors did not use the liquidity in the market in a productive manner; combined with increased public expenditures financed by these available funds (Yentürk, 1999), Turkey experienced high inflation rates without a significant change in unemployment and an advance in economic growth. Eventually, Turkey found itself in a currency crisis.

According to regulations in Turkey, NPLs are defined as the sum of impaired loans (loans with specific provisions) and the non-impaired loans that are overdue for more than 90 days. Overall, NPL ratios until 1998 were lower than 5%. But after 1998, especially with a surge in credit growth in 1999, problematic loan levels reached remarkably high levels. After the crisis in 2000 hit Turkey, overnight interest rates skyrocketed (to 4,000% levels) and the Turkish Lira depreciated by more than 50% in three months. By the end of 2001, the annual NPL ratio was 17.2% and by the end of 2002, it was 23.26%. Many banks went bankrupt during the crisis (Gormez, 2008).

At the onset of the 2000-2001 crisis, the Turkish economy was highly dependent on short-term capital inflows. Interest rates were also very volatile. As Orhangazi (2014) pointed, increased capital inflows correlate with credit expansion and are closely related with economic growth in Turkey. Slowdown in capital inflows, and even a negative net outflow in 2001, pushed the economy into recession.

In those years, the banking system was fragile due to systematic risks they were exposed to. Risks in the banking system can be summarized as maturity mismatches (funding long term government securities with short term deposits), ineffective supervision, and continuing open foreign currency positions. The share of the state-owned banks in the financial sector was around 30%, and they suffered big losses for subsidizing some sectors parallel to the economic policies of the government. During 1999 to 2001, 18 banks, which is equivalent to 12% of the total assets in the banking sector, were taken under the control of the Saving Deposit Insurance Fund.

After the crisis, a detailed economic program and structural reforms were implemented to overcome overwhelming structural problems (Ozatay & Sak, 2002). Loans to the manufacturing sector were especially problematic. To restructure the debt of manufacturing companies, which were unable to repay their debts, a new program was implemented that was named the İstanbul Approach with Law No.4743 Restructuring Debts to Financial Sector (Finansal Yeniden Yapılandırma Koordinasyon Sekreteryası, 2005). These kinds of legal frameworks and governance are crucial for tackling the NPL problem. There are several examples of financial restructuring programs that were launched in many countries for making an agreement between debtors and banks providing out-of-court mediation. The centralized out-of-court debt workout program was used by the governments of Korea, Thailand, Indonesia and Malaysia in the 1990s (Woo, 2000).

The NPL ratio in Turkey is generally lower than in Europe and the World. On the other hand, an upward trend is seen with the impact of the Global Financial Crisis in 2008 (to 6.4% in 2009, from 4.16% in 2007; see Figure 1). Increases in the NPL ratio have become evident in recent years, which are generally concentrated in private corporations. Currency shocks is an important factor behind this surge, as years of relatively cheap foreign exchange rates promoted credits on foreign currency.

Foreign currency lending is common for developing and transition countries and borrowers of foreign currency loans expect low interest rate advantages. Depending on the exchange rate fluctuations, the expected advantages may turn easily into disadvantages for the borrowers and banks. The ratio of foreign currency loans to total loans ratio in Turkey was 28% at the end of 2013, and it has increased to 40% by the end of 2018, and it was 38% of the total loans at end of 2019 (Banking Regulation and Supervision Agency of Turkey, 2019). Because of this high share of foreign currency denominated loans in Turkey, sharp depreciations in Turkish Lira caused an increase in the NPL level.

Banks and investors held meetings in 2018, regarding selling or transferring of the bad loans into special funds, but talks were not finalized and stalled over. The Banking Regulation and Supervision Agency (BRSA) announced that a total of TL 46 billion worth of loans (more than 8 billion USD) should be written off by banks (Banking Regulation and Supervision Agency of Turkey, 2019). Like the İstanbul Approach, a new Financial Restructuring program was introduced by BRSA on 15.08.2018 (named Regulation on Restructuring the Financial Sector Debts). But while these efforts have been established to reduce problems on one side, more credits are pumped to small and medium size firms through the Treasury-backed Credit Guarantee Fund on the other side. More recently, credit acceleration policies were applied via state banks and with legal enforcements (like asset ratio).

How Non-Performing Loans Affect The Bank Balance Sheet

Loans are one of the most important components of bank balance sheets and obviously one of the key sources of their profits. As in many countries, banking loans are the main source of corporate finance and economic growth in Turkey. Apparently, the quality of bank loan portfolios and NPL levels are essential for banks. Banks with high NPL ratios could face liquidity, profitability and capital adequacy problems. The increase in NPL in the majority of the banking sector has seriously threatened financial stability, as in the 2007- 2008 global mortgage crises.

NPLs can cause cash inflow to decrease because of the loan principal and interests not collected on maturities, and liquidity problems may increase. Munteanu (2012) concluded that the NPL ratio has a constant significant negative influence on bank liquidity determinants in Romania over the 2002-2010 period. (Munteanu, 2012). On the other side, banks cannot

concentrate on their main activities while trying to eliminate this problem. This leads to a decrease in the efficiency of banks' credit management and loan allocation process. Due to legal regulations, banks are obliged to allocate provisions for their NPLs that are deducted from the net interest income, and therefore, the profits of the banks are negatively affected.

The sum of bad loans and bank failures are interrelated. The NPL volume in the financial sector increases the possibility to put the bank in financial difficulty and profitability problems. The deterioration of balance sheets will result in bankruptcies and real sector financing declines because of the lack of available capital/funds. There is a consensus on the view that high NPL levels have a negative impact on the lending capacity of banking sector; e.g. bank lending to non-financial firms has decreased when the NPL ratio has increased (European Central Bank Banking Supervision, 2017). When countries manage to reduce their NPL ratios in the system, they experience faster growth rates. There is an inverse relationship between economic growth and the NPL ratio, positive growth rate of gross domestic product (GDP) decreases NPLs (Dimitrios, Helen, & Mike, 2016; Louzis, Vouldis, & Metaxas, 2012; Makri, Tsagkanos, & Bellas, 2014; Messai & Jouini, 2013; Us, 2018).

The NPL level of banks affects their lending capacity through three different channels, specifically profitability, capital adequacy and funding capacity. When the NPL volume increases, banks must increase provisions, which lowers the income of banks. Provisions may also tie up a significant sum of capital due to higher risk weights on harmed assets. A weakened balance sheet makes bank's funding costs higher. The combined effect of these channels increases lending rates, decreases lending volumes and increases the risk of the bank (Aiyar et al., 2015; European Central Bank Banking Supervision, 2017). The impact of credit risk management on the financial performance of commercial banks has been analyzed in Nepal (Poudel, 2012), and it indicated that banks need to allocate more efforts to default rate management.

The capital adequacy of banks is one of the main pillars for absorbing potential losses. Kozaric and Zunic (2015) analyzed the relation between NPL and capital adequacy in the Bosnia and Herzegovina banking system and found a strong negative correlation between them (Kozarić & Žunić, 2015). In order to limit negative consequences, regulatory authorities closely watch the allocating loan provisions and loss coverage policies.

Literature Review on Non-Performing Loans and Its Determinants

In order to obtain successful forecasts on NPL ratios, the determination of variables to include into the models matters a lot. The inclusion of irrelevant variables do not possess a problem for the methods employed in this study but excluding relevant variables, thus ignoring important information may reduce performance. In this section, a review on the choice of variables in the studies is given.

The literature on NPL focuses on different aspects of the topic. Some of the studies focus on financial vulnerability and crises related with the volume of NPLs in economies, with an increased attention after the global financial crisis. These studies have emphasized that NPLs can be used as an indicator of banking crises and have analyzed how a macro prudential policy can play an important role preventing system-wide increases in NPLs (Reinhart & Rogoff, 2011; The European Systemic Risk Board, 2019). Another group of studies examine the relationship between financial development and NPLs, and the economic consequences of reducing nonperforming loans (Balgova et al., 2016; Ozili, 2019).

Identifying the factors affecting the NPL levels in an economy provides valuable information to support efforts to prevent adverse outcomes (Makri et al., 2014; Messai & Jouini, 2013). There are some other studies forecasting NPLs using macro and micro variables (Greenidge & Grosvenor, 2010). Another study was conducted with the forecasting models regarding recovery rates of NPLs using a private database from a European debt collection agency (Bellotti, Brigo, Gambetti, & Vrins, 2021).

Variables considered regarding the NPLs prediction in the literature can be categorized in two main groups. The first one is the macroeconomic variables, and the second one is bank-specific variables. GDP growth, unemployment rate, inflation rate, government budget balance, public debt as percentage of GDP, interest rates are frequently used macroeconomic variables in analyses. From the bank-specific variables, capital adequacy requirement of the banks, efficiency of banks, the loan deposit ratio is found to be included.

As mentioned before, the NPL ratio and the GDP growth have an inverse relationship and most of the studies indicate that banks' problematic loans are closely related to economic and business cycles. When the growth rate of an economy declines, earnings of firms and households decay and it becomes difficult for them to fulfill their liabilities. When the economy has higher growth rates, the debt servicing capacity of firms and households increase (Dimitrios et al., 2016; Makri et al., 2014; Messai & Jouini, 2013; Salas & Saurina, 2002; Us, 2018). However, in Vatansever and Hepsen (2013)'s study, the GDP growth was not found significant for explaining the NPL ratio in Turkey.

Studies inquiring the factors affecting the NPL ratios indicate a strong positive correlation with unemployment rates. It is widely accepted that reducing unemployment and increasing income improve the financial condition and payment ability of borrower's loan installments (Dimitrios et al., 2016; Louzis et al., 2012; Makri et al., 2014; Messai & Jouini, 2013).

There are significant number of studies which included inflation rate into their analysis on NPL ratios. The inflation rate's impact on NPLs is not clear and the relationship can be either negative or positive (Arrawatia, Dawar, Maitra, & Dash, 2019; Khan, Ahmad, Khan, & Ilyas, 2018; Nkusu, 2011); and some studies even indicate that inflation does not have any significant impact (Makri et al., 2014).

Government budget balance, public debt as a percentage of GDP and interest rates are other indicators included in studies. Public debt is an important indicator of the fiscal structure of a country and a low debt promotes financial stability and a healthier banking system. Higher debt levels are expected to be accompanied with higher NPLs. This relationship also implies that fiscal problems might lead to an increase in problematic loans (Louzis et al., 2012; Makri et al., 2014; Us, 2018). In contrast, Dimitrios et al. (2016) reported that there is no significant relation between fiscal policy, debt and NPLs.

Among bank-specific factors, the capital adequacy ratio is one of the most frequently used but the results are conflicting. Some of the studies indicate a positive relationship between the capital adequacy level and the NPL level in banks. Vatansever and Hepsen (2013) indicated a positive relation between these variables. In their model, when return on equity (ROE) increased by 1 point, then, the NPL rate increased by 0.15. On the other hand, some of the models indicate a negative relation between these variables. When the capital requirements are enforced by law and capital adequacy ratios improve, there will be an improvement on loan quality and NPLs will be lower (Makri et al., 2014).

In a study using the data of 59 countries, empirical results show that an increased capital adequacy ratio and better provisioning policies seem to reduce the level of problem loans (Boudriga, Taktak, & Jellouli, 2009). Berger and DeYoung (1997) report a negative link between the capital requirement and NPLs, which asserts that less capitalized banks are more likely to take risks and a low capital ratio is associated with higher NPLs.

Another important bank-specific factor is the efficiency of banks, which can be measured in different ways. In Berger and DeYoung's (1997) study, Granger-causality tests were conducted, and they concluded that bad management and moral hazard hypotheses explained a significant part of NPLs. Sstudies which used the ratio of other expenses to assets as an indicator for managerial efficiency found a positive relationship with NPLs (Louzis et al., 2012; Us, 2018). In another paper, empirical evidence was provided by investigated causality between the cost efficiency and NPLs for the Czech Republic's banking industry. They extended the Granger-causality framework used by Berger and DeYoung (1997), and provided support for bad management hypothesis, and stated that inefficiency in bank management resulted in an increase in NPLs (Podpiera & Weill, 2008).

Several studies found that a significant and negative relationship between the return on assets and the amount of NPLs. It is clear that banks that are not under pressure to increase their profits do not extend risky loans (Dimitrios et al., 2016; Messai & Jouini, 2013). Return on assets and loans to deposit ratios are indicators of quality and riskiness of management. Loans to deposit ratio is another bank-specific variable that is taken into account for explaining NPLs and expectedly, the ratio has a positive correlation with the NPL ratio (Dimitrios et al., 2016; Makri et al., 2014). This ratio is a proxy of the total debt burden of households and companies,

and it reflects banks' risk-taking attitude. High debt burden is negatively correlated with NPLs in economic upturn periods, in economic downturn periods, it would be positively correlated (Nkusu, 2011).

Some other studies found a positive relation between credit to deposit ratio and NPLs. This relation states that an increasing credit to deposits ratio reveals a risk preference and is expected to lead to higher NPLs (Dimitrios et al., 2016). Lastly, it is found that the NPL of previous year is one of the major contributors to the deterioration of the current year NPL (Arrawatia et al., 2019).

Methodology

In this study, the NPL ratios in deposit banks functioning in Turkey are forecasted by two machine learning (ML) methods, namely Random Forests (RF) and Boosted Trees (BT). Predictor variables included in forecasting models are selected parallel to the literature. Additionally, several uncertainty measures are added to the models.

Data

The dataset comprised of sixteen variables, including the NPL ratio. Predictor variables consist of three banking-sector specific factors, eight macroeconomic factors, three global and country specific uncertainty measures and one dummy variable to distinguish recession eras for Turkey. In the preliminary examination, twenty-one variables were included in the dataset; but it is seen that some of these variables are closely related to each other (with very high correlation scores up to 0.97; preliminary examination results are presented in supplementary material). For this reason, some of these variables are dropped from the dataset, or combined to capture average information. Details and sources of data can be found in supplementary materials.

In conventional and commonly used econometric methods, it is a necessity to work with non-stationary data, because most statistical methods require an assumption of stationarity on time-series, and a violation of this assumption may lead to spurious results. Most time-series exhibit non-stationary behaviors, meaning that the statistical properties like mean and variance may change over time, and thus, will prevent inferential analyses. Transforming data by differencing is usually used to make time-series stationary, but as López De Prado (2018) points, this action will erase some important information about past (memory) that costs less predictive power[1].

1 There are different views on the effect of non-stationary time-series on predictive power of models. Even López De Prado (2018) says stationarity is a necessity for supervised learning (e.g. RF and BF), there are many studies that employed non-parametric methods and successfully used non-stationary time-series for prediction purposes (see Changqing et al. (2015)).

Consequently, in order to reveal time-varying statistical properties of data, stationarity tests (i.e. augmented-dickey fuller- ADF) are conducted on the time-series used in this study. It is seen that there is a mixture of integrity order, I(0) and I(1), among variables (see supplementary materials). But to preserve and use the long-term memory of time-series, no transformation is made on the data, they are used as in their raw forms.

The analysis period covers the dates between 2003:Q1 and 2019:Q4; or in other words, includes the reform years after 2001 and end just before the pandemic crisis. Quarterly observations are adopted because most of the macroeconomic data are not available in higher frequencies. The whole dataset has 68 observations, but with inclusion of lags into the models, the total observation number will vary from 67 (for 1 lag) to 64 (for 4 lags).

Predictive Models

In this study, two powerful ensemble trees, random forests (RF) and boosted trees (BT) are implemented to forecast NPL in Turkey, by using several macroeconomic and banking sector indicators. These methods are preferred because many determinant variables (and their lags) are included, there is a high probability that relationships and interactions among variables may be too complex to be modelled properly with conventional econometric approaches. Relatedly, statistical properties and structures of time-series may not be suitable for direct implementation, and many structural breaks due to business cycles may exist over the analysis period. RF and BT provide opportunity to bypass such observable and unobservable issues.

The simplest example of tree based methods is the classification and regression tree (CART). In CART with regression setting, a single tree is created by partitioning the data into smaller groups that are more homogenous with respect to the response (Kuhn & Johnson, 2013). Homogeneity is ensured by selecting a predictor with a split value that minimizes errors over the groups[2]. This splitting procedure continues until a termination condition is met. We used CART to build a benchmark model and compare the performance of RF and BT.

Random Forest

CARTs are highly successful for learning on training data and provide highly interpretable outcomes for analysts, but they are also subject to a high variance[3] problem. RF (Breiman, 2001) provide an improvement over CARTs (and several options used to lower variance like pruning and bagging) by constructing a "forest" consisting of decorrelated trees. In RF, many

2 A group's prediction for the response is the mean of observations' response values within the group. Errors are then calculated as the difference between actual response values and the mean.

3 A method with high variance will give quite different outcomes for every distinct training data, thus lacks generalization ability.

trees are created on bootstrapped samples, and each split decision is made by considering only a subset of all the original predictors. This last property provides a chance to capture every possible information from all predictors, otherwise impossible if strongly informative predictors exist; because initial splits will mostly be dominated by those few predictors, and this may result in similar trees. By removing restrains on other predictors, many distinct trees may exist, and a substantial reduction in variance will be achieved. In many studies, RF are found highly efficient especially for prediction purposes.

Boosted Trees

Trees with the Friedman's gradient boosting machine (Friedman, 2001) are employed as the second forecasting method in this study. In BT, similar to RF, an ensemble of trees is grown over samples, but unlike RF, trees are not independent from each other and the whole train dataset is used for learning, rather than bootstrapped samples. Each tree is grown sequentially by using cumulative information (loss function) of previous trees. Typical loss function in regression setting is squared error and trees are fit to the residuals from the model, rather than actual response values. Throughout the learning, residuals are updated (by a learning rate) and used as new response values to grow the next tree. The process terminates after a predetermined condition is met. By using all the trees' knowledge, a final prediction is made[4].

Apart from their prediction performances, both RF and BT can provide valuable information on the relationship between predictors and response, which is called the variable importance. The importance of a variable is measured by the loss of performance (as increase in prediction error) when it is excluded from the model. Of course, this importance cannot be interpreted as a causal effect, but still exhibits an opportunity to understand and interpret the underlying nature of acquired results. After the most important variables are identified, their marginal effects (by integrating out other variables) on the NPL are also examined by partial dependence plots.

Both RF and BT models are implemented in R statistical software (R Core Team, 2020) by using the *randomForest* package (Liaw & Wiener, 2002) and the *gbm* package (Greenwell, Boehmke, Cunningham, & GBM Developers, 2020), respectively. All packages and codes for replication are provided in the supplementary materials.

Parameter Settings

Three parameters need to be specified for RF and BT models. Some of these parameters have major influences over performances, so it is particularly important to determine an efficient setting. This is not an easy task, and highly depends on the analyzed problem/dataset.

4 At initial step, mean of response values is used for calculating first set of residuals of all observations, then a tree is fit using this first set of residuals and predicted residuals are added to mean of response to obtain first step's predictions. These predictions are used for calculating second set of residuals of all observations and the process continues.

