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A Sociophysical Approach To Relationship Between Politics and Economy: The Lagrange Model of The Crowds

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Abstract
Individuals can be thought of as physical elements within the social system. When they are considered as the decision factors of society, in addition to showing differences as individuals, they can lose their individuality by displaying each other's characteristics under community behavior (if the nucleus of an atom were an individual, the electrons that revolve around it would be other individuals and society). Individuals that are called factors or agents that shape collective behavior and constitute the core of society also play a role in determining the mechanism of the political system in a country.
In this study, it was discussed whether the Lagrangian Approach, which maintains its place in the literature with its application to many areas, can be successful in modeling political developments and political decisions of communities. It was assumed that in political systems there is stability at the level where mutual satisfaction is maximum, the concept of social entropy and atomization and order and disorder between groups or individuals were modeled on the axis of political science and sociophysics, and it was observed that the basic macroeconomic variables (unemployment, income distribution, inflation, per capita income, gini coefficient, welfare, etc.) are influential in social entropy and atomization diffusion.

Keywords: Sociophysics, Lagrange Approach, Politics, Economy.

1. Sociophysics

From past to present, scientists have tried to interpret and explain social phenomena with the help of physics rules and by benefiting from these rules. Adam Smith, one of the classical economists who was influenced by Newton and tried to explain economic phenomena with the help of physics, could be said to be the leading scientist in this field (Türkcan, 2015: 60). In addition to Adam Smith, Engels and Comte can also be mentioned among the scientists who attempted to explain the variability and social cycles by making use of physics.
Social physics (sociophysics) is a science that uses equations based on the laws of physics and tools based on its infrastructure to understand the behavior of communities. This branch of science, which deals with the behavior of communities in the social sense, has begun to open a new field of application with its commercial applications as capitalist systems spread to the world.
Sociophysics began to develop with Henri de Saint-Simon. (1803) Lettres d'Eun Habitant de Geneve). Later, he worked with Auguste Comte, who is accepted as the father of sociology and also a student of his, on projects that encompassed biology, physics and social phenomena.
In macro-sociophysics, communities in society were considered as elements. Later, in the micro-sociophysical dimension, the association of individuals in the relevant communities and their behaviors with the laws of physics began to emerge.

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Adolphe Quetelet (1835) put forward the necessity of reconsidering society using probability and social experiments in statistics.
Nowadays, Galam [6-13], Minoo [16-19] and Stauffer [23-27] have frequently studied the relationship between social communication, social phenomena and physics systems.

2. Relationship Between Social Entropy and Sociophysics

It is commonly accepted that the second law of thermodynamics states that all systems left to the natural conditions in the universe will evolve towards entropy, disorganization and disruption over time. It is evident that the transition from a regular, organized and planned structure of a social system to an irregular, disorganized and unplanned state will increase its *entropy*, and the increase in the irregularity of a system will lead to the increase in the entropy of that system at the same rate.
When we look at the world social structure and the system functioning in the social and political sub-groups in the countries, the common point is that they have almost the same basic dynamics. The compliance or resistance of any group in the system is based on publicly available information and rumors in the system and reflects the common agreement reached between *those who buy and sell* the information in the relevant system. When new data or information arrive in the environment, they are analyzed by recipients, transmitters, and people who are called agents (factors). Interpretations and common consensus points form a new common decision-making mechanism for new information in the relevant system. This information continues to exist until the next stage where it is considered, decision-making mechanisms work on it and new equilibrium decisions are formed. Here, social information and the players who are defined as individuals who buy and sell information in this social functioning should be considered as the main elements of *microscopic social environment*.
The organized state of a particular group with which a certain number of representatives communicate is considered as the micro-structure of the social system. The similarities or differences in the decision-making structures of decision-makers in the micro-structure and the similarities or differences in the interpretation of existing information, and even the learning and evaluation capacities of the groups are evaluated within this scope and emerge as variables.
Decisions made by the individuals in groups and the division of *social risks* and movements they have to put up with into time zones reveal the diversity of the movements within the micro-structure. This brings along such concepts as *temperature in social systems* and *social entropy*. When microscopic observations are made in the model, molecules are considered as *social energy explosion* in individuals or society, and the environments where basic sociophysical experiments are performed are thought of as *social container*.
Entropy, which is a measure of the irregularity of a system, is the most basic and the most important measure alongside temperature in the microscopic system. Entropy is such a physical concept in the internal system that separate definitions of entropy are made in the disciplines formed by social containers with different characteristics. For example, political entropy, etc. Any function that increases in parallel to the increase in the irregularity of the system can be an entropy function. For example, let's imagine that there are a number of decision-makers in the community in a container with the same common idea and that we instill a new observation/idea/thought into it and observe it and then try to imagine what is going on inside. The newly introduced variables will begin to disperse into the existing community after initially keeping together for a short period of time because they will be scattered in different directions by individual molecules striking them.
Consider that all possible situations can be counted. When we mention a state of the system, what we we need to understand is a configuration in which the individual called a molecule, for example, has a certain coordinate and a certain velocity, and another molecule has another specific coordinate and velocity. In the case of the supplied molecules in the container, it is clear that the number of such states is very high, but a large part of them correspond to irregular, that is, high entropy states where the supplied molecules are randomly distributed in any direction within the container. All of these are homogeneous situations because, regardless of where the molecules are, looking at the mixture, it can be stated that the ideas supplied are distributed in the most probable state within the homogeneity of the social structure. In other words, an extraordinary number of different microscopic states correspond to a single macroscopic state, i.e. a homogeneous state.
In fact, this is why every time we drop new ideas/thoughts/events into the container, they are dispersed. The greater number of microscopic states corresponding to a homogeneous macroscopic state increases its probability. This is because the laws of statistical physics state that the probability of a macroscopic state is proportional to the corresponding microscopic states.
However, the probability that existing molecules may turn the new supply into a new drop again or perhaps gather it in a small corner is very close to zero, though not zero. This is possible only when the molecules have very specific