There are several traditional preferences in the literature; but the best approach is to tune those parameters within an experimental design. For all parameters, a range is determined and values within the range are divided with equal intervals. Then, each value of each parameter is tested while holding the remaining parameters constant. The parameter tuning design for both models is given in Table 1.

Table 1
Parameter tuning design for random forest and boosted trees models

	Parameter 1	**Parameter 2**	**Parameter 3**
	Total number of trees	*Each tree's depth*	*Number of candidate variables at each split*
Random Forest	[1, 10]; increments: 1 [100, 500]; increments: 100	[1,15]; increments: 1	[1:S*]; increments: 1
	Total number of trees	*Shrinkage parameter*	*Interaction depth*
Boosted Trees	[1, 10]; increments: 1 [100, 500]; increments: 100	[0.01,0.1]; increments: 0.01	[1:5]; increments: 1

**S = floor(number of determinants in the model / 2), 24 max.*
Note: For random forest model, number of trials starts from 1,200 (10x15x8) to 3,600 (10x10x24) and for all boosted model, there are 500 trials (10x10x5).
Source: Authors' compilation

The total number of trees depicts the number of trees to be created in each training process. Trees' depth has a direct effect on the variance-bias trade-off[5], a low (high) depth may result in a lower (higher) variance but more (less) bias on estimations. Though this trade-off can be mitigated if models include enough trees, it is still beneficial to see how model behavior changes with varying depth. The shrinkage parameter determines BT's rate of learning, which directly affects under/overfitting. Learning must be done slow enough to avoid overfitting. The number of candidate variables to be considered at each split indicates how many randomly selected variables will be used in each data space split. By not considering all the determinant variables, it becomes possible to get over a strong predictor (if any) in the data set. Eventually, more information can be gathered, and minor relationships will be revealed. Lastly, interaction depth in BT limits the total number of splits in each tree, thus related to the complexity of the trees and as in tree depth parameter of RF, variance-bias tradeoff. The subsample size in training processes in models is another parameter to tune, but as Scornet (2018) remarked, there is no need to optimize both the subsample size and the tree complexity.

Performance Estimation Method and Procedure

An unbiased model needs to perform similarly both on training data (data which is used for model building) and unseen (test) data; also called the generalization ability of the model. It is not possible to assess this ability if all observations are used for training, some must be left out for testing. In this study, some part of the dataset is used for training and the rest is

5 A recent discussion on variance-bias trade-off in machine learning can be found in (Belkin et al., 2019).

used for testing. No observations from the latter part will be used in training. The performance of training part is evaluated by an estimation method independently, and the estimation method's outcome is later compared with the test performance[6]. A comparison procedure is followed as in Cerqueira et al. (2020), and visualized in Figure 2.

For each parameter combination, a repeated holdout (Rep-hold) is used to evaluate predictive performances[7]. First, the whole data set is divided into an estimation set (70% of observations) and a validation (remaining observations) set. The estimation set is then split into 10 randomly generated holdout sets (each with a 70% of estimation set) with consecutive observations. Within each holdout set, 85% of observations are used for training and 15% left for testing. The same randomly generated holdout sets are created for each parameter set to control the sampling effect on performances. One iteration of the rep-hold method is shown in Figure 3. This procedure is also followed for obtaining the CART benchmark model's performance.

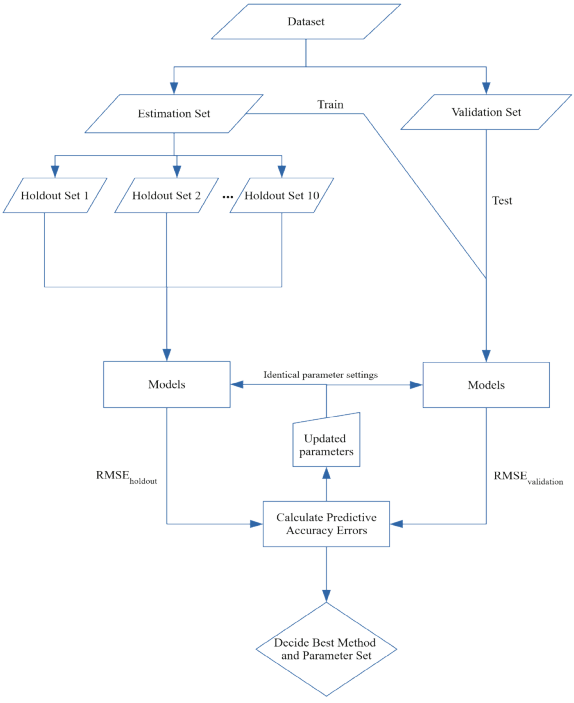

Figure 2. Flow of model evaluation and parameter selection

Source: Authors' compilation

6 Details on performance evaluation metrics are given in Section 4.5

7 Among many other alternatives, rep-hold is seen more suitable in case of non-stationary time series analyses (Cerqueira et al., 2020).

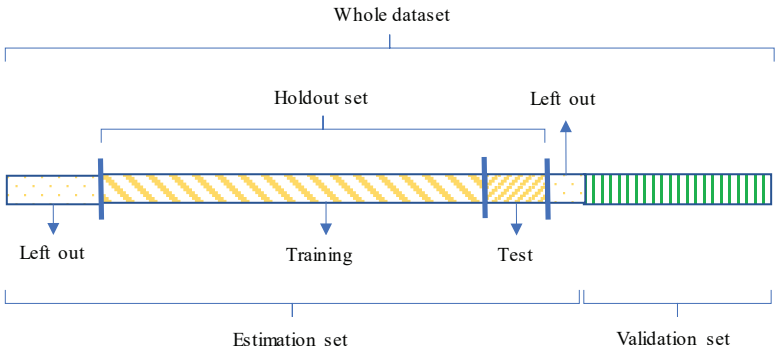

Figure 3. An example to one iteration of repeated holdout validation

Source: Authors' compilation

Evaluation Metrics

The models' performances are evaluated according to the root-mean square error (RMSE) and the mean absolute error (MAE) metrics, calculated as in equations 1 and 2:

$$RMSE = \sqrt{\frac{\sum_{n=1}^{N}(e_n)^2}{N}} \tag{1}$$

$$MAE = \frac{1}{N}\sum_{n=1}^{N}|e_n| \tag{2}$$

where e_n is the difference (error) between the predicted value ($\hat{p}_n$) and the actual value (p_n) of n^{th} test observation, and N is the total number of test observations.

RMSE is a standard metric commonly used in literature but there is a debate on its validity, such that Willmott and Matsuura (2005) proposed not to use it in studies and instead suggested to use MAE. But as Chai and Draxler (2014) presents, it is not suitable to ignore RMSE totally, even in many cases it is more reliable than MAE. Cognizant of both ideas, model selection and comparison are primarily made on RMSE but MAEs of superior models are also given.

Both the RF and BT methods are subject to randomness during training. To obtain overall performances and even explore how models react to this randomness, the methods are run 100 times (as Monte Carlo simulations) with each holdout set and with estimation set simultaneously in each parameter combination. All predictions are stored. The same random number seed is used initially, so it is possible to replicate results.

By using those simulations results, RMSE for rep-hold ($RMSE_{holdout}$) and RMSE for the validation set ($RMSE_{validation}$) are calculated as shown in Figure 4 with equations 3, 4 and 5:

$$Mean\ squared\ error\ (MSE) = \frac{\sum_{n=1}^{N}(e_n)^2}{N} \tag{3}$$

$$MSE_s = \frac{\sum_{sim=1}^{SIM} MSE_{sim}}{SIM}, \forall\ s = 1, \dots, S \tag{4}$$

$$RMSE = \sqrt{\frac{\sum_{s=1}^{S} MSE_s}{S}} \tag{5}$$

where SIM is the total number of simulations (selected as 100) and S is the total number of holdout sets (which is 10).

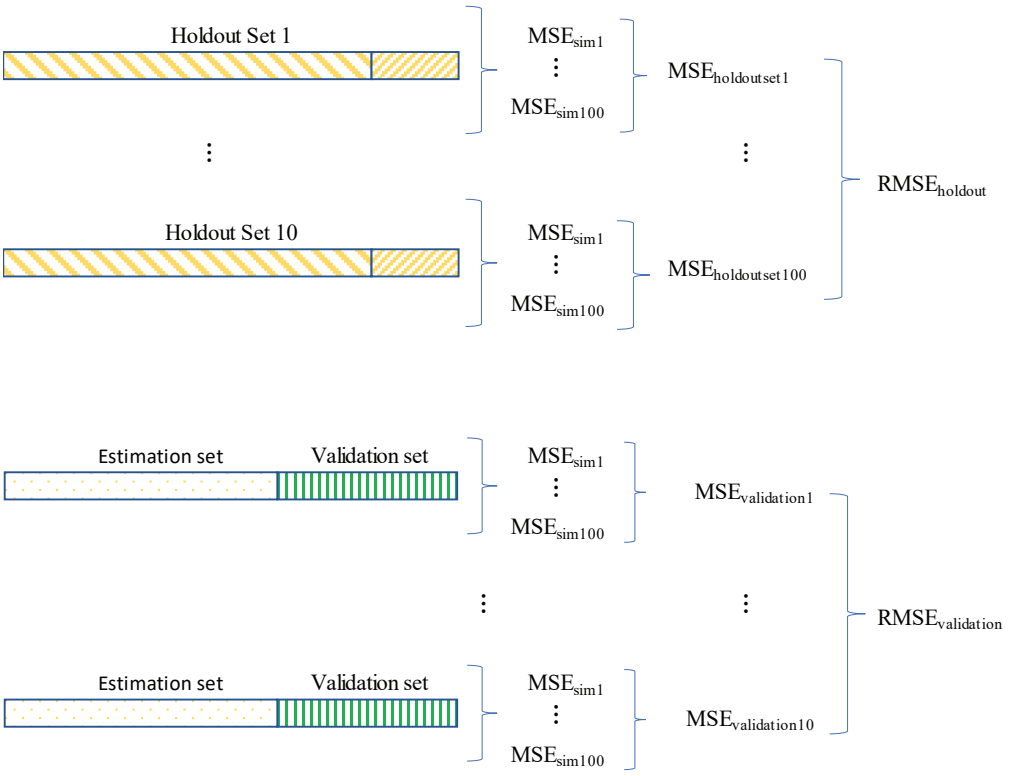

Figure 4. RMSE Calculation steps for repeated holdout and validation sets

Source: Authors' compilation

Hereinbefore mentioned, to decide if a model is reliable on future forecasts, depending solely on $RMSE_{holdout}$ or $RMSE_{validation}$ will not be enough. Therefore, another metric is used to understand how well a model's estimated error approximates truth error (Bergmeir, Hyndman, & Koo, 2018), named the absolute predictive accuracy error (APAE):

$$APAE = |RMSE_{holdout} - RMSE_{validation}| \quad (6)$$

Models that satisfy lower APAE are therefore regarded as less biased. Even in cases that RMSEs on validation set are higher than competitive models, the generalization ability of models with low APAE is considered more robust. So, in this study, parameters that give the lowest APAE are selected as the best.

Results

Optimum Parameters

For all lag specifications, the best parameter sets that provide APAE in RF and BT models are given in Table 2 and Table 3, respectively. RMSEs of the validation set and the CART model APAE are also given.

Table 2
Optimum Set of Parameters for Each Lag Specification, Random Forest

Included lags	Total number of trees	Each tree's depth	Number of candidate variables at each split	Baseline APAE	APAE	Validation set RMSE
1	300	1	1	0.0671	0.0339	2.1267
2	10	8	5	0.4924	0.0001	1.0993
3	1	4	8	0.3449	0.0029	1.4337
4	1	8	2	0.2591	0.4331	1.3047
1, 2	500	4	15	0.0216	0.0000	0.9442
1, 2, 3	6	2	24	0.0686	0.0000	1.2073
1, 2, 3, 4	1	9	15	0.2802	0.0014	1.3887

Source: Authors' compilation. Results obtained from R output.

Table 3
Optimum Set of Parameters for Each Lag Specification, Boosted Tree

Included lags	Total number of trees	Learning rate	Total number of splits at each tree	Baseline APAE	APAE	Validation set RMSE
1	1	0.07	3	0.0671	0.0000	1.9982
2	200	0.08	1	0.4924	0.0091	0.7867
3	2	0.05	1	0.3449	0.3392	1.4423
4	1	0.01	1	0.2591	0.4391	1.2980
1, 2	400	0.01	2	0.0216	0.0000	0.9489
1, 2, 3	500	0.06	3	0.0686	0.0003	0.6416
1, 2, 3, 4	400	0.1	1	0.2802	0.0671	0.6369

Source: Authors' compilation. Results obtained from R output.

Both RF and BT overperformed the baseline model. The best APAE was achieved when only the first lag was included and the first and second lags of predictors are included in BT. Latter specification provides a better validation set RMSE. Two specifications compete in RF also: Two lags with intermediate periods or three lags with intermediate periods. The former specification is also best for the validation set RMSE in RF. Adding more lags to the models seem not to supply extra valuable information for learning, and may even worsen model success.

NPL Ratio Forecasts

The validation (out-of-sample) part of the dataset covers the period 2015:Q1 and 2019:Q4. In Figure 5, mean random forest (model with first and second lags included and with optimum parameter set in Table 2) forecasts are given along with the boxplots.

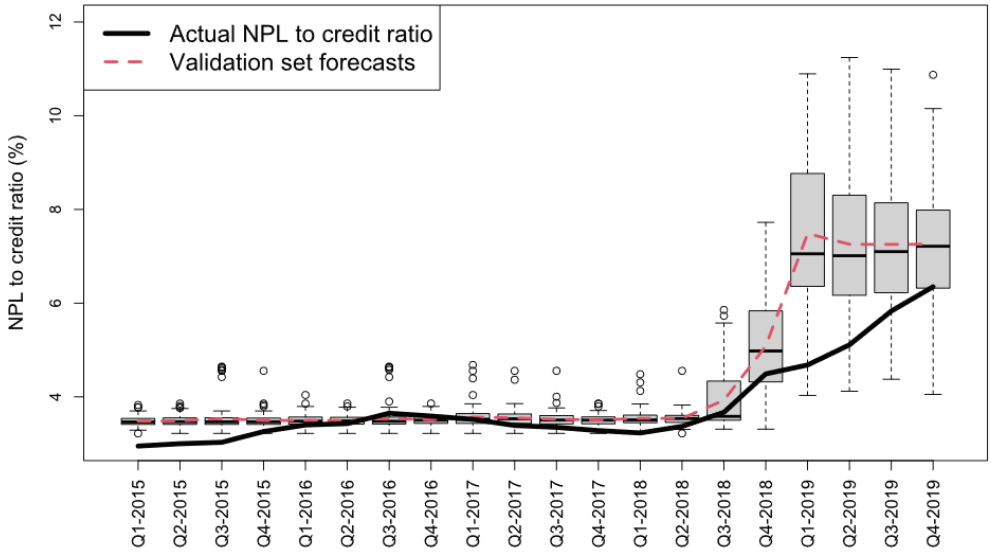

Figure 5. Random forest forecasts, boxplots are created with 100 simulations. RMSE = 1.1692, MAE = 0.6429
Source: Results obtained from R output. Plotted in RStudio

The model provides very good forecasts for four years within the validation period, closely follows true NPL ratios and reacts to trend changes[8]. During 2019, the forecast errors dramatically increase[9], and RF starts to overestimate the NPL ratio (although the gap closes in the last quarter of 2019). Additionally, the distribution of forecasts widens, and some outliers are seen above.

8 Pearson correlation between forecast and actual values = 0.9239, p-value < 0.05.

9 Pearson correlation between forecast and actual values = -0.3516, p-value = 0.6484.

In Figure 6, BT forecasts are given (with the first and second lags included and with the optimum parameter set in Table 3), which are pretty much similar to the RF forecasts. Again, the model starts to overestimate the true NPL ratios after 2019:Q1[10]. In 2019:Q4, the BT forecast is more closer to the true NPL ratio than the RF forecast. As RMSE and MAE suggests, BT overperforms RF by a small difference.

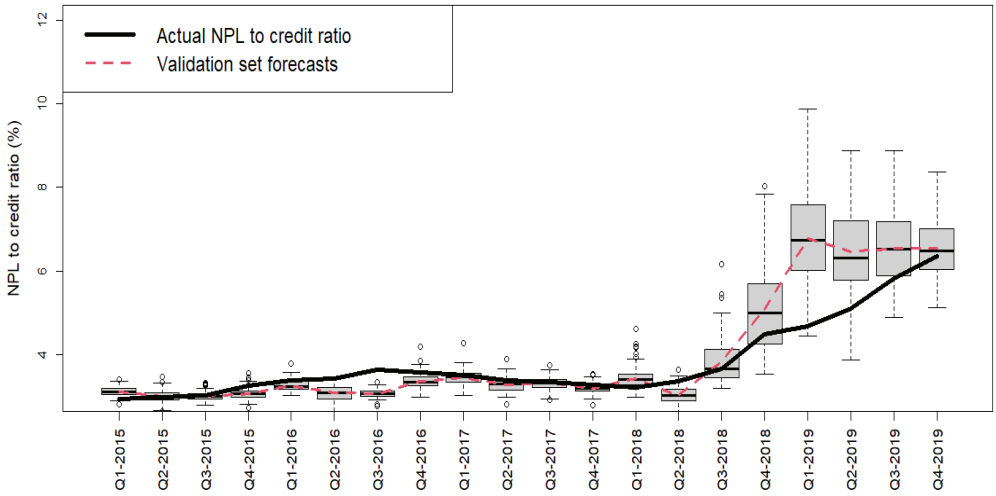

Figure 6. Boosted tree forecasts, boxplots are created with 100 simulations. RMSE = 0.6073, MAE = 0.3368
Source: Results obtained from R output. Plotted in RStudio

Overall, both models are found to be successful for tracking NPL ratios until 2019; the underlying reason(s) is going to be discussed in Section 6.

Predictor Importance

The previous quarter's NPL ratio (NPLL1) is explicitly the superior predictor of the NPL ratio in both models. The following important predictors are similar but there are some differences in their ranks. By consulting the mean importance metric for RF, the order of the most distinguished importance continues after NPLL1 as NPLL2, CreditL2, InflationL2, InterestL2, CreditL1, InterestL1, InflationL1 and CAdequacyL1 (see Figure 7). For BT, again by consulting the mean importance metric, the importance order after NPLL1 occurs as InterestL1, InflationL1, CAdequacyL1, NPLL2, InterestL2, CreditL1, InflationL2 (see Figure 8). As is seen, factors from both bank-specific and macroeconomic categories are found informative.

10 Pearson correlation between 2015:Q1 and 2018:Q4 is 0.8709, p-value < 0.05. Pearson correlation between 2019:Q1 and 2019:Q4 is 0.3762, p-value = 0.6238.

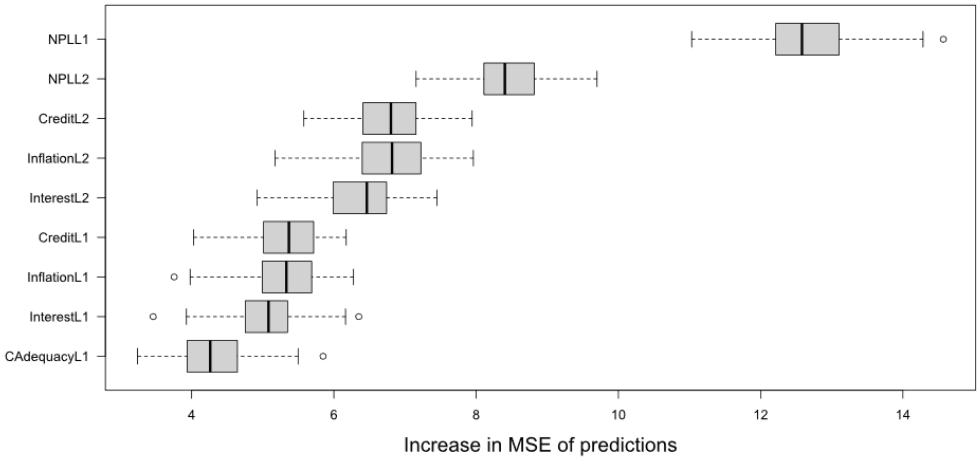

Figure 7. Boxplots of variable importance (100 simulations), random forest method. Outliers are shown as circles

Source: Results obtained from R output. Plotted in RStudio

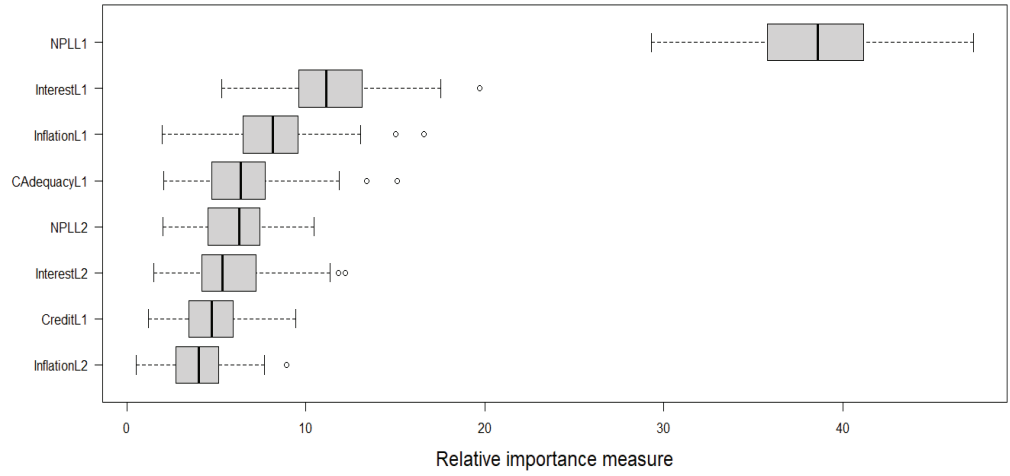

Figure 8. Boxplots of relative variable importance (100 simulations) boosted tree method. Outliers are shown as circles

Source: Results obtained from R output. Plotted in RStudio

Discussion and Policy Recommendations

In this study, NPL ratios in Turkey are forecasted by using two methods: random forests and boosted trees. Data starting from 2003:Q1 until 2014:Q4 are used for training and 2015:Q1 to 2019:Q4 are used for forecasting. In both methods, the same set of variables is used. Variables are selected in conjunction with the prior studies on NPLs in the literature. Some uncertainty measures are also included.

To evaluate the generalization ability of methods, an absolute predictive accuracy error

metric is used. The root mean squared error metric is further used to see the model's forecasting performance. Both employed methods perform similarly in terms of both metrics. It is found that the first (one quarter earlier) and second lags (two quarters earlier) of variables provide the best forecasting results. When intermediate lags are excluded, the third and fourth lags do not provide adequate information on future NPL ratios. Therefore, it is possible to say variable influences on future NPL ratios have a short-term memory. Even any causal relationships cannot be inferred with the employed approach, results indicate that several variables are highly informative.

The variables' importance reveals that the NPL ratio has an autoregressive structure. The most influential variable on future NPL ratios is the NPL ratio itself, with one and two lags, and has an increasing effect (see Figure 9 and Figure 10). This is in line with the findings of Makri et al. (2014) and Arrawatia et al. (2019). From the policy-making or regulatory perspective, focusing on dealing with current problematic loans will be more beneficial for the system in the short-term. Turkey has several experiences in restructuring loans, i.e., the Istanbul Approach in 2002 and the Anadolu Approach in 2006. While both approaches are not considered as perfectly effective, it is evident that there is a need for better management of current problematic loans.

More recent changes/regulations, starting from August 2018 seem to mitigate problems to some extent. The big difference between this study's forecasts and NPL ratios in 2019 gives us some clues. Particularly good forecasts prior to 2019 and the sudden decline in forecasting performance after, provides valid reasons to believe that the banking system would be exposed to higher volumes of problematic loans in Turkey after 2019. The methods' forecasts converge to actual ratios at the end of 2019.

To explain this more specifically, it is necessary to track recent regulations. Debt restructuring was introduced in Turkey after the currency crises in 2018 and is defined in the law; as granting a new loan to a debtor who is in difficulty or likely to be in difficulty to pay the current loan, in order to ensure total or partial payment. It is also expected to enable banks and other financial institutions to facilitate a uniform approach regarding the NPLs portfolio. At end of January 2019, 336 large-scale firms applied for the debt restructuring and 163 firms' processes were completed (The Banks Association of Turkey, 2019). Depending on these regulations, maturities of loans are extended, new loans are provided by the lenders and the loans which should be transferred as NPLs were not transferred. These restructured loans are classified as under performing loans instead of a NPL.

Partial dependencies reveal that inflation, interest rate and capital adequacy ratios have a positive relationship with NPL ratios for both the first and second lags, though these relationships are not same for all ranges. As an example, consider the functional relationship of the first lag of inflation with NPL ratios; in both Figure 9 and Figure 10, the marginal effect of inflation is nearly zero up to two digits inflation rates, and a sudden increase is seen after, which is again followed by a zero-marginal effect. Moreover, it is important to note that these bilateral relationships are assumed to be independent from other predictors' influences, which

cannot be considered as a valid assumption, especially in this analysis. But still, they provide an insight.

A positive relationship of inflation with NPLs is also reported by Nkusu (2011), Louzis et al. (2012), Messai and Jouini (2013), Arrawatia et al. (2019). But there are different views about inflation's effect on NPLs; it may be an advantage for borrowers by reducing the debt's real value, or it may deteriorate the repayment capacity by reducing the real income. For Turkey, Vatansever and Hepsen (2013), Khan et al. (2018) and Kılıç and Kartal (2021)[11] found inflation is not significant. This study's finding is in line with Us (2018).

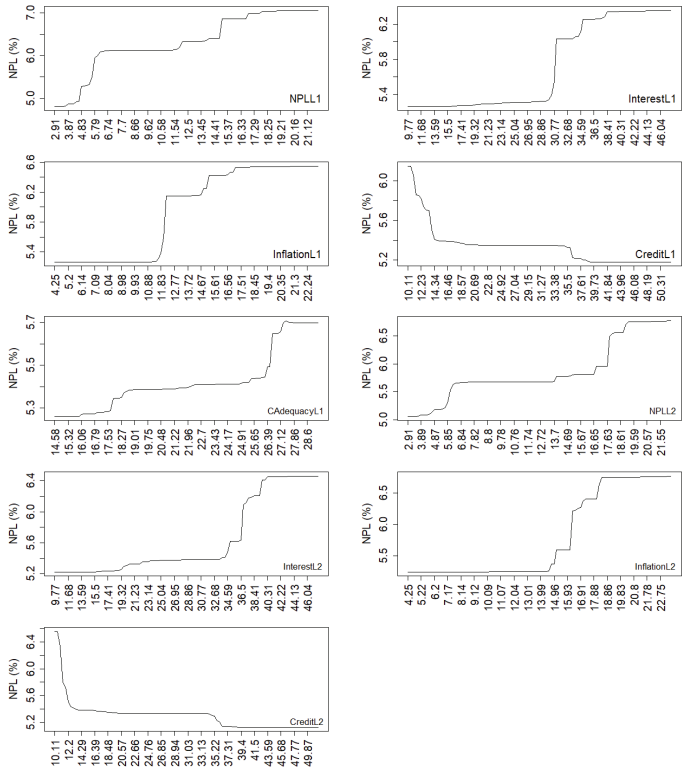

Figure 9. Partial dependency plots of most important variables, random forest

Source: Results obtained from R output. Plotted in RStudio

11 In this study, producer price index is found to be reversely related with NPL.

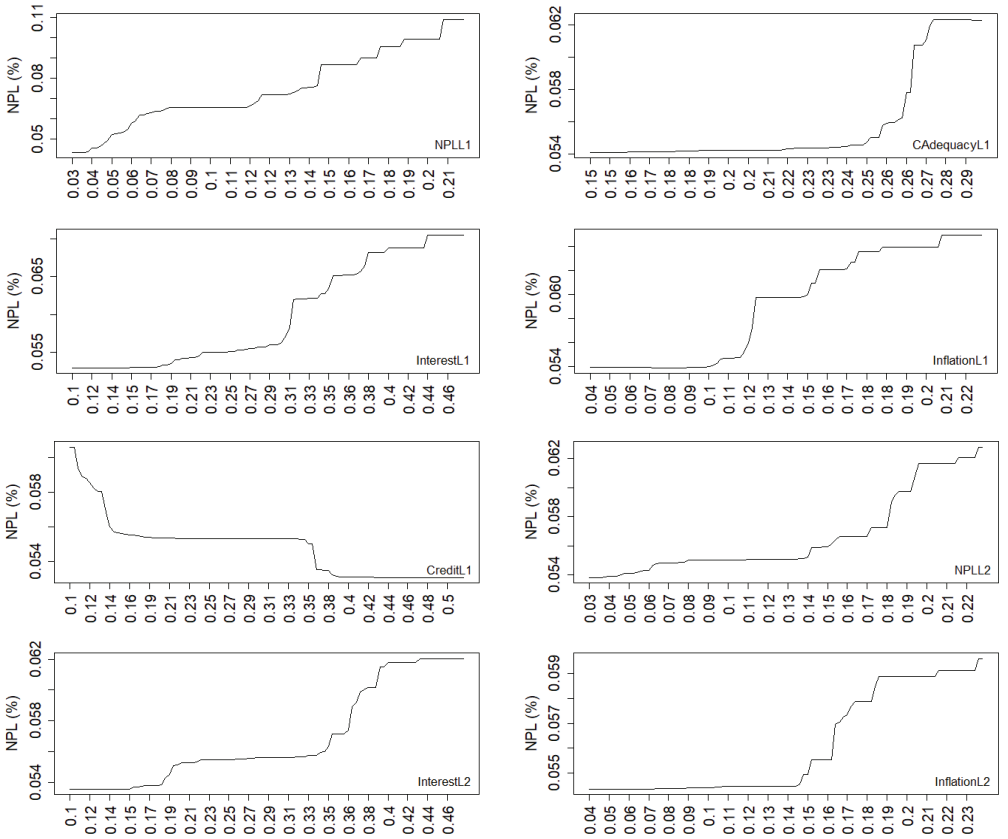

Figure 10. Partial dependency plots of most important variables, boosted tree
Source: Results obtained from R output. Plotted in RStudio

In Turkey, a positive link with capital adequacy and the NPL ratio is also documented in Us (2018) (for the period 2002:Q4 and 2015:Q4). Kılıç and Kartal (2021) agree that for the NPL volume (2005-2019 period). One may argue banks with highly adequate capital positions may be more willing to accept riskier loans. Also, the interest rate and NPL relationship found in this study is consistent with Kılıç and Kartal (2021). The credit amount compared to GDP in the economy has a negative relationship with the NPL ratio; which will contribute to the adoption of extensive macroprudential measures (Us, 2018: 1614). NPL reduction could free up a sizeable amount of loanable funds and cyclically help to improve the financial structure of corporate sector in Turkey.

Concluding Remarks

As a conclusion, this study's methods are believed to be useful for successfully predicting future NPL ratios in Turkey (but also applicable for other country analyses), and thus may be beneficial to the financial sector and market regulators.

It is also important to note that there are possible events/times that altered dynamics of NPLs; global events like the 2008 Financial Crisis or local events like the coup attempt in 2016. Continuing studies incorporating such significant changes will be insightful. A comprehensive approach to manage the economic and institutional situation can lead to a more sustainable lending environment and eventually result in better economic conditions. The current pandemic's influence on problematic loans is also worth examining, but it is left for future studies.

Supplementary materials

Dataset, information on data, preliminary analyses results and codes can be found in:

https://data.mendeley.com/datasets/vz758vy3yr/draft?a=2aff80b3-96a7-41fe-82b8-438c27fae8de

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RESEARCH ARTICLE

The Effect of Bank Employees with a Postgraduate Education Level on Credit Risk and Financial Performance

Abdulmuttalip Pilatin[1]

Abstract

The aim of this study is to examine the effect of the educational qualifications of bank personnel on Turkish banks. Within the scope of the study, based on the annual data of 21 banks operating in Turkey during the 2004-2019 period. The factors affecting the non-performing loans of banks have been examined with static panel data analysis methods over five different models. A random effects method was used in the analysis. The results show that Non-Performing Loans and Loan Loss Provisions, which are the credit risk indicators of the bank, decreased with the increase in the ratio of personnel with postgraduate education, which is used as a human capital indicator for banks. It reveals that investment in postgraduate personnel reduces the credit risk of banks by less than 1% and at a level of 5% significance. These results were also corroborated by a sensitivity analysis. However, it has been determined that the level of postgraduate education, which is used as a human capital indicator of banks, does not have a significant relationship with the Z-Score, which is an indicator of bankruptcy risk, and Asset on Equity and Return on Equity, which is an indicator of profitability.

Keywords

Non-Performing Loans, Financial Performance, Human Capital, Credit Risk

Introduction

Intellectual capital (IC), which is considered among intangible assets, has begun to replace physical capital in terms of providing important production factors and sustainable business activity in knowledge and knowledge-based economies in the globalized world (Drucker, 1993; Clarke & Gholamshahi, 2018). All three dimensions of intellectual capital (human capital, structural capital, and customer capital) are important to a business. Human capital, which is among these three dimensions, is considered a very important factor for service businesses because it not only affects the quality of short-term services, but also affects various long-term business outputs (Aryee et al., 2016; Seleim & Bontis, 2013; Diebolt, & Hippe, 2019).

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Some researchers who want to develop intellectual capital components think that human capital is the most important component of intellectual capital (Wang & Chang, 2005; Githaiga, 2020). It is stated that one of the most important factors contributing to the economic growth of a nation is human capital (Yarovaya, Mirza, Abaidi & Hasnaoui, 2021). Sveiby (1997) states that human capital can be defined as "the capacity to act in a wide variety of situations to generate both tangible and intangible assets". Qualification of a business's human resources makes a significant positive contribution to the business and its employees. It positively affects the development of employees and makes the business more efficient and sustainable (Awan & Sarfraz, 2013). In recent years, human capital is an important factor that every business pays attention to and provides a competitive advantage to businesses (Neves & Proença, 2021; Gupta and Raman, 2021). Therefore, banks with more qualified human capital show a more efficient, less risky and more profitable performance (Adesina, 2021).

Human capital has become very important in today's world, especially for service structures based on information and technology. For this reason, human capital is at the center of successful companies due to its direct and indirect impact on firm performance (Gitaiga, 2020).This situation is also valid for banks that operate largely based on human capital, which are among the most important building blocks of the economy and the main funders of economic activities (Rahman & Akhter, 2021). This is because banks need less physical capital due to their intensive use of technology and service structures, while they continue their activities using more human capital.

The performance differences between different businesses in the same sector, between sectors and between banks can be explained by the differences in human capital such as recruitment, the education level of the personnel hired and training. The resource-based view (RBV) that provides superior performance and a competitive advantage to a firm's valuable, rare, inimitable and non-substitutable private capital stock supports this explanation (Barney, 1991; Prahalad & Hamel, 1990). Education, is the most important component of human capital. The level of education is considered one of the most effective factors in increasing the economic potential of people, firms and nations. Supporting this view, it shows why human capital allocates huge resources to education services for the socio-economic development of countries at the point of achieving national goals and the wealth of nations (Stewart, 1997; Acemoğlu, & Robinson, 2012).

The most important group of people in companies is the board of directors. The importance of the boards of directors in terms of directing businesses and making strategic decisions is undeniable.. However, it is the personnel who will implement the decisions of the board of directors and who will ensure the achievement of the target by working and performing in line with the strategies and targets determined by the companies, especially in banks. It should not be forgotten that these are middle and lower level employees who are outside the boards

of directors of enterprises and banks and constitute the majority of the employees. For this reason, in this study, the effect of the education level of bank employees on credit risk and bank performance is discussed.

If the principal and interest payments of the loans are 90 days or more late, such loans are considered non-performing loans (uncollectible receivables) for banks (IMF, 2006). The 90-day period for the uncollectible parts of the loans extended by the banking system in the world has been determined as the delay period (Klein, 2013: 8). The generally accepted period in Turkey is 90 days as in the world (Ayaydın, Pilatin & Barut, 2021). A well-functioning banking system is very important in terms of ensuring the sustainability of banks, which are the main fund providers of the country's economy. Profitability may not be sufficient for a well-functioning banking system. Banks should keep their credit risks at a certain level or below a certain level.When banks fail to balance risk correctly, they start lending to riskier customers, which increases banks' non-performing loan rates. Increasing the non-performing loan rates of banks creates an important risk factor by negatively affecting the bank, then the sector and the economy (Turner, 2010: 44; Çelik, & Tekşen, 2021). In addition, increasing non-performing loans disrupt the financial functioning of banks, causing a decrease in their profitability. Banks with a decreasing profitability may resort to increasing the loan interest rates and commission fees they apply to customers in order to reach their targeted profitability. This situation reflects negatively on both banks, consumers and the general course of the economy. If non-performing loans cannot be prevented, bank profitability may also tend to decrease. On the other hand, investment costs increase due to rising interest rates. This may turn into a cause that triggers inflation in the long run.

The ability of loan allocation personnel to perform an accurate creditworthiness and risk analysis is increasing in parallel with their educational status. At this point, the lending attitudes of the loan allocation personnel of banks are very important.

Studies in the literature have generally focused on whether there is a relationship between the educational level of the board members of banks and bank performance (Deca, Sanchez, & Ferrero, 2015; King, Srivastav & Williams, 2016; Pereira & Filipe, 2018). The importance of the boards of directors, which are the most important boards of companies in terms of directing banks and making strategic decisions, is undeniable in terms of directing the business (D'Amato and Gallo, 2019). However, it is known that the personnel who will work in accordance with the strategy, goals and credit policies determined by the banks and ensure that the bank achieves these goals are the personnel working at the middle and lower levels. For this reason, the effect of postgraduate education, which is one of the most important determinants of human capital, on the credit risk and profitability of banks has been discussed in the study. The main motivation source of the study is that there is no study in the literature focusing on the postgraduate education level of bank personnel.