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velocities and coordinates, and the number of such states is almost nonexistent, and in effective social conditions, though the probability that ideas gather together without scattering or the events not spreading is negligibly low, it does not seem likely.

In fact, the relationship between entropy and sociophysics can be defined as the explanation of the deterioration of a structure based on quantum physics. The concept of entropy can be explained as the deterioration in the structure of an organization, an institution, and a community. The deterioration in the structure of a community can also be expressed as an increase in the differentiation between the ideas of those belonging to that community.

When the concept of sociophysics is applied to a community, the following conclusions can be reached. The more certain a person's ideas and thoughts are over a certain period of time, the lower the uncertainty in his position. Accordingly, the uncertainty in his/her momentum is great as much. This basic principle can also be applied to people's thinking and decision-making processes (Şahin and Batı, 2017: 1-7). In fact, the basic principle of our study is to explain people's decision-making processes and their ability to stand behind their long-term decisions using a physics modeling.

3. Model

In political systems, there is political stability at the level where mutual happiness, prosperity and purchasing power are maximum. In political systems, let **E** represent individuals' or communities' "*emotions*" or "*thoughts*". As it is known, thoughts and decisions of different communities are an important constraint for the model to be studied. Entropy, which shows the differences of political thought in groups, is an important constraint. Social entropy being $\boldsymbol{S}$**= lnP**, individual conflicts within groups or conflicts between groups will lead to maximum entropy under irregularity. In the transition **[lnP**$_{\textbf{maximum}}$ **→ lnP**$_{\textbf{minimum}}$ **]**, the transition of differences created through conflict is called ***T***tolerance. According to these variables,

$$\mathbf{L = E + \lambda\ lnP \rightarrow maximum}$$

equation is called *Lagrange Principle*. The principle, which finds application in many fields, especially in Engineering and Economics, is a model that basically tries to maximize a contribution by combining the constraint functions with a selected objective function. In the engineering applications of this model, the principle is that under **E** energy, **λ** temperature and $\boldsymbol{S}$**= lnP** entropy, **L** will get the maximum value.

When the entropy of the differences of the groups is multiplied by the resistance or (1-Tolerance) degree of the groups against each other and the purchasing power of the relevant group (macroeconomic factors such as decrease in welfare-happiness-unemployment rates, etc. can be added) is added, **L social adjustment dynamics** can be calculated. In all communities, when **L** *is maximum, the society can be said to be in political harmony*.

The determinants of whether an audience has political opinion A or political opinion B have found an area of investigation by the researchers under the traditional normal distribution. The reason for the frequent use of the normal distribution is its superiority in explaining other statistical references. To elaborate, it can be formulated as N_A being the number of representatives in a group, N_B being the number of representatives in the other group

$$\boldsymbol{P(N_A; N_B)} \frac{\boldsymbol{N!}}{\boldsymbol{N_A!\ \ N_B!}} \boldsymbol{\cdot q^{N_A}(1-q)^{N-N_A}}$$

. For example, constraint variables can be more easily created on individuals or communities who are under community pressure and have only one vote choice on one side and thus who cannot evaluate alternatives,"*groups without options*". Variables related to the perception of communities can also be taken as a constraint function.