A total of 21 banks, 3 of which are public-owned, 8 private-capital deposit banks, and 10 foreign-owned deposit banks established in Turkey, were included in the study. The study is based on the annual data of 21 banks for the period 2004–2019. There are 34 deposit banks in Turkey, but 3 of them were excluded from the study because the number of branches in Turkey is less than 4. The remaining 10 were not included in the study due to the inability to provide data for each year in 2004–2019.

After the introductory part of the study, the related literature and hypothesis development are mentioned in the second part. In the third part, the data set and the methodology are explained. In the fourth chapter, the application and findings are mentioned. In the fifth and last part of the study, the results and suggestions are given by giving the research findings.

Related Literature and Hypothesis Development

Human capital theory states that the knowledge and skill acquired by individuals are likely to result in higher earnings in the labor market (Becker, 1964). In addition to the increase in the financial performance of enterprises with high human capital, innovative initiatives that will contribute to their competitiveness also increase (Pala &Pilatin, 2019). Education levels and work experience are the two most important types of human capital that individuals can earn throughout their careers (Myers, Griffeth, Daugherty, & Lusch, 2004; Singer & Bruhns, 1991). Both of these two variables are used as an indicator of human capital. For some, work experience generally decreases as the level of education increases. This is because those who spend more years getting more and better education have less time to gain work experience.

When the studies in the literature are examined, it is seen that there is a relationship between the education level of the board members and the bank's performance (Meca, Sánchez, & Ferrero, 2015; King, Srivastav & Williams, 2016; Pereira & Filipe, 2018). The importance of the board of directors, which is one of the most important boards of companies, in terms of guiding banks and making strategic decisions is undeniable (D'Amato & Gallo, 2019). However, the personnel who work in line with the strategies and targets set by the companies and especially the banks and ensure the achievement of these targets are the middle and lower level personnel.

In a small number of studies in Turkey, bank's boards of directors have also been discussed (Yılmaz, 2017; Yağlık & Şimşek, 2017; Yağlık, 2019). There are also studies dealing with the effect of intellectual capital capacity on financial performance in the Turkish banking system (Kahya, İmamoğlu & Durmaz 2015). These studies were generally carried out with the VAIC method produced by Pulic (1998) (Arslan & Kızıl 2019; Ozkan, Cakan, & Kayacan, 2017). However, the VAIC method has been criticized on some points. Topaloğlu & Bayrakdaroğlu (2012) examined the effects of the intellectual capital levels of bank employees on the bank

through a survey. However, risk and profitability were not addressed in this study. When the literature is examined, there is no study that deals with the effect of postgraduate education level on the risk and performance of banks in the Turkish banking sector. This situation constitutes the main motivation for this comprehensive study.

Businesses want to hire personnel who have the potential to provide them with a competitive advantage. It is also essential to increase organizational benefits, invest in an effective system, recruit and retain the right staff, and develop high-quality human resources for firms (Rahman & Akhter 2021). Having a sufficient level of education of the personnel of an enterprise contributes to greater productivity and efficiency of the personnel (Adesina, 2019; Andersen, 2021). Banks are institutions in the service sector where human capital is very important. More trained personnel are expected to result in a lower credit risk and higher profitability later on because it is thought that decreasing non-performing loans will enable the bank to reach a higher financial performance. No study has been found on the effect of education level, which is considered as one of the most important indicators of human capital, on credit risk in banks. However, in a related study (D'Amato and Gallo, 2019), it is stated that the education level of the members of the board of directors of banks mediates the relationship between the risk-taking of cooperative banks. For this reason, in this study, the effect of education level on the credit risk and financial performance of banks is examined rather than experience, which is one of the human capital indicators. In addition, no study has been found in the literature that deals with the banking sector, where the postgraduate education level is taken as an indicator of human capital. This reason is one of the important motivation sources of the study. The aim of this study is to reveal the effect of education levels of bank employees at different levels on credit risk and financial performance. For this, five different hypotheses have been developed by making use of the studies in the literature and considering the gap in the literature.

Based on this, the following hypothesis was developed:

H_1: Postgraduate education(PEDU) is negatively correlated with banks' non-performing loan rates (NPL).

H_2: Postgraduate education(PEDU) is negatively related to banks' Loan loss provisions (LLP).

As the Z-Score increases, the bankruptcy and bankruptcy risk of banks decreases. For this reason, the relationship between human capital and Z-Score is expected to be positive (Chiaramonte, Groci &Poli, 2015).

Based on this, the following hypothesis was developed.

H_3: Postgraduate education(PEDU) is positively associated with banks' bankruptcy risk (Z-Score).

The relationship between human capital and financial performance has been extensively studied over time; however, the available literature shows mixed findings. Studies in the literature have found different relationships between human capital and business performance (Andersén, 2021; Schultz, 1993; Jamal &Saif, 2011; Nguyen, 2020; Rahman, & Akhter, 2021; Köse & Tanç, 2018). Some studies indicate that there is no relationship (Razafindrambinina and Anggreni, 2017; Calabro et. al. 2021; Nyberg et. al. 2014; Soewarno &Tjahjadi, 2020).

While some studies say that there is a positive or negative direct link (Firer &Williams, 2003; Chowdhury et al., 2019), some say that there is an indirect causality (Bontis et al., 2000; Wang &Chang, 2005) . Urquhart, & Zhang, (2021), in their study, based on a sample of CEOs in publicly traded FTSE 350 firms, investigated the relationship between CEO training and firm performance, providing evidence that firms with CEOs with PhDs outperform others. Adesina (2021) analyzed data from 400 commercial banks operating in 34 African countries. Here, despite calculating the human capital variable over VAIC-based wages, it shows that higher human capital is positively related to bank performance. In the USA, which is a developed country, Meles et al. (2016) states that HC has a positive effect on bank performance. Similar results are found in the studies of Topaloğlu & Bayrakdaroğlu (2012) and Yılmaz and Aybars (2021) on the Turkish banking sector. In the study conducted by Vo and Tran (2021) in Vietnam, the findings show that intellectual capital contributes to bank performance in a significant and positive way.

Based on this, the following hypotheses were developed:

H_4: Postgraduate education(PEDU) is positively related to the return on assets (ROA) of banks.

H_5: Postgraduate education(PEDU) is positively related to the return on equity (ROE) of banks.

Data And Methodology

In this study, a data set consisting of time series and cross section data was used. Multiple models were created with this data set. With these models, it is aimed to reveal the effect of human capital on a banks' credit risk, bankruptcy risk and profitability. In the methodology part of the study; The purpose and scope of the study, the variables used, research models, hypotheses and research methods are mentioned. In the last part of the section, the tests used in the model selection in the study are given.

Data

In the study, a data set of 21 banks operating in Turkey with 3 public capital, 8 private capital and 10 commercial banks with foreign capital located in Turkey was used. The study was based on the annual data of banks for the period 2004–2019. Although there are a total of

34 deposit banks in Turkey, 3 of them have less than 4 branches in Turkey, and the remaining 9 banks were excluded from the study due to a lack of data for the years 2004–2019. However, as of the end of 2019, the total assets of the banks included in this data set correspond to 94% of the total assets of the banking sector. In terms of the number of employees, this rate is around 98%.

A large sample of banks covering the period 2004-2019 was used to test the hypotheses of the research. More specifically; The data used in the calculation of the postgraduate education levels of banks, dependent and independent variables in terms of credit risk, bankruptcy risk and profitability were taken from the database of the Banks Association of Turkey (BAT) and the Banking Regulation and Supervision Agency (BRSA), which includes the balance sheet information of banks.

Variables

The aim of this study is to reveal the human capital levels of banks, which are among the important actors of the financial sector, and the effect of human capital levels on NPL, LLP, which is a credit risk indicator, Z-SCOR, which is an indicator of bankruptcy risk, and profitability ratios such as ROA and ROE. For this purpose, the factors affecting the non-performing loans of banks were analyzed by a panel data analysis method by using the data of the 2004-2019 period of 21 banks operating in Turkey. The variables used in the research are shown in Table 1.

In the study, 4 dependent variables, 2 independent variables, 7 bank-specific variables, Macroeconomic and Financial variables and dummy variables were used. These variables are shown in Table 1.

As in similar studies, the level of postgraduate education is taken as a proxy for the human capital variable (Karadağ, 2016; Rahman & Akhter, 2021; Urquhart & Zhang, 2021). This variable was obtained as the ratio of those with a postgraduate degree working in a bank to the total number of employees. NPL, which is taken as a dependent variable as a credit risk indicator of banks and is used in many similar studies (Foss et al. 2010, Reinhart & Rogoff, 2011; Jin et. al. 2019; Pilatin & Ayaydın; 2022), is the variable that shows the NPL ratio of banks.

LLP, which is taken as the credit risk indicator of banks as the dependent variable and used in many similar studies (Foss et al. 2010, Reinhart & Rogoff, 2011; Jin et. al. 2019; Pilatin & Ayaydın; 2022), is the other variable LLP, which shows banks' loan loss provision ratios.

The Z-score (Boyd & Graham, 1986; Beck & Laeven, 2006; Laeven & Levine, 2006; Chiaramonte, Croci & Poli; 2015), is calculated as;

$$Z - SCORE = \frac{ROA + ETA}{\sigma ROA}$$

Table 1
Variables Used in The Study

	Variables	Code	Definition	Referance
Dependent Variables	**Non Performing Loans**	NPL	Non Performing Loans / Total Loans	*Foss vd. (2010), Reinhart & Rogoff (2011), Pilatin & Ayaydın (2022)*
	Loan Loss Provisions	QUALTY	Loan loss provisions / Total Loans	*Keeton (1999), Sharma & Gounder (2015), Jin et. al. (2019), Pilatin & Ayaydın (2022)*
	L.Z-Skor	Z-SKOR	Natural Logorhythm of (ROA+ETA)/Standard deviation of ROA	*Liu et. al. (2013), Baselga-Pascual et al., (2015), Chiaramonte, Groci & Poli, (2015)*
	Return of Asset	ROA	Net Profit / Total Asset	*Messai & Jouini (2013), Nikolaidou and Vogiazas (2014), Ayaydın, et. al. (2021)*
	Return on Equity	ROE	Net Profit / Equity	*Sharma & Gounder (2015), Podpiera & Weil, (2008), Abid et. al. (2014), Louzis et al., (2012), Ayaydın, et. al. (2021)*
Independent Variables	**Postgraduate Education**	PEDU	Number of Postgraduate Employees/Total Employees	*Urquhar & Zhang (2022), Rahman & Akhter, (2021)*
	Specialization in Lending	SPECIALIZ	Total Loans / Total Asset	*Klein (2013), Espinoza & Prasad (2010), Louizis vd. (2012)*
	Capitalization	CAP	Equity / Total Asset	*Klein (2013), Louizis et. al. (2012), Macit (2012), Makri et. al. (2014).*
Bank-Specific Variables	**Diversification**	DIVERSITY	Non-Interest Income / Total Income	*Fukuyama & Matousek, (2011), Ozili, 2017*
	Effective	EFFECTIVE	Non-Interest Expenses/ Total Assets	*Espinoza and Prasad (2010), Louizis et al. (2012)*
	Efficient	EFFICIENT	Total Loans / Total Deposit	*Dimitrios vd. (2016)*
	Market Share	MSHARE	The ratio of the bank's assets to the sector's total assets	*Etmiko, (2018), Rehman, Aslam, & Iqbal, (2022)*
	Interest Rate	RATE	Interest Rate	*Beck et al. (2015), Berge & Boye (2007)*
	Exchange Rate	EXCHANGE	Annual Average Exchange Rate ($)	*Bunda & Desquilbet, (2008)*
Macroeconomic and Financial Variables	**Economic Growth**	GDPG	GDP growth rate	*Rinaldi & Sanchis (2006), Ghosh, (2015), Louzis et al., (2012), Espinoza & Prasad, (2010)*
	Unemployment	UNEMP	Annual Unemployment Rate	*Messai & Jouini (2013), Rinaldi & Sanchis (2006).*
	Inflation Rate	INFL	Annual Inflation Rate	*Bunda, & Desquilbet (2008), Messai & Jouini (2013)*
Dummy	**Public Bank**	PUBLIC	Gets 1 if it's a public bank, 0 if it's a private bank	*Ghosh (2015), Messai & Jouini (2013)*

ROA represents the bank's return on average assets, whileThe ETA shows the ratio of the bank's equity to its total assets. σROA represents the standard deviation of the bank's average return on assets. A three-year time frame (previous year, current year, and following year) is used to calculate the volatility of the bank's return on assets (σROA) (Chiaramonte et al, 2015). A higher Z-score indicates a lower risk of bankruptcy, as well as a stronger bank structure. Therefore, a negative relationship is expected between the dependent variable, the Z-score, and the dependent variable, postgraduate education. Since the Z-score is highly volatile, the natural logarithm of the Z-score was taken (Laeven & Levine, 2009; Liu, Molyneux, & Wilson, 2013).

Return on assets (ROA) and return on equity (ROE), which represent dependent variables, are used as financial performance indicators. A higher return on bank assets (ROA) indicates that banks are well-utilized and are able to generate sufficient profits. If this ratio is low, it means that banks cannot use their assets efficiently. In this study, bank performance was measured by return on assets (ROA), as used in previous studies (Messai & Jouini, 2013; Nikolaidou & Vogiazas, 2014; Ayaydın, et al., 2021). Likewise, a higher return on bank equity (ROE) indicates that banks' equity is used well and sufficient profits are made. In this study, bank performance was also measured by return on equity (ROE), as used in previous studies (Podpiera & Weil, 2008; Abid et. al., 2014; Sharma & Gounder, 2015; Louzis et al., 2012; Ayaydın, vd., 2021).

In addition, some control variables used in the literature were also used in the study to increase the accuracy of the model. These include bank-specific variables such as SPECIALIZ, CAP, DIVERS, EFFECTIVE, EFFICIENT and MSHARE, as well as macroeconomic and financial variables such as IRATE, EXCHANGE, GDPG, UNEMP and INFL. In addition, a dummy variable was added to the model to see if the results changed if the banks were state banks.

Methodology

In panel data studies, it is necessary to examine whether there is autocorrelation, varying variance and correlation between units for the classical, fixed and random effects model. In the case of one or more of the aforementioned situations, the problem of biased estimation of the model results may arise. For this reason, it is necessary to statistically test whether these assumptions exist before proceeding to the model estimates created in the research (Ün, 2018: 75).

Before model estimation, it is important to check whether the panel consists of a micro panel or a macro panel because different panels require different econometric methods. For micro panels the asymptotics should be for large N and constant T. Asymptotics for macro panels can be for large N and large T. It is important to pay attention to the issues that may

arise in time series such as unit root, structural break and cointegration in macro panels and which concern the stationarity of the variables. In micro panels, on the other hand, since the time dimension is shorter (N>T), there is no need to deal with stationarity (Baltagi, 2013: 1).

In panel data analysis, it is generally encountered that the number of horizontal cross-sectional units is higher than the number of periods. In general, the panel data model;

$$Y_{it} = \alpha + \alpha + \sum_{i=1}^{k} \beta_k X_{kit} + u_{it} \qquad i = 1,2,3.....N; \quad t = 1,2,3...T; \quad k = 1,2,3.....q \qquad (1)$$

It can be written in the form.

Where Y is the dependent variable, X_k is the independent variables, α is the constant parameter, β_k is the slope parameters, and u_{it} is the error term. i refers to the horizontal cross-sectional units (such as individual, company, city, country), and the t refers to the time (such as day, month, year). It is assumed that the mean of the error term u_{it} is zero and has a constant variance. In this model, the constant and slope parameters are valued according to both units and time (Tatoğlu, 2013: 4). According to the above panel data model, it is predicted that all independent variables affect all horizontal cross-sectional units to the same degree. Otherwise, the equation expressed is insufficient. An important issue that arises at this point is how to define (β_1). The starting point can be kept constant for all units, or different starting points can be allowed for different units. In this case, two methods appear - fixed and random-effect models. The fixed-effect model predicts that the starting point will take a constant value for all horizontal cross-sectional units. The fixed effect model is expressed with the help of the following equation (Kaya & Yılmaz, 2006: 69).

$$Y_{it} = \beta_{1i} + \beta_{2i} X_{2it} + \beta_{3i} X_{3it} + u_{it}, \qquad \beta_{1j} \neq \beta_{1i} \qquad (2)$$

The random effects model defines the starting point as a random variable. Accordingly, the starting points consist of the sum of the constant value and the zero-mean random variable. The random effects model is expressed by the equation model defined below (3). The parameter estimate is calculated in such a way that the Pooled Least Squares estimator is in the following formula. The Pooled Least Squares Method makes estimates under the assumptions that the constant and slope parameters are constant in cases where unit or time effects do not exist (Tatoğlu, 2013: 40).

$$Y_{it} = \beta_{1i} + \beta_{2i} X_{2it} + \beta_{3i} X_{3it} + u_{it}, \qquad \beta_{1j} \neq \beta_{1i} + \mu_i \qquad (3)$$

If the error term has unit or time effects, the error term in the pooled least squares method is, that is, the combined error. Here: unit effects show the time effect. If the error term is heteroscedastic (Changing Variance), effective estimators cannot be obtained. In this case, a method such as using resistant standard errors or making estimates using the generalized least squares (GEKK) method should be chosen (Tatoğlu, 2013: 42).

$$\beta_1 = [\sum_{i=1}^{N} \sum_{i=1}^{N} X'_{it} X_{it}]^{-1} . \ [\sum_{i=1}^{N} \sum_{i=1}^{N} X'_{it} X_{it}] \quad (4)$$

Pooled ordinary least squares method (POLS); it can take the entire observation into a pool. If the binary composition of horizontal-sectional data with time series is neglected in POLS, a large educational performance function can be estimated. When a pooled model is established, it assumes that the function coefficients showing the effect of training on performance remain constant over time and cross-section (Gujarati, 2016: 407). The In-Group Estimation Method is used in the analysis of the fixed-effect panel data model. Which of the "fixed-effect" and "random-effect" models will be valid in panel data forecasts is determined by the "Hausa test" (Greene, 1993: 458-462). Accordingly, some tests were carried out on the micro panel (N>T), which was created from the data of 21 banks operating in Turkey in the 16-year period including the years 2004-2019. The tests are different according to the fixed and random effects models. According to the Hausman test, this study is more suitable for the random effects method. In this study, in order to determine whether there is a heteroscedasticity problem for each model in the random effects model, the Modified Wald Test; Bhargava, Franzini and Narendranathan's Durbin-Watson and Baltagi-Wu local best invariant test (1982) was applied to determine whether there was an autocorrelation problem. The Pesaran (2004) test was used to determine whether there is a correlation between units (horizontal section dependency) in the models.

As a result of the tests, it was determined that there was no heteroscedasticity, autocorrelation and correlation between units in the models (See Table 4). For this reason, Generalized Least Squares Estimator is used in model estimation.

The hypotheses created to reveal the effect of banks' postgraduate education level on credit risk and profitability are as follows.

Model 1

$$\mathbf{NPL}_{i,t} = \beta_{0i} + \beta_1 PEDU_{i,t} + \beta_2 MSHARE_{i,t} + \beta_3 SPECIALIZ_{i,t} + \beta_4 CAP_{i,t} + \beta_5 EFFTECTIVE_{i,t} + \beta_6 DIVERSITY_{i,t} + \beta_7 EFFICIENT_{i,t} + \beta_8 RATE_{i,t} + \beta_9 EXHANGE_{,t} + \beta_{10} GDPG_{i,t} + \beta_{11} UNEMP_{,t} + \beta_{12} INFL_{i,t} + \beta_{13} STATE_i + \mu_{i+} \lambda + u_{i,t}$$

Model 2

$$\mathbf{LLP}_{i,t} = \beta_{0i} + \beta_1 PEDU_{i,t} + \beta_2 MSHARE_{i,t} + \beta_3 SPECIALIZ_{i,t} + \beta_4 CAP_{i,t} + \beta_5 EFFTECTIVE_{i,t} + \beta_6 DIVERSITY_{i,t} + \beta_7 EFFICIENT_{i,t} + \beta_8 RATE_{i,t} + \beta_9 EXHANGE_{,t} + \beta_{10} GDPG_{i,t} + \beta_{11} UNEMP_{,t} + \beta_{12} INFL_{i,t} + \beta_{13} STATE_i + \mu_{i+} \lambda + u_{i,t}$$

Model 3

$$\mathbf{Z\text{-}SKOR}_{i,t} = \beta_{0i} + \beta_1 PEDU_{i,t} + \beta_2 MSHARE_{i,t} + \beta_3 SPECIALIZ_{i,t} + \beta_4 CAP_{i,t} + \beta_5 EFFTECTIVE_{i,t} + \beta_6 DIVERSITY_{i,t} + \beta_7 EFFICIENT_{i,t} + \beta_8 RATE_{i,t} + \beta_9 EXHANGE_{,t} +$$

$\beta_{10}GDPG_{i,t} + \beta_{11}UNEMP_{,t} + \beta_{12}INFL_{i,t} + \beta_{13}STATE_i + \mu_{i+} \lambda + u_{i,t}$

Model 4

$$\mathbf{ROA}_{i,t} = \beta_{0i} + \beta_1 PEDU_{i,t} + \beta_2 MSHARE_{i,t} + \beta_3 SPECIALIZ_{i,t} + \beta_4 CAP_{i,t} + \beta_5 EFFTECTIVE_{i,t} + \beta_6 DIVERSITY_{i,t} + \beta_7 EFFICIENT_{i,t} + \beta_8 RATE_{i,t} + \beta_9 EXHANGE_{,t} + \beta_{10} GDPG_{i,t} + \beta_{11} UNEMP_{,t} + \beta_{12} INFL_{i,t} + \beta_{13} STATE_i + \mu_{i+} \lambda + u_{i,t}$$

Model 5

$$\mathbf{ROE}_{i,t} = \beta_{0i} + \beta_1 PEDU_{i,t} + \beta_2 MSHARE_{i,t} + \beta_3 SPECIALIZ_{i,t} + \beta_4 CAP_{i,t} + \beta_5 EFFTECTIVE_{i,t} + \beta_6 DIVERSITY_{i,t} + \beta_7 EFFICIENT_{i,t} + \beta_8 RATE_{i,t} + \beta_9 EXHANGE_{,t} + \beta_{10} GDPG_{i,t} + \beta_{11} UNEMP_{,t} + \beta_{12} INFL_{i,t} + \beta_{13} STATE_i + \mu_{i+} \lambda + u_{i,t}$$

Analysis and Findings

Descriptive Statistics

Table 2 shows the explanatory statistics of the dependent variables for the 2004-2019 period. NPL, LLP, Z-SKOR, ROA and ROE independent variables; PEDU represents the main independent variable. In addition to these, bank-specific variables, control variables, and a dummy variable coded as 1 if the banks are public banks were also used.

According to the table, the average of the banking sector is NPL 6,422%. LLP is 1.076%, L.Z-SCORE 3.921%, ROA 4.643, ROE 18.624 and PEDU 6.422.

Table 2
Descriptive Statistics for Variables

Dependent variables	N	Mean (%)	Std. Deviation	Min.	Max.
NPL	336	6.422	3.007	0.009	28.094
LLP	336	1.076	0.737	0.065	6.618
L.Z-SKOR	336	3.921	0.843	.0724	7.286
ROA	336	4.643	1.652	-12.554	6.462
ROE	336	18.624	17.582	-178.636	39.885
Independent variables					
PEDU	336	6.422	3.371	1.160	21.010
Bank-Specific Variables					
SPECIALIZ	336	4.567	5.355	.042	20.487
CAP	336	57.785	13.486	9.985	83.842
DIVERSITY	336	14.348	7.458	-16.854	35.874
EFFECTIVE	336	3.254	1.486	1.427	14.145
EFFICIENT	336	93.745	26.658	16.877	226.874
MSHARE	336	4.564	5.125	0.037	20.458
Control Variables					
RATE	336	14.219	5.505	7.937	26.750
EXCHANGE	336	2.235	1.329	1.287	5.721

Dependent variables	N	Mean (%)	Std. Deviation	Min.	Max.
INFL	336	9.468	3.241	6.160 8.432	20.150
UNEMP	336	10.392	1.450		14
GDPG	336	5.349	3.854	-4.654	11.025
DUMMY	336	.143	0.350	0	1

Table 2 shows the descriptive statistics for the variables used in the regressions. The entire sample body includes 336 observations from 2004 to 2019. The data were obtained from the Data System of the Banks Association of Turkey (https://verisistemi.tbb.org.tr/) and the Banking Regulation and Supervision Agency (https://www.bddk.org.tr/). Variables are explained in Table 1.

Table 3 shows the correlations of the variables. Accordingly, the NPL variable, LLP, CAP, EFFECTIVE and DIVERS variables are in positive and have a significant correlation. The LLP variable also has a significant correlation with the same variables, similar to the NPL. The ZSKOR dependent variable, MSHARE, CAP variables have positive and negative and significant correlations with the EFFECTIVE variable. The ROA dependent variable was positively and significantly correlated with the ROE, MSHARE, CAP and DUMMY variables and are EFFECTIVE negatively. Finally, the ROE dependent variable is in positive and has a significant correlation with the MSHARE, CAP and DUMMY variables and is EFFECTIVE.

Appropriate Model Selection

With the conclusion that there is a unit effect according to the F-Test for the models, it is necessary to determine whether the unit effect is constant or random in order to determine the correct model. In this context, the Hausman (1978) Test was applied to both models.

The Hausman (1978) Test is used to decide which is the optimal model when choosing between the fixed and random effects model. The main hypothesis of the test in question is "There is no correlation between explanatory variables and unit (time) effect." while the alternative hypothesis is established as "Explanatory variables and unit (time) effect are correlated". If the H_0 cannot be rejected, it is concluded that the difference between the parameter estimators of the fixed-effects model and the random-effects model will be very small, and both estimators are consistent, but the random-effects estimator is more efficient. If the H_0 is rejected, it is concluded that the difference between the parameter estimators will be large and the random effects estimator is inconsistent with the fixed effects estimator (Tatoğlu, 2018: 187).

Table 3
Correlation Matrix

	NPL	LLP	Z-SKOR	ROA	ROE	PEDU	MSHR.	SPEC.	CAP	EFFT.	DIVER.	EFFC.	DUMMY
NPL	1.000												
LLP	0.510***	1.000											
Z-SKOR	-0.182	-0.183	1.000										
ROA	-0.119*	-0.298**	0.158	1.000									
ROE	-0.151*	-0.342**	0.136	0.943**	1.000								
PEDU	-0.124***	-0.209*	-0.164	-0.216	-0.198	1.0000							
MSHARE	-0.100**	-0.096*	0.132*	0.295*	0.266*	-0.340*	1.000						
SPECIALIZ	-0.259*	0.088	0.072	0.009	0.093	0.096*	0.056	1.000					
CAP	0.066*	-0.025*	0.281**	0.219*	0.102*	0.043	-0.123	-0.205	1.000				
EFFECTIVE	0.226*	0.423*	-0.176*	-0.322*	-0.374*	0.001	-0.431*	-0.141	0.368*	1.000			
DIVERSITY	0.137*	0.262*	-0.003	0.157	0.084	-0.282*	0.117	-0.186	0.259	0.376*	1.000		
EFFICIENT	-0.281*	0.031	-0.078	-0.075	-0.028	0.059	-0.151	0.832*	-0.253	-0.225	-0.183	1.000	
DUMMY	0.068	-0.151	-0.051	0.168*	0.204*	-0.096	0.501**	-0.163	-0.246*	-0.356*	-0.135	-0.227	1.000

Note: ***, **,* indicate that the variables are significant at 1%, 5% and 10% significance level, respectively.

Table 4
Model Selection and Summary of Model Test Specifications

	F Test		Hausman Test		Selected Model		Specification Tests	
	Coefficient	P	Coefficient	P	Autocorrelation Test		Peseran CD	Variable Variance Test
Model 1	5.35	0.000*	18.71	0.4758	Durbin-Watson Baltagi-Wu LBI	0.685 1.081	0.285 Prob:0.9604	48.26 Prob:0.000
Model 2	9.52	0.000*	17.93	0.5854	Durbin-Watson Baltagi-Wu LBI	0.894 1.247	0.284 Prob:0.8674	24.56 Prob:0.000
Model 3	448.57	0.000*	24.78	0.5274	Durbin-Watson Baltagi-Wu LBI	0.745 1.145	0.296 Prob:0.3894	.263 Prob:0.000
Model 4	17.43	0.000*	17.93	0.5791	Durbin-Watson Baltagi-Wu LBI	0.862 1.263	0.289 Prob:0.3138	440.51 Prob:0.000
Model 5	10.20	0.024*	3.65	0.9978	Durbin-Watson Baltagi-Wu LBI	0.916 1.442	0.284 Prob:0.7237	211.93 Prob:0.000

Note: * denotes critical value at alpha=0.05 level.

When the Hausman (1978) Test results stated in Table 4 are examined; in the NPL, LLP, Z-SKOR, ROA and ROE models, it was seen that the H_0 hypothesis could not be rejected at the 5% significance level (Prob> 0.010), and there was no correlation between the unit effect and the explanatory variables. In the light of these results, it was understood that there was no correlation between the unit effect and the explanatory variables in all five models, and the one-way unit random effects model was more consistent for the research model.

When Table 4 is examined, the Modified Wald Test performed for each model in the random effects model shows that there is no heteroscedasticity problem in the models. According to Bhargava, Franzini, and Narendranathan's Durbin-Watson and Baltagi-Wu local best invariant test (1982), there is no autocorrelation problem in the models. According to the Pesaran (2004) test, which was conducted to determine whether there is a correlation between units (horizontal section dependency) in the models, it was determined that there was no correlation between units in the models. For this reason, the Generalized Least Squares Estimator was used to estimate the models.

Results

After it has been determined that the random effects model will be applied, the necessary assumptions must be provided in order to use the Generalized Least Squares (GLS) estimator,

which is the random effects estimator. If the assumptions cannot be met, then resistant estimators will be used. These assumptions are that there is constant variance between error terms (no changing variance problem), no correlation between units (horizontal section dependence) and no correlation (autocorrelation) between error terms. Generalized Least Squares Estimator was used because the necessary assumptions were met in the models.

Model 1 results; consistent with H1, it reveals that human capital is negatively and significantly correlated with banks' non-performing loans. As the level of postgraduate education, which is used as a human capital indicator of banks, increases, the non-performing loans of banks decrease strongly (B1<0). A one-unit increase in human capital causes a decrease of -0.382 (z value= -5.89) in non-performing loans. This shows that banks with high human capital follow a more selective and cautious lending policy when extending loans than banks with low human capital.

According to Model 1, the share of banks in the sector (MSHARE), lending specialization (SPECIALIZ), deposit to loan ratio (EFFICIENT), market interest rates (RATE) and gross national product growth (GROWTH) negatively and significantly affect non-performing loans. There is an inverse relationship between the variables in question and the problem loans of banks Decisively. As these variables increase, the problem loans of banks decrease. As the size of the banks in the sector increases, their competitive capacity also increases. This result can be interpreted as a banks' ability to provide loans to their lower-risk loan customers in the market. Similar results were obtained in similar studies (Ayaydın et. al., 2021).

The lending specialization (SPECIALIZ) variable was found to be negative and statistically significant in models 1 and 2. As conventional banks specialize in lending in Turkey, it means that they can better identify and follow up risky customers and loans that cause NPLs to increase. Although there are similar results in the literature (Kosmidou et. al., 2007; Ayaydın et. al., 2021), the opposite results were obtained in some studies (Festic, 2011, Messai and Jouini, 2013, Ozili, 2019). The negative effect of the SPECIALIZ variable on non-performing loans can be explained by reasons specific to Turkey.

Accordingly, as the rate of channeling the total assets of banks to loans increases in Turkey over the years, the non-performing loan ratios increase less compared to this increase, that is, they tend to decrease. It can be said that the structural arrangements and changes made after the 2001 crisis were effective in the emergence of this situation. In addition, the fact that the Total Credit/Total Assets (SPECIALIZ) ratio, which was 45% in the first 3 years of the research, has approached 70% in the last three years, can be interpreted as confirming this situation. The low rate of this ratio brings with it results such as high storage costs and lower profitability (Staikouras et. al. 2008).

GDP growth is expected to affect loan demand and returns (Boadi & Osarfo, 2019). As seen in Models 1 and 2 in this study, increasing GDP growth significantly reduces the credit

risk of banks. At this point, it can be seen as a remarkable result that the increase in market interest rates reduces the non-performing loans of banks. While supporting the same results in Model 2, the results in Models 4 and 5 also confirm that the profitability of banks increases with interest rates. The increase in interest rates in Turkey affects banks positively both in terms of risk and profitability.

On the other hand, operating efficiency (EFFECTIVE), inflation (INFL) and unemployment (UNEMP) are positively and significantly related to non-performing loans. As these variables increase, the non-performing loans of banks also increase. In addition, it has been determined that there is a positive relationship between non-performing loans and public banks (DUMMY). From this, it is understood that public banks have higher non-performing loans compared to private banks. No statistically significant relationship was found between the equity ratio (CAP), income diversification (DIVERSITY) and exchange rate (EXHANGE) variables and non-performing loans.

Although Staikouras and Wood (2003) stated that inflation may have a direct and indirect effect on the performance of banks, in this study, it was determined that the inflation rate was statistically positive and significant only with non-performing loans.

Tablo 5
GLS Model Results

Independent Variables	**Dependent Variables**				
	Model 1 NPL	**Model 2 LLP**	**Model 3 Z-SKOR**	**Model 4 ROA**	**Model 5 ROE**
PEDU	-0.382***	-0.077***	-0.026	0.019	0.231
	[-5.89]	[-5.21]	[-1.58]	[0.64]	[0.63]
MSHARE	-0.172***	-0.001	0.008	-0.005	-0.175
	[-3.18]	[-0.04]	[-0.43]	[-0.12]	[-0.53]
SPECIALIZ	-0.078***	-0.024*	0.001	0.013	0.073
	[-3.95]	[-0.46]	[1.04]	[1.64]	[0.46]
CAPITAL	0.007	-0.034***	0.151***	0.238***	2.271***
	[0.13]	[-2.81]	[7.08]	[9.27]	[7.05]
EFFECTIVE	0.518***	0.326***	-0.299***	-0.906***	-10.015***
	[3.93]	[11.38]	[-5.85]	[-15.61]	[-13.76]
DIVERSITY	-0.011	0.007	0.001	0.059***	0.629***
	[-0.50]	[1.52]	[0.03]	[6.20]	[5.85]
EFFICIENT	-0.018*	-0.002	0.001**	0.005	0.078
	[-1.90]	[-0.91]	[2.35]	[1.11]	[1.20]
INFL	0.088*	0.009	0.004	0.003	0.306
	[1.70]	[0.63]	[0.17]	[0.12]	[0.94]
RATE	0.233***	-0.042***	-0.005	0.097***	0.965***
	[-6.41]	[-5.40]	[-0.37]	[6.42]	[4.51]
GROWTH	-0.069*	0.063***	-0.009	-0.005	-0.124
	[-1.66]	[-7.07]	[-0.54]	[-0.31]	[-0.57]
UNEMP	0.300**	0.034	-0.029	0.108*	0.956
	[2.01]	[-1.09]	[-0.50]	[1.79]	[1.21]

Independent Variables	Dependent Variables				
	Model 1 NPL	Model 2 LLP	Model 3 Z-SKOR	Model 4 ROA	Model 5 ROE
EXCHANGE	0.272 [1.17]	0.143*** [2.88]	-0.145 [-1.25]	0.404*** [-4.27]	-4.994*** [-4.04]
DUMMY	1.553* [1.94]	0.042 [0.19]	0.206 [0.29]	0.184 [0.22]	4.047 [0.68]
_Cons	10.612*** [4.97]	1.957*** [4.25]	3.073*** [3.67]	-2.289** [-2.55]	-18.744* [-1.64]
Random Effect	Yes	Yes	Yes	Yes	Yes
R^2	0.54	0.64	0.61	0.57	0.53
# of observations	336	336	336	336	336
Wald chi2	252.26	846.33	441.10	389.12	274.75
Prob. > chi2	0.000***	0.000***	0.000***	0.000***	0.000***
theta	0.5878	0.5936	0.7651	0.7493	0.6448

Note: ***, ** and * denote the significance level of 0.01, 0.05 and 0.10, respectively. The values in [ ] brackets indicate the z value.

Although there is evidence that growth affects loan demand (Goddard, Molyneux & Wilson, 2004) and profitability (Işık, Noyan, et al., 2017), there is no evidence that it increases profitability in Turkey according to Models 3 and 4. These results are consistent with the study results of Samırkaş, Evci & Ergün (2014).

The Model 2 results, consistent with H_2, reveal that human capital is negatively and significantly correlated with a banks' loan loss provisions. As the postgraduate education level of the personnel in the banks increases, the loan loss provisions of the banks decrease strongly (β_1<0).

A one-unit increase in postgraduate education causes a decrease in the loan loss allowance of -0.077 (z value= -5.21). In general, the results in Model 2 support the results in Model 1. This situation can be interpreted as banks with high postgraduate education having to allocate less provision for loan losses as a result of following a more selective and cautious lending policy than banks with low postgraduate education during the loan allocation process.

According to Model 2, banks' lending specialization (SPECIALIZ), equity ratio (CAP), market interest rates (RATE) and gross national product growth (GROWTH) are negatively and significantly related to the bank's loan loss provisions. While these variables increase, the bank's loan loss provisions decrease. The results show that postgraduate education is positively and significantly associated with banks' operating efficiency (EFFECTIVE) and exchange rate (EXHANGE). As the operational efficiency and exchange rate of banks increase, the provision for loan losses also increases.

According to the Model 3 results, there is no significant relationship between the postgraduate education ratio and the Z-Score ratios of banks. The fact that the capital ratios of the banks in Turkey are strong and therefore the Z-SCORE ratios are higher than the re-

commended ratio of 1.8 (Li et al., 2017; Aksoy and Donduran, 2020), where the risk of bankruptcy may arise, may have rendered the relationship meaningless. While there was a positive and significant relationship between CAP, EFFECTIVE and EFFICIENT variables and Z-SCORE, no relationship was found between other variables.