Individuals can be thought of as physical elements within the social system. When considered as the factors that make up the society, individuals may lose their individuality in close ties by putting aside their differences in the understanding of the community (S= lnP → min; entropy minimum). For example, when social awareness increases, as use of common slogans increases, the bonds that hold people together become stronger and the society converges towards individual behaviors.

Different groups being **[A B C,…….]** and the expectations that form the groups being (**e)** and behaviors being (**a**), Community set can be grouped as T = [A (e, a), B (e, a), C (e, a), ……]

.

A, B, C, ... The situation when groups or individuals lose their individuality as a result of coming together as groups is called **atomization** .

If the number of individuals in group A is N_A and the function of their distinguishing features is f (A) = (e, a), intra-group common objectives E_A being a function, it is expressed as

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$$f(A)=\begin{cases} sıkıbirliktelikveortak\ hedefler, düzen\ ;\ E_A>0\ ;lnPmin \\ E_A\neq 0 \\ bireyselliklerin\ önplana\ çıkması, düzensizlik\ ;\ E_A<0\ ;lnPmax \end{cases}$$

and Lagrange Parameter $\lambda_A=\frac{E_A}{N_A}$.

In the Lagrangian approach, the benefit function shown as E_A in the collective and harmonious form, and S= lnP entropy show the chaotic phase of the groups.

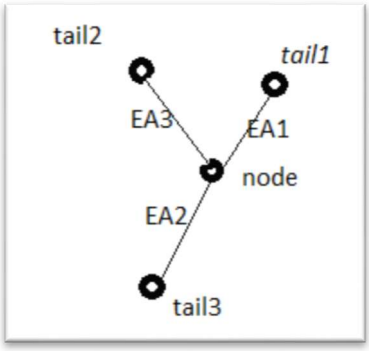

Fig 1. Two-dimensional network representation of group A

4. Application Example: Turkish Political System and Social Entropy

When the parties in the Turkish Political System after 2000 are examined, it is seen that 4 parties occupy a considerable place in politics. AK Parti, CHP, MHP, HDP share almost 90% of the total votes in the country. It is assumed that there are 4 different social groups within the social structure (unless we take into account the 2018 AK Parti - MHP alliance negotiations) which have formed their own internal governance/organization dynamics. Figure 2 shows the cumulative distribution of the votes obtained by the parties based on the data published in the Official Gazette with the approval of the Supreme Board of Elections in the elections that took place between 2002-2015.

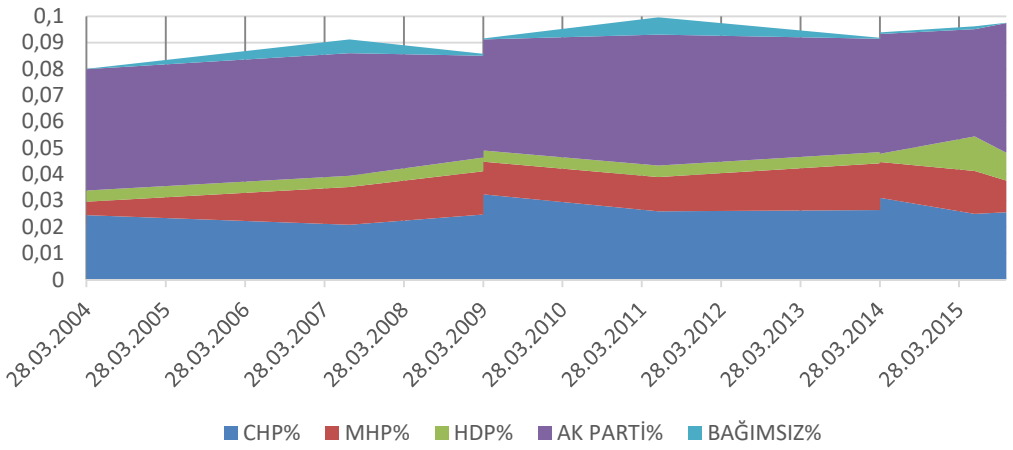

Fig 2. Vote Percentages of Four Big Parties Between 2002 and 2015 (Cumulative)

In the Republic of Turkey, which completed its integration from single-party era to multiparty political life, the path that the inclusive growth ideal for the period between 2002-2015 has taken move synchronously with the actions expected from the elections and realizations. It is observed that election declarations and promises also have a

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determinative effect on percentage of votes. When these election declarations were subjected to content analysis, the parameters were seen to be based on 3 main principles. Depending on whether the priority policy areas in the election campaigns differ in the four parties with the most votes, their share of the pie may change..