According to the Model 4 and 5 results; Although postgraduate education positively affects ROA and ROE, which are important profitability indicators of banks, this relationship between them is not significant. It was determined that there is a positive and significant relationship between CAP, DIVERSITY, and RATE. While banks' equity ratios, income diversification and interest rates increase, ROA and ROE increase significantly. It was determined that there is a negative and significant relationship between EXCHANGE and EFFECTIVE. While the exchange rate and non-interest expenses of banks increase, their profitability decreases significantly. It can be said that these results are due to the high foreign currency usage rates of banks in Turkey and their foreign currency short positions. The high non-interest expenses indicate that the operational efficiency of the banks is low and as a result, it may have a reducing effect on profitability.

Tablo 6
Hypothesis Results

Hypothesis	**Acceptance / Reject**
H_1. Human capital (PEDU) is negatively correlated with banks' non-performing loan rates (NPL).	**Accepted**
H_2. Human capital (PEDU) is negatively correlated with banks' loan loss provisions (LLP).	**Accepted**
H_3. Human capital (PEDU) is positively related to the bankruptcy risk of banks (Z-SCORE).	**Rejected**
H_4. Human capital (PEDU) is positively correlated with banks' return on assets (ROA).	**Rejected**
H_5. Human capital (PEDU) is positively correlated with banks' return on equity (ROE).	**Rejected**

A summary of all hypotheses is given in Table 6. Accordingly, it was related to a negative and significant relationship between human applied and non-performing loans (NPL) and loan expenditures (LLP). As with any relationship between the risk (Z-SCORE) of other banks, return on assets ratio (ROA) and equity ratio (ROE).

Sensitivity Tests

In this study, the validity of the research hypotheses was tested on the variables of credit risk, bankruptcy risk and profitability. While the credit risk variable was tested with NPL and LLP, the bankruptcy risk was tested with the Z-Score. Profitability is tested with both ROA and ROE. It is aimed to ensure the acceptability of the results by testing profitability and credit risk with two variables. In addition, bans with an asset size of 9% and above of the sector and those with less than 9% were divided into two and retested.

As in the studies of Kim and Lu (2011), Hasan et al. (2017), and Pilatin & Ayaydın (2019) the results from the basic model reduce any potential concern that human capital is affected

by endogenity due to variables that are related to but neglected. As an alternative method, susceptibility testing was also performed.

Seven banks with an asset size of 9% and above and 14 banks with an asset size of less than 9% of the banks were analyzed again separately on the same models. The results in Table 7 show the test results.

Table 7
Effect of Postgraduate Education Level on Credit Risk and Financial Performance (Asset size of 9% or more in the sector)

Independent Variables	Dependent Variables				
	Model 1 NPL	**Model 2 LLP**	**Model 3 Z-SKOR**	**Model 4 ROA**	**Model 5 ROE**
PEDU	-0.364**	-0.045**	-0.032	-0.018	-0.018
	[-2.08]	[-1.32]	[-0.63]	[-0.44]	[-0.44]
MSHARE	-0.661***	0.015	0.034	0.003	-0.003
	[-6.76]	[0.10]	[1.21]	[0.15]	[-0.01]
SPECIALIZ	-0.363***	-0.019	0.002	0.057***	0.657***
	[-4.32]	[-1.54]	[0.09]	[2.83]	[2.64]
Independent Variables	**Dependent Variables**				
	Model 1 NPL	**Model 2 LLP**	**Model 3 Z-SKOR**	**Model 4 ROA**	**Model 5 ROE**
CAPITAL	-0.053	0.067***	0.095**	0.005	-1.144***
	[-0.42]	[3.47]	[2.54]	[0.18]	[-3.02]
EFFECTIVE	0.203	0.505***	-0.428***	-1.250***	-16.872***
	[0.92]	[15.08]	[-6.57]	[-23.45]	[-25.76]
DIVERSITY	0.049	0.030***	0.002	0.040**	0.517**
	[0.71]	[2.88]	[0.08]	[2.40]	[2.48]
EFFICIENT	0.114***	0.009	0.007	-0.028***	-0.306**
	[2.65]	[1.36]	[0.54]	[-2.78]	[-2.40]
INFL	-0.055	0.204	-0.027	-0.006	-0.342
	[-0.44]	[1.09]	[-0.74]	[-0.21]	[-0.93]
RATE	-0.011*	-0.026**	0.001	0.085***	1.338***
	[-0.23]	[-2.24]	[-0.03]	[4.59]	[5.90]
GROWTH	0.026	-0.045***	0.023	-0.003	0.025
	[1.62]	[-3.70]	[0.98]	[-0.15]	[0.11]
UNEMP	0.338	0.001	-0.014	0.160**	2.146 ***
	[1.22]	[0.02]	[-0.17]	[2.39]	[2.61]
EXCHANGE	0.241	0.881	-0.043	-0.430***	-4.835***
	[1.62]	[1.13]	[-0.31]	[-3.75]	[-3.43]
DUMMY	2.027**	0.526***	0.112	-0.671	-8.082***
	[2.28]	[3.91]	[0.43]	[0.22]	[-3.07]
_Cons	10.576***	-1.214*	3.252**	1.989*	28.098**
	[3.48]	[1.66]	[2.29]	[1.71]	[1.96]
Random Effect	Yes	Yes	Yes	Yes	Yes
R^2	0.52	0.74	0.48	0.56	0.84
# of observations	112	112	112	112	112
Wald chi2	130.83	335.95	113.45	349.87	748.23
Prob. > chi2	0.000***	0.000***	0.000***	0.000***	0.000***
theta	.5358	.5942	.6687	.7493	.6448

Note: ***, ** and * denote the significance level of 0.01, 0.05 and 0.10, respectively. The values in [ ] brackets indicate the z value.

Banks with an asset size of 9% or more were analyzed separately. The results reveal that human capital is negatively and significantly correlated with banks' non-performing loans, supporting the baseline model results. As the level of postgraduate education, which is used as a human capital indicator of banks, increases, non-performing loans of banks decrease (β_1<0). A one-unit increase in human capital causes a decrease of -0.364 (z value= -2.08) in non-performing loans.

To support the main model, as the level of postgraduate education, which is used as a human capital indicator of banks, increases, the provision for credit losses of banks also decreases (β_1<0). A one-unit increase in human capital causes a decrease of -0.045 (z value= -1.08) in loan loss reserves. According to the results of Models 3 and 5, there is no relationship between the dependent variables of Z-SCORE, ROA and ROE and the dependent variable of human capital, respectively.

The data of 14 banks with an asset size of less than 9% of the banks were analyzed again and again using the same models. Table 7 shows the test results.

Table 8
Effect of Postgraduate Education Level on Credit Risk and Financial Performance (Asset size of less than 9% in the sector)

	Dependent Variables				
Independent Variables	**Model 1 NPL**	**Model 2 LLP**	**Model 3 Z-SKOR**	**Model 4 ROA**	**Model 5 ROE**
PEDU	-0.368*** [-5.55]	-0.077** [-4.34]	-0.254 [-0.63]	0.016 [0.43]	-0.087 [-0.20]
MSHARE	-0.201 [-0.90]	-0.039 [-0.60]	0.081 [0.88]	0.184 [1.20]	-2.632* [-1.65]
SPECIALIZ	-0.046*** [-2.68]	-0.000 [-0.01]	-0.001 [-0.11]	0.008 [0.92]	-0.011 [-0.10]
CAPITAL	-0.129** [-2.26]	0.047*** [-3.07]	0.156** [5.39]	0.287*** [9.23]	2.567 *** [6.86]
EFFECTIVE	0.880*** [5.67]	0.282*** [6.88]	-0.266*** [-3.38]	-0.795*** [-9.50]	-6.673*** [6.61]
DIVERSITY	0.001 [0.07]	0.009* [1.81]	0.001 [0.01]	0.048*** [4.45]	0.434*** [3.24]
EFFICIENT	-0.020** [-2.33]	0.002 [-0.84]	0.009** [-2.00]	0.008* [1.71]	0.104* [1.82]
INFL	0.240*** [3.42]	0.015 [0.84]	0.014 [0.37]	-0.021 [-0.58]	0.208 [0.46]
RATE	-0.369*** [-10.15]	-0.047*** [-4.94]	-0.005 [-0.29]	0.106*** [5.53]	0.804*** [3.42]
GROWTH	-0.151*** [-3.58]	-0.081*** [-7.35]	-0.023 [-1.02]	0.010 [0.46]	0.015 [0.06]
UNEMP	0.320** [2.10]	-0.046 [-1.14]	-0.043 [-0.54]	0.057** [0.57]	0.246 [-0.25]

Independent Variables	Dependent Variables				
	Model 1 NPL	**Model 2 LLP**	**Model 3 Z-SKOR**	**Model 4 ROA**	**Model 5 ROE**
EXCHANGE	-0.012 [-0.05]	0.119* [1.87]	-0.167 [-1.32]	-0.235* [-1.82]	-2.63* [-1.68]
DUMMY	-	-	-	-	-
_cons	10.576*** [4.90]	2.42*** [4.25]	3.001*** [2.74]	-3.009** [-2.55]	-19.878 [-1.42]
Random Effect	Yes	Yes	Yes	Yes	Yes
R^2	0.46	0.44	0.43	0.46	0.42
# of observations	224	224	224	224	224
Wald chi2	176.45	147.29	106.47	170.80	107.54
Prob. > chi2	0.000***	0.000***	0.000***	0.000***	0.000***
theta	.5917	.6661	.4384	.7564	.6572

Note: ***, ** and * denote the significance level of 0.01, 0.05 and 0.10, respectively. The values in [ ] brackets indicate the z value. All of them are private banks.

According to the results, banks with an asset size of less than 9% were again analyzed separately. The results reveal that human capital is negatively and significantly correlated with banks' non-performing loans, supporting the baseline model results. As the level of postgraduate education, which is used as a human capital indicator of banks, increases, non-performing loans of banks decrease (β_1<0). A one-unit increase in human capital causes a decrease of -0.368 (z value= -5.55) in non-performing loans.

To support the main model, as the level of postgraduate education, which is used as a human capital indicator of banks, increases, the provision for credit losses of banks also decreases (β_1<0). A one-unit increase in human capital causes a decrease of -0.077 (z value= -4.34) in loan loss reserves. According to the results of Models 3 and 5, there is no relationship between the dependent variables of Z-SCORE, ROA and ROE and the dependent variable of human capital, respectively.

Conclusion

Human resources departments of businesses exist to recruit the most educated, qualified and competent personnel. That's what banks' human resources departments are for. Perhaps the best are hired for superior education and competence. While some of the characteristics of the personnel are observable (educational background, competence and experience), some of them are unobservable (leadership and entrepreneurial skills) (Bhagat et al., 2010). Unobservable features are difficult to identify and measure. However, observable features are easy to identify and measure and are very important for business. Education level is important because it is both observable and the most important and most used surrogate of human capital (Hambrick & Mason, 1984; Barro & Lee, 2010; Ellul & Yerramilli, 2013). In this study, the level of postgraduate education was used as an indicator of human capital for banks.

Human capital is at the center of successful companies because of its direct and indirect impact on business performance. This view is supported by the resource-based view (RBV), which provides superior performance and competitive advantage to an enterprise's capacity for valuable, rare, inimitable, and non-substitutable products and services (Barney, 1991; Prahalad & Hamel, 1990). Different empirical studies have been conducted on different sectors regarding human capital. While studies on human capital show that human capital contributes to a higher financial performance (King et. al. 2016; Adesina, 2021), there are also studies reporting that it does not (Razafindrambinina & Anggreni, 2017; Soewarno & Tjahjadi, 2020).

In general, human capital in the banking sector is more important than in production enterprises. This is because as the level of education and knowledge of human capital increases, its competence also increases. There are studies on the effect of the education level of board members on financial performance and bank risk level in banks (García-Meca et. al. 2015; King et. al. 2016; Pereira & Filipe, 2018; Yılmaz & Aybars, 2021). The main implementers of the bank's policies and objectives are the personnel working at different levels and constituting the majority of the employees. However, no study has been found on the effect of education levels on the bank's credit risk and financial performance. This gap in the literature constitutes the main motivation for the study.

Banks, which are very important for economies, ensure the functioning of the financial system by bringing together those who supply funds and those who demand funds in the system. In order for investment, commercial and financial activities to continue and develop in the economic structure, market actors must be able to meet the needs from financial markets. The most important function of banks is the lending function. The banking system works well to the extent that banks fulfill their lending function.. While performing the lending function, banks pay attention to the fact that the customer consists of the customers who will provide the bank with the highest return and the lowest risk. They also try to give loans to areas that will make the highest contribution to the economy. At this point, the human capital of banks gains importance because more educated bank personnel are expected to be more skilled at benchmarking customers, predicting risks and managing future cash flows. Therefore, since a bank with more educated personnel will have a lower NPL ratio, it is expected to have a lower credit risk and a more efficient and profitable performance.

The main purpose of this study is to determine whether there is any relationship between postgraduate education and banks' credit risk, bankruptcy risk and profitability in Turkey, a developing country. In the study, analyses were carried out by taking the data of all state-owned, private-capital and foreign-owned conventional banks in Turkey during the 16-year period covering the 2004–2019 period. Although the number of conventional banks in Turkey is 34, these banks were not included in the research because the number of branches of 3 banks in Turkey is less than 4. The remaining 10 banks were excluded from the scope of the study as they did not provide sufficient data for the years 2004–2009 and did not maintain widespread

banking activities throughout Turkey. The sample used in the study covers 94% of the asset size of the Turkish banking system and 98% of the number of employees.

In the study, non-performing loans (NPL), loan loss provisions (LLP), bankruptcy risk (Z-Score), return on assets (ROA) and return on equity (ROE) were used as dependent variables. The postgraduate education variable was used as the independent variable. According to the empirical results, results supporting H1 were found between postgraduate education and non-performing loans. Accordingly, postgraduate education is significantly and negatively correlated with non-performing loans (NPL) of banks. As the postgraduate education level of banks rises, the tendency of non-performing loans decreases. Results supporting H_2 were found between postgraduate education and provisions for loan losses (LLP). Accordingly, postgraduate education is significantly and negatively correlated with LLP. As the postgraduate education level of banks increases, the LLP tendency decreases. These results show that as the level of postgraduate education of bank personnel increases, the probability of conversion of loans to non-performing loans decreases accordingly. This shows that bank personnel with higher education levels follow a more conservative and prudent strategy in lending.

According to the results of the study, no results supporting H_3 were found between postgraduate education and Z-SCORE. The results do not support H_4 and H_5, which indicate that high postgraduate education has a positive effect on ROA and ROE, which are bank profitability indicators. No significant relationship was found between postgraduate education and ROA and ROE.. These results support the studies of Awan & Sarfraz (2013), Calabro et. al. (2021), Nyberg (2014) and Rahman & Akhter (2021).

According to the sensitivity analysis, it has been confirmed that there is a negative and significant relationship between the postgraduate education level of banks with an asset size of 9% and above and NPL and LLP. It has been confirmed that there is a negative and significant relationship between the postgraduate education level of banks with an asset size below 9% and the credit quality indicators NPL and LLP. Thus, it has been revealed that there is a negative and significant relationship between banks' postgraduate education level and credit risk in terms of size. These results support both the theory on which the research is based and the H_1 and H_2. As seen in Models 1 and 2 in the study, increasing GDP growth significantly reduces the credit risk of banks. Interestingly, the increase in market interest rates in Turkey significantly reduces the non-performing loans of banks, while significantly increasing bank profitability in all models. It can be seen as a remarkable result of this study. While supporting the same results in Model 2, the results in Models 4 and 5 also confirm that the profitability of banks increases with interest rates. The increase in interest rates in Turkey affects banks positively both in terms of risk and profitability.

According to all these results, as the level of postgraduate education, which is a human capital indicator of banks, increases, non-performing loans (NPL) and loan loss provisions

(LLP), which are indicators of credit risk, decrease. On the other hand, it has been understood that there is no relationship between the Z-SCORE, which is an indicator of bankruptcy risk of banks, and ROA and ROE, which are profitability indicators. These findings support studies conducted in developing countries (Absar et. al 2012; Garcia, 2005; Rahman & Akhter, 2021). There are different results in the study conducted in the developed country sample (Nguyen et. al. 2015). The fact that the level of postgraduate education is not associated with profitability may be due to the fact that there are too many variables affecting profitability. The results do not support the studies of Topaloğlu & Bayrakdaroğlu (2012) and Yılmaz & Aybars (2021). Because in banks where the level of postgraduate education is high, staff may tend to behave more cautiously and conservatively. This situation can be interpreted as causing the personnel to use less credit and decrease the profitability together with the credit risk. In addition, as the level of postgraduate education increases, the tendency of loan allocation personnel to give loans with high risk and return decreases. This conservative loan allocation policy may prevent banks from increasing their profitability after a certain period of time. Non-performing loans, which gained importance all over the world after the 2008 global financial crisis, can be used as an early warning system to predict a possible financial crisis. Considering this, in order to prevent this, the necessity for banks to be more selective in extending loans comes to the fore. In order to achieve this, as the results of this study show; banks are required to employ staff with a higher level of postgraduate education.

The findings of this study provide important information for policy makers, regulatory and supervisory institutions and organizations, research commissions, bank managers and researchers. Bank managers may set criteria for employing personnel with a certain level of postgraduate education in the bank policy. Policy makers, regulatory and supervisory institutions can apply policies that encourage banks to employ employees with a certain level of postgraduate education who are experts in their fields.

The effects of the Covid-19 pandemic, which adversely affected the global economy, on the national economies, financial system and banking system have not been fully revealed. . In this period, low-interest loans, bailout packages and incentives were given in order to reduce the negative effects on the economies and to revive the economic activity. These developments led to rapid growth of loans and deterioration in loan quality, especially in developing countries. This may trigger new and devastating financial crises for the banking sector (Pilatin & Ayaydın, 2022). At this point, banks' postgraduate education levels can be used as a supportive mechanism to reduce these risks or to enable them to emerge in a more controlled manner. In future studies, studies can be conducted on the effect of the education level of bank employees on the credit risk and profitability of banks during the Covid-19 period. The research can be further developed by using different variables in the future study.

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RESEARCH ARTICLE

Recalculation of Manufacturing Industry Production Function with Trade Openness and Human Capital: Multi-Dimensional Panel Data Application

Ergün Aktürk[1], Yusuf Akan[2], Sena Gültekin[3]

Abstract
The manufacturing industry plays a key role in ensuring long-term and sustainable economic development. Although the impact of the service and information technology sectors on economic growth has increased recently, reindustrialization trends have appeared especially in developing and underdeveloped countries. Studies on the manufacturing industry have started to gain importance again within the scope of reindustrialization. In this context, the production functions of the manufacturing industry started to be recalculated and the factors affecting the manufacturing industry became the field of study again. In particular, global trade has become one of the dominant issues in terms of the manufacturing industry. This study aims to calculate the manufacturing industry production function of 40 countries for the period of 2000-2014. While making this calculation, it is aimed to see the effect of trade openness and human capital on manufacturing industry production. For this purpose, multidimensional panel data analysis was used and the Cobb-Douglas production function was calculated. As a result of the analysis, it has been found that labor, exchange rate, trade openness, and human capital have a positive effect on manufacturing industry production.