. **Table 1.**Content Analysis of Election Declarations of Four Big Parties Between 2002-2015

Year	**Content Analysis Parameters**		**Party Names**			
			AK PARTİ (94 Pages)	**CHP (95 Pages)**	**MHP (129 Pages)**	**HDP**
2002	**Economic Parameters**	*Welfare State*	**11**	**10**	**16**	**-**
		Stability	**34**	**21**	**38**	**-**
		Income	**46**	**40**	**60**	**-**
		Growth	**28**	**30**	**27**	**-**
	Welfare State Parameters	*Quality of Life*	**14**	**79**	**10**	**-**
		Foreign Affairs	**14**	**26**	**36**	**-**
		Social Structure (Society)	**89**	**147**	**98**	**-**
	Political Parameters	*Freedom*	**26**	**45**	**12**	**-**
		Democracy	**21**	**51**	**12**	**-**
		Political System (Government Regime)	**12**	**75**	**62**	**-**
			AK PARTİ (254 pages)	**CHP (4 Pages)**	**MHP (130 pages)**	**HDP**
2007	**Economic Parameters**	*Welfare State*	**25**	**0**	**14**	**-**
		Stability	**48**	**0**	**25**	**-**
		Income	**74**	**1**	**46**	**-**
		Growth	**27**	**3**	**33**	**-**
	Welfare State Parameters	*Quality of Life*	**46**	**2**	**17**	**-**
		Foreign Affairs	**25**	**3**	**28**	**-**
		Social Structure (Society)	**125**	**3**		**-**
	Political Parameters	*Freedom*	**43**	**3**	**8**	**-**
		Democracy	**28**	**2**	**10**	**-**
		Political System (Government Regime)	**13**	**5**	**66**	**-**
			AK PARTİ (298	**CHP (70 Pages)**	**MHP (205 Pages)**	**HDP**

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			Pages)			
2011	Economic Parameters	*Welfare State*	28	12	41	-
		Stability	46	23	42	-
		Income	97	40	66	-
		Growth	44	30	44	-
	Welfare State Parameters	*Quality of Life*	63	83	46	-
		Foreign Affairs	44	26	24	-
		Social Structure (Society)	163	145	162	-
	Political Parameters	*Freedom*	13	43	26	-
		Democracy	46	49	27	-
		Political System (Government Regime)	109	75	108	-
			AK PARTİ (380 pages)	CHP (203 pages)	MHP (269 pages)	HDP (28 pages)
2015	Economic Parameters	*Welfare State*	41	30	41	2
		Stability	90	27	49	0
		Income	106	51	89	6
		Growth	60	43	51	2
	Welfare State Parameters	*Quality of Life*	49	104	46	72
		Foreign Affairs	40	45	22	1
		Social structure (Society)	175	176	182	46
	Political Parameters	*Freedom*	49	46	26	21
		Democracy	52	65	39	14
		Political System (Government Regime)	176	137	124	35
			AK PARTİ (360 pages)	CHP (244 pages)	MHP (133 pages)	HDP (92 pages)
2018	Economic Parameters	*Welfare State*	52	22	35	1
		Stability	71	23	25	1
		Income	108	64	16	23
		Growth	66	39	14	2
	Welfare State	*Quality of Life*	103	68	25	53
		Foreign Affairs	25	29	20	0

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	Parameters	*Social Structure (Society)*	**156**	**86**	**93**	**34**
	Political Parameters	*Freedom*	**51**	**19**	**14**	**14**
		Democracy	**42**	**42**	**50**	**19**
		Political System (Government Regime)	**186**	**74**	**58**	**18**

Source: Compiled from the election declarations retrieved from www.tbmm.gov.tr.(Access date: 14.08.2018)

As mentioned above, in the content analysis, firstly 3 basic parameters were put forward and then the related words were determined and attention was drawn to the number of usage of these words in the election declarations. The main principle of our study is to identify the issues that the voters pay attention to in their decision-making processes and to examine the relationship between these words and the stability of the votes received by the parties. Actually, the concept of entropy comes into play at this point. The reason is that the voters of the ruling party and MHP voters pay high attention to the same considerations and the fact that these two parties did not introduce many changes in the election declarations shows that the voters have not abandoned their parties.

Based on the above table, basically 3 basic axes are examined. Firstly the issues that the voters pay attention to while performing voting behavior by considering the number of certain words in the parties' election declarations, secondly, the possibility of forecasting future choices of the voters by predicting their future voting behavior, and finally the issues that the parties give weight to were tried to be determined, and then the determination of the voters and changes in their decisions were attempted to be identified. Changes in the decisions of the voters, or in other words, the disruption in the voters of the parties were tried to be explain in terms of sociophysics. Changes in ideas in a community can be explained by the concept of entropy.