Keywords
Manufacturing Industry, Cobb-Douglas Production Function, Multidimensional Panel Data Analysis, Trade Openness, Human Capital

Introduction

Industrialization is the process of producing goods and services with the extensive use of existing resources. The manufacturing industry plays a key role in ensuring long-term economic development (Szirmai, 2009). It prevents the increasing population from accumulating in agriculture and thus enables the increase in production and therefore the national income. The increase in national income creates a source for new investments. This development manifests itself not only in the impact on GDP but also in the increase in the diversity of manufactured goods (Sutikno & Suliswanto, 2017). Kaldor (1966), one of the first authors to

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examine the effect of the manufacturing industry on economic growth in detail, stated in his first law that the engine of growth is the manufacturing industry. Based on Kaldor's second law, there is an increase in the productivity of workers by learning the work they do with industrial growth. This also supports economic growth. Similar results were obtained in other studies examining the relationship between the manufacturing industry and economic growth (Libanio & Moro, 2006; Su & Yao, 2016; Karami, Elahinia, & Karami, 2019; Ughulu, 2021).

The recent increase in the impact of the service sector on economic growth compared to the agriculture and industry sectors has started discussions that industrialization is no longer the driving force of the economy, and this situation is also reflected in the economics literature (Lee & McKibbin, 2014). However, the spread of trade on a global scale has also affected industrial production. With the increase in production, especially in the trade of intermediate goods, the economics literature has started to develop in this field. However, it has been determined that the studies pay attention to trade openness and the effects of import and export are examined separately and are very limited. Withal, examining human capital and trade together is important to reveal the importance of human capital along with trade in order to ensure the industrial development of especially underdeveloped and developing countries with low human capital.

Recent re-industrialization trends have made it necessary to reconsider the subject with new data and to make the evaluation by considering income groups. The intensification of the literature in recent years indicates increasing interest. However, in the literature review conducted within the scope of this study, it appeared that the effects of trade openness on the manufacturing industry were not widely examined. In addition to trade openness, the effect of manufacturing industry imports and exports on manufacturing industry production should be examined specifically. It is also important to examine the difference in this effect in various income groups. The present study aimed to fill this gap in the literature. This study aims to calculate the Cobb-Douglas production function for the manufacturing industry with the data of 40 countries in various income groups for the period 2000-2014 and to examine the effects of trade openness and manufacturing industry imports and exports in manufacturing industry production with multidimensional panel data analysis. The fact that a detailed study of the world was not done for this period in previous studies, the analysis of countries by dividing them into income groups, and the use of multidimensional panel data analysis are the original points of the study. The next sections will be the theoretical framework, analysis, discussion and then the conclusion section.

Theoretical Framework

The rapid development in the service, and information, and communication sectors and their contribution to economic growth has recently led to a debate that these fields have

replaced the manufacturing industry. The view that the new engine of growth is the service sector has come to the fore (Maroto-Sánchez & Cuadrado-Roura, 2009; Lee & McKibbin, 2014). For this reason, it has started to be discussed to what extent a country should develop its manufacturing industry at the stage of development. Although the place of the manufacturing industry has become a controversial issue recently, the manufacturing industry continues to maintain its importance, especially in middle-income countries. There are various reasons for this situation. The manufacturing industry affects the service sector both in the short and long term, a development in the manufacturing industry causes the service sector to develop as well. In addition, compared to other sectors, the manufacturing industry is the sector that supports investment and technology accumulation the most. In addition, the manufacturing industry is the area that makes the most important contribution to the development of human capital in middle-income countries. Therefore, the manufacturing industry still forms the basis of economic growth in low- and middle-income countries (Su & Yao, 2016). On the other hand, the fact that the manufacturing industry is the sector that accumulates the most physical capital causes it to benefit more from economies of scale. Economies of scale are achieved by both decreasing fixed costs and increasing efficiency. In addition, the fact that it is connected with other sectors ensures that an increase in output in the manufacturing industry is reflected in other sectors, which creates a multiplier effect. Therefore, the manufacturing industry still maintains its importance in terms of development (Haraguchi, Cheng, & Smeets, 2017).

The manufacturing industry, along with the use of natural resources, is one of the most important supporting forces of growth, especially in underdeveloped countries. In addition, the manufacturing industry, which is one of the most important areas that bring foreign currency returns to the national economy, is the primary driving force of innovation (Dadush, 2015). Although global industrial growth increases global welfare, it has different effects on every economy. While industrial growth in developed countries increases productivity by producing new technologies, it also creates positive externalities in climate and environmental conditions. In developing countries, production is an important tool that creates more added value than traditional fields, helps to increase employment and welfare levels with new technologies, and reduces poverty. Value added is accepted as an important indicator of industrial development, which is found by subtracting all inputs from all outputs of a sector (Facevicova & Kynclova, 2020). Figure 1 shows the development of industrial added value over time by income groups. When examining Figure 1, the left axis is for high, upper middle and lower middle-income countries and the right axis is for low-income countries. The reason for the division of the axes is that the added values of the low-income countries are not visible in the figure because it is quite low compared to other income groups. Although fluctuations in the low and lower-middle-income groups remain the same, the industrial value-added is quite low. The fastest growth has been experienced in the upper-middle-income group. Value-added, which followed a relatively horizontal course in upper-middle-income group countries

until the early 2000s, has increased rapidly since this period and approached the high-income group. In the emergence of such a course, it is of great importance that countries became an investment focus of companies with international capital with the liberalization movements experienced in these countries. Although a similar course is followed in low-middle-income countries, the incomplete environment of investment conditions in these countries prevents industrial development. The gap between low-income and high-income countries is widening day by day, and this is also seen in the growth rates of countries (Correa & Kanatsouli, 2018). The abandonment of labor-intensive production in the manufacturing industry, especially in developed and developing countries, does not mean that the manufacturing industry has lost its importance. The increase in the productivity of labor provides the acceleration of economic growth. The rapid increase in labor productivity has played an important role in the rapid growth of countries such as South Korea, Taiwan, Singapore, and Hong Kong (Tregenna, 2011).

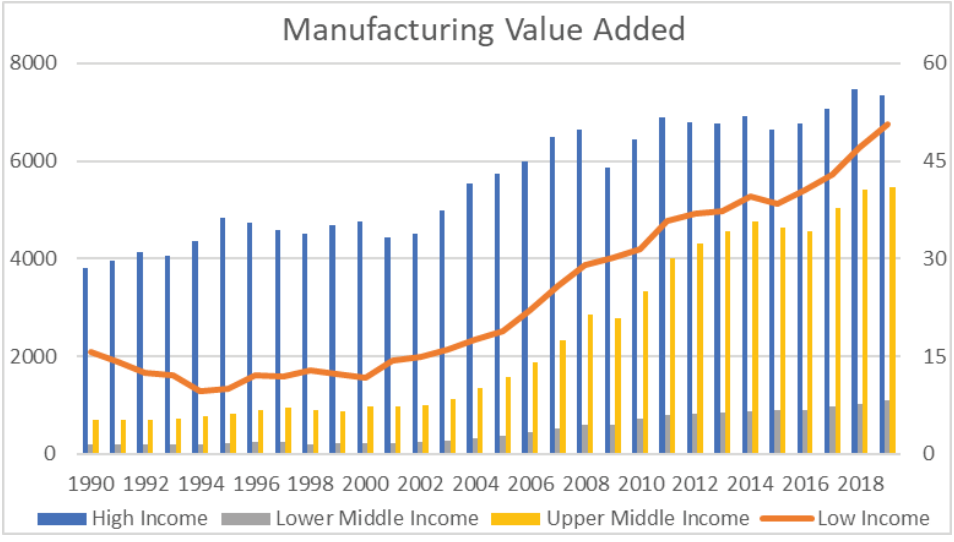

Figure 1. Manufacturing Value Added

Source: UNIDO

According to the neo-classical view, the income levels of countries with similar technological opportunities will converge over time. The high marginal productivity of capital in low-income countries will ensure convergence to high-income countries in the long run. However, on a global scale, it is seen that poor countries do not show such a development, except for some East Asian countries. This situation arises from the unique political, institutional, and other characteristics of the country. For this reason, it is not possible to talk about an unconditional convergence (Rodrik, 2013). This is illustrated in Figure 1 by the fact that the industrial value-added of low-income countries does not converge with high-income countries over time.

The manufacturing industry is one of the most important tools that provide income by creating employment, increasing resource efficiency, and making countries competitive in international trade, thus increasing welfare (Jenkins & Sen, 2006). However, this is not always sufficient to improve the industrial competitiveness of the country on a global scale. The Competitive Industrial Performance (CIP) index prepared by UNIDO shows the success of a country in producing and selling industrial products in the domestic and foreign markets. Thus, it reveals its industrial competitiveness comparatively. When calculating the CIP index, six primary indicators are considered: industrial value-added per capita, industrial exports per capita, industrialization intensity, export quality, country-specific impact on world industrial value-added, and country-specific impact on world industrial exports. The high value of these indicators increases the CIP index value, which indicates that the country's industrial competitiveness is high. The CIP index is widely used to compare neighboring countries. Because these countries can often be commercial partners or competitors. These countries may have similar socio-economic structures, use the same currency, and have similar cultural heritage (Correa & Todorov, 2020). The heat map in Figure 2 shows the distribution of the CIP index. According to the figure, it is seen that industrial competitiveness is concentrated in North America, Europe, and East Asia. The countries with the lowest level of competitiveness are concentrated on the African continent. Industrial agglomeration is important in terms of specializing in the labor force, gathering more resources, increasing competition among entrepreneurs, creating economies of scale, creating positive externalities, and spillover knowledge and technology in the region (Li, 2020). For this reason, industrial production concentrated in certain regions develops the region by feeding itself. It is easily seen from the heat map that dark and light-colored countries are concentrated in certain regions, indicating that industrial agglomeration is valid for North America, Europe, and East Asia.

Since the Industrial Revolution, the manufacturing industry has been of great importance for developed countries to achieve their current success and for some developing countries to converge to the developed country category, although the number is small. However, in the last few decades, developed countries have become deindustrialized and the number of people working in the industrial sector has decreased continuously in these countries. Moreover, this situation has occurred in underdeveloped and developing countries since the 1980s. The deindustrialization experienced by these countries has a detrimental effect on economic growth (Rodrik, 2015). This deindustrialization process harbors dangers such as reducing the rate of economic growth, increasing inequalities, causing the destruction of quality jobs, and hindering the accumulation of human and physical capital. Therefore, various steps need to be taken to reverse this process, especially in developing and underdeveloped countries. It is normal to see asymmetries in this reversal phase. Thus, the size of deindustrialization and the size of reindustrialization may not be the same (Tregenna, 2011). The share of employment in the manufacturing industry, and the share of the manufacturing industry in GDP which are the indicators of deindustrialization, are widely used in the literature (Dasgupta & Singh, 2007;

Tregenna, 2011; Krawczyński, Czyżewski, & Bocian, 2016). Figure 3 shows the distribution of the share of employment in the industry in total employment by income groups. From the beginning of the 2000s, it is seen that this share has increased in all income levels other than the high-income group. Even if this increase is not very evident yet, it may be an indicator of reindustrialization. Also, this process is likely to be slower than the deindustrialization process.

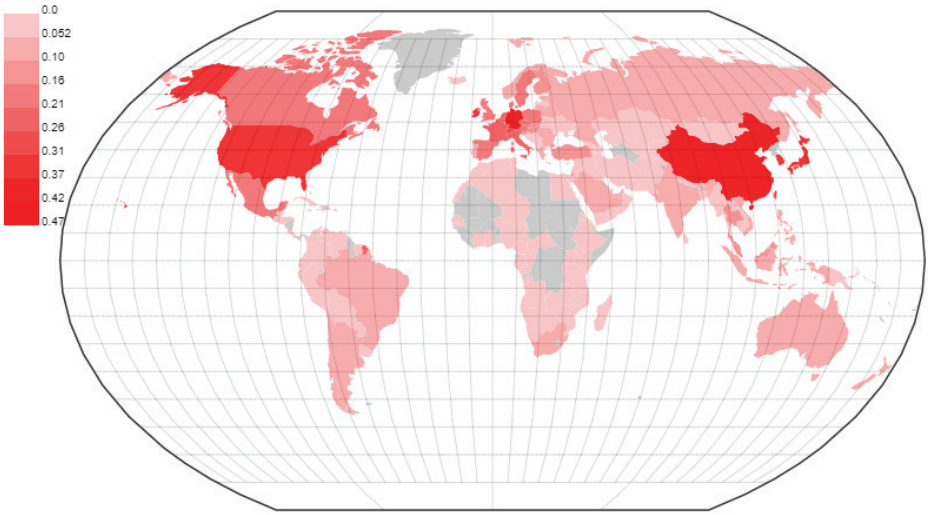

Figure 2. 2018 CIP Index Heat Map

Source: UNIDO

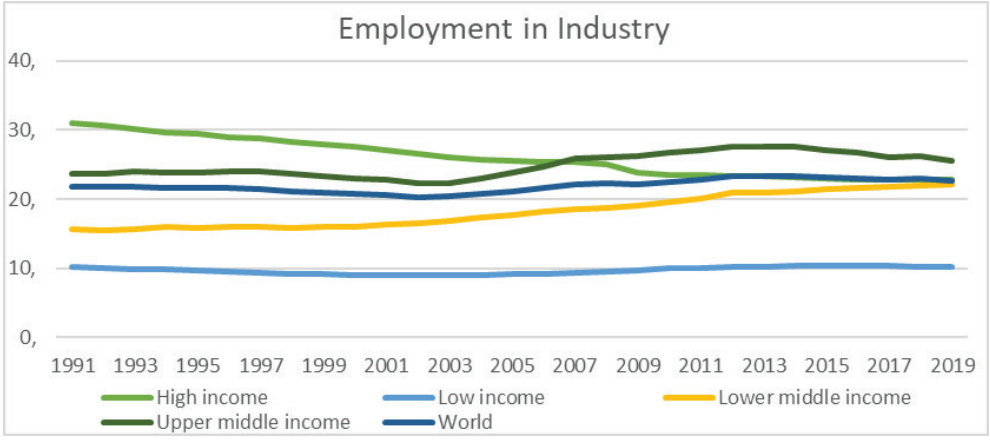

Figure 3. Employment in Industry (% of Total Employment)

Source: World Data Bank

The fact that industrialization gained importance again after the 2000s necessitated recalculation of the factors affecting industrialization and the production functions of the manufacturing industry as of this period. When the field of economics is examined, it is seen that the production function is calculated for various periods and regions. However, some of these studies examined the economy in general and did not specifically cover the manufacturing industry (Willman, 2002; Hájková & Hurník, 2007; Khatun & Afroze, 2016; Aslan, Menegaki, & Tugcu, 2016; Aquino & Ramírez-Rondán, 2020; Tripathi & Inani, 2020). Some of them comprise studies on industry on a country or regional basis (Khalil, 2005; Böhringer, Moslener, Oberndorfer, & Ziegler 2012; Hossain, Basak, & Majumder, 2013; Šipikal, Širaňová, & Némethová, 2017; Gajdzik, 2020).

To increase the competitive pressure, efforts to increase profitability by reducing costs, and to increase efficiency, companies have started to carry out their production in different countries, considering the cost elements in the production stages. This situation is affected by the foreign trade structure of the countries as well as their geographical locations (Saygili, Cihan, Yalcin, & Hamsici, 2010). In this context, especially intermediate goods are constantly subject to foreign trade. This outsourcing has brought specialization and integration into international production. While this situation pushes countries to remove trade barriers and integrate into the global economic system, it has allowed developing countries to converge with developed countries. Access to new technologies, opening up to international markets, and gaining knowledge enable this convergence (Landesmann, & Stöllinger, 2019). For this reason, foreign trade is of great importance for the manufacturing industry, and the development of the manufacturing industry through comparative advantages through foreign trade enables especially developing countries to converge with developed countries. For this reason, a series of studies have been carried out to determine the effects of foreign trade on the manufacturing industry.

When the literature was examined, it was realized that the effects of trade openness on the manufacturing industry were analyzed. Some of these studies only dealt with certain country groups (Tahir, Estrada, Khan, & Afridi, 2016; Sade, Esther, Oladipo, & Adedokun, 2021). However, there are also studies examining the effects of trade openness on the added value of the manufacturing industry in certain country groups (Azolibe, 2021). Apart from these, the effects of trade openness on growth have been frequently studied in the literature (Dumitrescu & Hurlin, 2012; Banday, Murugan, & Maryam, 2021). Although the effect of trade on the manufacturing industry is examined within the scope of these studies, this approach includes a holistic perspective. However, if imports consist mainly of consumer goods that can discourage domestic production, trade is likely to adversely affect domestic production (Ndikumana, 2000). For this reason, it is important to analyze the effects of manufacturing industry imports and exports on production separately. However, when the literature is examined, it has appeared that such studies are quite limited. Some of these studies focused on

exports and technology imports without concentrating on manufacturing industry imports and exports and examined the impact of technology imports on the manufacturing industry (Rjiesh, 2018). In addition, the effects of manufactured input imports on production were also examined (De Souza & Gómez-Ramírez, 2018). Furthermore, there are a limited number of country-based studies. In some of these studies, manufacturing industry production was not focused on, and the effect of America's import of manufactured goods from China on the number of people working in the manufacturing industry in Mexico was examined (Mendoza Cota, 2016). The present study aimed to fill this gap in the literature.

Human capital, another variable used within the scope of the study, is frequently used in the literature. In particular, the relationship between human capital and growth has been frequently studied in the literature (Li & Wang, 2016; Yang & Zhao, 2020). However, some studies reveal company-based analysis (Hsu & Chen, 2019). In addition, by examining the relationship between human capital and technology, it has been determined that while the increase in human capital causes a decrease in low-tech industries; it creates an increase in the share of medium and high-tech industries (Zhou, 2018). Human capital is represented by many different variables in the literature. In some studies, the average year of education (Ismail, 2006; Yang & Zhao, 2020), the index value calculated by the authors from the average school year (Kartal, Zhumasheva, & Acaroglu, 2017), and a variable calculated over the relationship between worker income and health-education (Brock & German-Soto, 2013) are used to represent human capital. Within the scope of the current study, the Human Capital Index was used by considering human capital with a holistic approach. HCI measures the productivity of a child born today as a future employee, based on the criteria of full health and complete education, by calculating the contribution of health and education to worker productivity. Therefore, the index consists of four major components: the three major determinants of human capital (education, health, and employment) plus the factors such as regulations and infrastructure that allow these three major determinants to transform into greater returns (World Economic Forum, 2013).

Analysis

Data

Production, in its simplest sense, is the conversion of factors of production into goods and services in a certain period. The production function shows the relationship between these factors and the amount of production. The most important estimation step in nonlinear production models is the correct estimation of the parameters of the dependent and independent variables. The most frequently used nonlinear models can be listed as Cobb-Douglas, CES, and Translog production functions (Mahaboob, Ajmath, Venkateswarlu, Narayana, & Prave-

en, 2019). The production function of Cobb-Douglas (Cobb & Douglas, 1928), which is one of the most frequently used of these functions, is also used in the literature for the manufacturing industry (Hossain, Basak, & Majumder, 2013; Peter, 2017; Kumar, Sankaran, Arjun, & Das, 2019). In the study conducted by Hossain, Bhatti, and Ali (2004), it was decided that the Cobb-Douglas production function is the most appropriate function for the manufacturing industry by making comparisons between various production functions. Several studies in the literature reach similar results (Miller, 2008; Aiyar & Dalgaard, 2009).

4 different Cobb-Douglas production function was established within the scope of the research. These functions can be listed as follows:

Model 1

$$lnq=\beta_0+ \beta_1\ lnk+ \beta_2\ lnl+ \beta_3\ open+ \beta_4\ lnexc \quad (1)$$

Model 2

$$lnq=\beta_0+ \beta_1\ lnk+ \beta_2\ lnl+ \beta_3\ open+ \beta_4\ lnexc+ \beta_5\ hc \quad (2)$$

Model 3

$$lnq=\beta_0+ \beta_1\ lnk+ \beta_2\ lnl+ \beta_3\ mexp+ \beta_4\ mimp+ \beta_5\ lnexc \quad (3)$$

Model 4

$$lnq=\beta_0+ \beta_1\ lnk+ \beta_2\ lnl+ \beta_3\ mexp+ \beta_4\ mimp+ \beta_5\ lnexc+ \beta_6\ hc \quad (4)$$

lnq= log of gross production by industry (reel value)

lnk= Log of reel capital stock

lnl= Log of number of employees

mexp= Manufactures exports (% of merchandise exports)

mimp= Manufactures imports (% of merchandise imports)

lnexc= Official exchange rate

hc= Human capital index

open= Trade openness

The data used in calculating manufactures export-import, exchange rate, human capital, and trade openness data were obtained from the WB-World Development Indicator database. The trade openness was calculated in accordance with the literature as follows. Real values are used during this calculation (Managi, Hibiki, & Tsurumi, 2009; Brueckner and Lederman, 2015):

Trade openness= $\frac{(Import+Export)}{GDP}$

The data of the manufacture production, capital stock, and labor used in the study were obtained from the WIOD (World Input-Output Database)-Socio-Economic Accounts (2016) database. Manufacturing industry data consists of 18 sub-sectors. The data used in the study was obtained by collecting these sub-sectors. The data set published by WIOD covers only the period 2000-2014. For this reason, the data set used in the analysis includes a 15-year time series. The WIOD input-output table consists of datasets from 42 countries according to the ISIC Rev 4.0 industry classification standard. Taiwan and China were excluded from the analysis due to the lack of data. In addition, the WIOD data set offers specific series for each sub-sector within the manufacturing industry. In this way, it provides the opportunity to find detailed data for various sub-sectors (Dietzenbacher, Los, Stehrer, Timmer, & De Vries, 2013). The descriptive statistics of the variables are as given in Table 1.

Table 1
The descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
lnq	5.68	1.36	3.26	9.79
lnk	9.48	0.05	8.30	9.66
lnl	3.00	0.71	1.28	4.65
open	0.88	0.48	0.20	3.23
mexp	68.12	20.01	11.58	97.43
mimp	69.04	9.43	38.53	86.94
lnexc	0.51	0.95	-0.30	4.07
hc	3.10	0.44	1.78	3.73

Model and Results

Multidimensional panel data analysis was used within the scope of the study. This quite new method was applied for the first time in the study of Baltagi, Song, and Jung (2001). When panel data models are examined, it is generally seen that the effect of the unit dimension is more weighted than the time dimension. In this case, it is appropriate to use two units and a one-time effect in multidimensional panel data models (Tatoğlu, 2016). Multidimensional panel data models can be created nested and non-nested. The advantage of nested models is that they provide a detailed analysis by covering the effects of groups such as country-city, country-income, as well as time effects. Non-nested models are generally applied in the gravity model (Tatoğlu, 2017). Multidimensional panel data models are estimated with the assumption of fixed and random effects. Multidimensional models estimated with fixed effects assumption are analyzed with shadow variable least squares estimator and within-group estimator. In the random-effects model, generalized least squares and maximum likelihood methods are applied (İsabetli & Tunalı, 2018).

In this study, two units, income group, and country, and a time dimension were used. Countries are classified according to low, lower-middle, upper-middle, and high-income groups in accordance with the list prepared by WB. Since there is no country in the low-income group in the dataset used in this study, countries are classified into three groups. The models of the study, which were analyzed with the multidimensional nested panel data method, were established as follows:

Model 1

$$lnq_{ijt}=\beta_0+ \beta_1\ lnk_{ijt}+ \beta_2\ lnl_{ijt}+ \beta_3\ open_{ijt}+ \beta_4\ lnexc_{ijt}+ \mu_i + \gamma_j + \lambda_t + u_{ijt} \quad (1)$$

Model 2

$$lnq_{ijt}=\beta_0+ \beta_1\ lnk_{ijt}+ \beta_2\ lnl_{ijt}+ \beta_3\ open_{ijt}+ \beta_4\ lnexc_{ijt}+ \beta_5\ hc_{ijt}+ \mu_i + \gamma_j + \lambda_t + u_{ijt} \quad (2)$$

Model 3

$$lnq_{ijt}=\beta_0+ \beta_1\ lnk_{ijt}+ \beta_2\ lnl_{ijt}+ \beta_3\ mexp_{ijt}+ \beta_4\ mimp_{ijt}+ \beta_5\ lnexc_{ijt}+ \mu_i + \gamma_j + \lambda_t + u_{ijt} \quad (3)$$

Model 4

$$lnq_{ijt}=\beta_0+ \beta_1\ lnk_{ijt}+ \beta_2\ lnl_{ijt}+ \beta_3\ mexp_{ijt}+ \beta_4\ mimp_{ijt}+ \beta_5\ lnexc_{ijt}+ \beta_6\ hc_{ijt}+ \mu_i + \gamma_j + \lambda_t + u_{ijt} \quad (4)$$

Here i shows the unit size of the countries, j shows the country groups classified according to income groups, and finally, t shows the time dimension. μ_i is the country effect, γ_j is the income group effect, and λ_t is the time effect. First of all, the significance of each effect individually and together was tested with the LR test. Altogether, in paired or individually set LR tests, the hypotheses are that the standard errors of the unit effects are equal to zero. The LR test results are as given in Table 2.

According to the LR test result, all H_0 hypotheses were rejected for all models. It has been revealed that the country and income group effects are significant and the two-unit panel data methods are appropriate in the analysis process of the model. Then, the models were estimated with fixed and random effects. Estimation results are given in Table 3 and Table 4.

Table 2
LR Test Results

Null Hypothesis	**LR Test Statistics**			
	Model 1	**Model 2**	**Model 3**	**Model 4**
$\mathbf{H_0= \sigma_\mu = \sigma_\gamma = \sigma_\lambda = 0}$	1772.81*	1640.22*	1847.46*	1703.39 *
$\mathbf{H_0= \sigma_\mu = \sigma_\gamma = 0}$	1104.63*	1353.54*	1103.16*	1328.87*
$\mathbf{H_0= \sigma_\mu = \sigma_\lambda = 0}$	1770.62*	1640.22*	1847.40*	1703.39*
$\mathbf{H_0= \sigma_\gamma = \sigma_\lambda = 0}$	312.30*	161.06*	309.19*	144.63*
$\mathbf{H_0= \sigma_\mu = 0}$	1104.62*	1349.22*	1103.16*	1324.25*
$\mathbf{H_0= \sigma_\gamma = 0}$	201.24*	64.82*	205.31*	62.03*
$\mathbf{H_0= \sigma_\lambda = 0}$	58.84*	49.04*	93.40*	48.52*

Note: * indicates significance at the 1% significance level.

Table 3
Fixed Effects Estimation Results

Shadow Variable Least Squares Estimator				
	Model 1	**Model 2**	**Model 3**	**Model 4**
lnk	0.02	0.02	0.03	0.02
lnl	0.92*	0.88*	0.78*	0.75*
open	0.08*	0.07**		
lnexc	0.81*	0.79*	0.77*	0.74*
hc		0.31*		0.32*
mimp			0.01*	0.01*
mexp			-0.001	-0.001
cons	2.23*	1.35**	2.06*	1.16**
F-test	4131.00*	4187.43*	4782.80*	4886.20*
R^2	0.9977	0.9978	0.9981	0.9981
Within Group Estimator				
lnk	0.04	0.02	0.03	0.02
lnl	0.76*	0.94*	0.83*	0.95*
open	0.08*	0.08*		
lnexc	0.67*	0.68*	0.63*	0.67*
hc		0.25*		0.20*
mimp			0.005*	0.004*
mexp			0.002*	0.003*
cons	4.10e-07	4.79e-07	4.42e-07	4.91e-07
F-test	8865.85*	7363.67*	8077.34*	6891.60*
R^2	0.9835	0.9841	0.9855	0.9859

Note: * and ** indicate significance at the 1% and %5 significance level, respectively.

When Table 3 and Table 4 are examined, it has been determined that all three models are significant as a result of the F statistics and Wald test of the models. However, the shadow variable least squares estimator variable is not preferred because it causes a loss of degrees of freedom by adding a shadow variable to the model and the limitations of the specifications it allows. In addition, the shadow variables of nested units drop of the model because of multi-collinearity. For this reason, the results are not different from the two-dimensional panel (Tatoğlu, 2018: 300). Therefore, the shadow variable least squares estimator variable results are not consistent. For these reasons mentioned above, within-group estimators were preferred. When the results of the within-group estimators are examined, it is seen that the explanatory power of all models is quite high (For model 1 and 2 it is 98%, for model 3 and 4 it is almost 99%). What all models have in common is that the capital stock is meaningless. This may be because countries from different income groups are evaluated together. The change in the marginal effect of capital stock in different income groups may have rendered the variable meaningless. All variables except capital stock were found to be significant. In addition, the coefficient of labor in all models is quite high compared to other variables. The data used in this study includes the entire manufacturing industry. If the sub-sectors of the manufacturing industry are examined, the elasticity of labor may change. However, in parallel with the current study in the literature, it has been determined that labor flexibility is higher for different

Table 4
Random Effects Estimation Results

Maximum Likelihood Estimator				
	Model 1	**Model 2**	**Model 3**	**Model 4**
lnk	0.01	0.01	0.01	0.01
lnl	1.03*	0.98*	0.90*	0.89*
open	0.08*	0.07**		
lnexc	0.87*	0.85*	0.84*	0.83*
hc		0.33*		0.31*
mimp			0.008*	0.007*
mexp			-0.0002	0.0001
cons	1.82*	1.15**	1.92*	1.10**
Wald	981.36*	1060.29*	1053.49*	1146.00*

Note: * and ** indicate significance at the 1% and %5 significance level, respectively.

countries. (Hossain & Al-Amri, 2010; Hassine, Boudier, & Mathieu, 2017; Song & Son, 2020). Therewithal, looking at Figure 3, it is seen that the rate of labor in industrial production has increased. This supports the positive effect found in the analysis.

Within the scope of the study, two different methods were used to represent the trade. The first of these is trade openness. The trade openness values in Models 1 and 2 were found to be significant at 1%, and the coefficient of trade openness in both models was found to be 0.08. Trade openness is a frequently used indicator of the literature. Especially in developing countries, the positive effects of trade on the manufacturing industry have been revealed in many studies. This shows that the traditional misconception about the harmful effects of trade on domestic industries is not valid (Tahir, et al., 2016; Sade, et al., 2021). Competition caused by trade causes productivity gains (Chikabwi, Chidoko, & Mudzingiri, 2017), forcing firms that want to export more to increase productivity. Thanks to trade, access to technology, economies of scale, and spillover effects occur. In addition, the opportunity to access foreign markets provides an increase in productivity. Although the goods coming from foreign countries force the domestic companies, the efficient management skills, on-the-job training programs, increased competence, etc. that come to the country thanks to these companies, improve the domestic companies (Wong, 2006). In the 3rd and 4th models, imports and exports of the manufacturing industry are used, not trade openness to represent trade. Although both variables have a significant and positive effect, they have very small coefficients. In both models, the share of manufactured goods exports in total goods exports and the share of manufactured goods imports in total goods imports have a very low impact on the manufacturing industry. Although this situation seems to be a contradictory result with the high coefficient of the trade openness variable, even if there is no export and import of manufactured goods, the trade-in other fields may feed the manufacturing industry by feeding the manufacturing industry sideways. This situation can be explained by the development of the financial system thanks to the development of foreign exchange inflow and outflow, the increase in the investments of the trading countries in the relevant country, the increase in the demand of house-

holds as a result of the increase in the income of the countries engaged in foreign trade, and the increase in the production industry indirectly by the development of trade areas other than the manufacturing industry. Since it is not possible to prove these relationships within the scope of the current analysis, additional analyses can be made in future studies in this context.

Another important variable handled within the scope of the analysis is human capital. In the 2nd and 4th models where human capital is included, the coefficients of the variable were found to be positive and significant as 0.25 and 0.20, respectively. This result shows parallelism with the literature (Ismail, 2006; Ciccone & Papaioannou, 2009). Although the exchange rate has very close coefficients in all models within the scope of the current analysis, it positively affects the manufacturing industry. This result is in parallel with the literature (Sade, et al., 2021). Accordingly, it shows that if the value of the domestic currency decreases compared to the foreign currency, exports become cheaper and imports become more expensive, and thus domestic manufacturing companies will be encouraged to produce more for export and will always increase their productivity (Azolibe, 2020).

Discussion

It is widely accepted in the literature that the manufacturing industry is the main factor in ensuring sustainable growth (Luken & Castellanos-Silveria, 2011; Wang, Wang, & Dai, 2018). However, in terms of development, the transition of production from labor-intensive systems to capital-intensive and technology-intensive systems is important (Li, Xue, & Huang, 2018). The efficiency of labor and capital increases the productivity of the sector and raises income. For this reason, investments in new technologies are very important in terms of increasing the added value of both labor and capital (Novotná, Leitmanová, Alina, & Volek, 2020). Labor-intensive industries are especially vital for job creation. However, to benefit from economies of scale and price competition, it is tried to increase capital intensity through technological developments in industries. However, this may lead to a decrease in employment, especially among unskilled workers (Das & Kalita, 2009). In the post-industrial era, more production was made with fewer workers than in the Fordist mass production era, and the marginal productivity of workers was lower than technological progress. Especially medium-skilled white and blue-collar workers have been replaced by technology (Acemoglu & Autor, 2010; Tüzemen & Willis, 2013).

Although the service, information, and finance sectors have gained importance around the world recently, the weakness in virtual economies has brought them closer to mainstream growth models. This situation has developed the trend of re-industrialization with high technology and added value. In this process, competition is not applied to costs and prices, but by technological development (Hu & Hu, 2013). In addition, with the re-industrialization process, the demand for educated workers is increasing, which reduces unemployment among in-

dividuals with high human capital. Increasing the added value of workers and adapting them to work with new technologies can be achieved through wage policy (Scott, 2006; Moore & Shute, 2012). Therefore, human capital is one of the major strengths for high-tech companies to maintain their competitive advantage in the knowledge economy (Chen & Chien, 2011). Governments should implement optimal industrial policy to support human capital development in industry, reducing the opportunity cost of human capital to zero and the probability of human capital leaving the community to zero. Mutual trust and cooperation, which are the biggest determinants of human capital, need to be implemented with active industrial policies (Hsu & Chen, 2019). However, technological developments and the use of technological products in the manufacturing industry increase the productivity of workers. Using robots in the industry allows for the improvement of product quality and the expansion of product variety (Jungmittag & Pesole, 2019). In the increasingly competitive environment created by globalization and the rise of information technology in the 2000s, the value creation activities of countries have radically differentiated and led to various advances. For this reason, Germany first developed the concept of Industry 4.0 to bring itself to a new and privileged position. This concept refers to the combination of many technological innovations that are expected to significantly change the manufacturing industry. Thanks to technologies such as robotics, artificial intelligence, cloud computing, and big data analysis, it is aimed to connect the entire industry by integrating both the physical and virtual worlds. This is expected to change all production systems (Aydın, 2018).

The center-periphery relationship that emerged because of globalization after the Industrial Revolution is one of the reasons for commercial growth. This situation has led to the emergence of today's developed and developing country distinction. Especially the deindustrialization movements experienced in the 19th century push the developing countries to be cautious. However, one of the biggest results of participating in trade is to reduce costs first and then to provide convergence (Baldwin, Martin, & Ottaviano, 2001). Especially in developing countries, starting from the baby industry thesis, newly developing industries were protected and trade was limited and these industries were supported by the state. In the current study, it has been determined that the negative impact of foreign trade on the manufacturing industry is not valid in the selected countries. Although most of the countries in the current study are developed countries, similar results were obtained for developing countries (Dodzin & Vamvakidis, 2004).

Conclusion

The relationship between industrial production and international trade has been frequently examined and various theories have been put forward. Especially the baby industry theory has been respected for a long time and countries have protected their newly developing industries against the harmful effects of trade according to theory. Nevertheless, almost all

countries that do not want to lose the superiority of being the first country to enter the market, especially with globalization, have started to trade rapidly. In addition, the effects of imports and exports on industrial production have also been discussed separately. However, the economic literature has not yet formed a consensus on this issue. On the other hand, within the scope of the literature, it is accepted that the effect of human capital generally affects positively industrial production, as in economic growth.

As a result of the analysis made within the scope of the current study, it was determined that trade openness, exports, imports, and human capital positively affect industrial production. This result shows that the theories stating that trade has harmful effects on production are not valid for the countries covered in the analysis. On the other hand, the human capital variable meets the expectations. It would be appropriate to implement policies to increase trade and disseminate education programs that can be applied to the general population in order to increase trade and develop human capital in the countries mentioned.

The strongest aspect of the study is that, thanks to the data set used, the number of people working and the amount of capital in that industry were used as variables, and the general capital level and the number of employees in the country were not used as in most of the literature. Thus, the coefficients obtained as a result of the analysis really reflect the manufacturing industry, not the entire country. Although the present study fills an important gap in the literature, it has several limitations. First of all, the study includes only a 15-year data set. Secondly, it does not cover recent developments. Therefore, it is planned to conduct another study with a different data set to examine the recent developments.

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Appendix

List of the countries: Australia, Austria, Belgium, Canada, Switzerland, Cyprus, Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Japan, Republic of Korea, Lithuania, Latvia, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, United States, Bulgaria, Brazil, Indonesia, Mexico, Russian Federation, Turkey, India.

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Turner, S. J. (2010). Website statistics 2.0: Using Google Analytics to measure library website effectiveness. *Technical Services Quarterly, 27,* 261–278. http://dx.doi.org/10.1080/07317131003765910

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Smith, J. A. (2010). Citing advance online publication: A review. *Journal of Psychology.* Advance online publication. http://dx.doi.org/10.1037/a45d7867

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Henry, W. A., III. (1990, April 9). Making the grade in today's schools. *Time, 135,* 28–31.

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