When the table above and the current ruling party is considered, the factor that directs the decision-making behavior of the voters stands out as the economic factor. When the economic parameters are taken into consideration, AK Parti, starting from the 2002 elections to the 2018 local elections, drew the attention of the voters to the economic growth of the country, the development rates and the incomes of the voters, and managed to keep the issues that the voters value on its agenda at a higher rate and succeeded in preventing the disruptions in the voter community. Considering the percentage of the votes received in that period, it was found that the majority of the voters voted in order to maximize their economic interests. As for CHP voters, it can be seen that they pay considerable attention to the concepts of freedom and democracy among the political parameters. The reason for partial variation in social disruption rates in MHP is the variation in the number of words included in the election declarations.

Basically, when the votes of the above parties are considered, another reason for the increasing votes of AK Parti is the increase in the number of voters shifting from the voters of the other parties to the ruling party and the participation of new voters in the elections. However, the great number of voters called as the persistent voters who conduct the voting behavior for the same party without changing their opinion is remarkable in AK Parti. One of the main reasons for this is the ability of the voter community to protect themselves against social disruptions. Of course, the shift of voters from other political parties shows that entropy or disruptions in these parties are in excess. Changes in vote percentages will help us understand the disruption within the electorate community, as will be discussed later.

Another issue that should be taken into consideration when content analysis is made is the number of pages of declarations prepared by the political parties. When the 5 election periods are examined, it is seen that the declarations with the highest total number of pages belong to AK Parti. According to Özer (1998), reiteration strategy is one of the most effective ways of learning and remembering information as it is. Based on scientific findings, the ruling party increases the number of pages in its declarations in order to draw the attention of the voter and ensures more permanence in the minds of the voters by finding the opportunity to repeat the issues that it wants to draw attention to.

The desire of scientists to predict future events is another issue that has been on the agenda since the existence of science. When many political scientists examine voter behavior, they try to get information about future voting behavior. Thanks to this modeling and considering the declarations, the political party that the electorate may prefer in the next elections can be more easily predicted. As long as the political parties do not radically change the issues they attach importance to and draw attention to, it is observed that there will not be a high level of disruption in the structure preferred by the electorate.

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Basically we divided the parameters into 3, but each is divided into words in itself. Words referring to economic parameters are welfare, income, stability, growth, words that provide information about political content are freedom, democracy and political regime or administration, and words about the importance of social structure can be listed as society, quality of life, and foreign policy. These words were chosen randomly and they were accepted as providing information about the structure.

In competitive markets, firms will produce based on consumer demand, while in the field of politics, the parties will prefer positions that will appeal to the public and maximize their votes. In this framework, competitiveness in the election will be strengthened depending on the level of parties' response to voter demand and represent the potential of vote.

Election categories are grouped into seven main policy areas: “economy, welfare and quality of life, foreign relations, the structure of society and social groups, freedom and democracy, political system.” Among these areas, economy, welfare and quality of life stand out as the most important areas highlighted in the election declarations in Turkey (Aytaç, 2017: 8-10). When the election declarations are examined, it is one of the main objectives of the parties to get the support of the people through these policy areas. While the economy was considered as an important area in the period of 2002-2015, it was considered as the most important topic in the general election works of June 7, 2015 compared to the previous elections. In particular, "inclusive growth ”(an increase in both social and economic volume) constitutes the backbone of the election campaigns of the four major parties. It defines and encompasses an economic growth in a way that will benefit not only some segments of the society, but also the disadvantaged groups, especially the poor, as a result of economic growth (Gür, 2015: 1-4).

While the statements regarding the policy area of the economy, welfare and quality of life areas accounted for approximately 63% of the Ak Parti declarations in the November 2015 election declaration, this rate was 56%, 54% and 40% for CHP, MHP and DTP/BDP/HDP, respectively. In the content analysis as regards the number of pages, it is seen that each party gave the highest share to economic policies. In fact, Ak Parti reserved more space for economic elements in the areas of economy and welfare and quality of life. The frequency of statements for each of the remaining five policy areas is very close to one another and covers less than 10% of all statements. The policy areas of economy and welfare and quality of life are also a priority area in the main opposition party's (CHP) declaration statements during this period. It was the most important policy area (29% of all statements) in the 2011 election declaration. The third most frequently repeated policy area in CHP's election declarations were plotted as freedom and democracy (Aytaç, 2017: 8-10).

The most balanced party in terms of distribution of policy areas is MHP. In the seven areas categorized above, MHP declarations were relatively consistent with minimal changes from election to election. As in the other parties, the economy area is at the forefront compared to the six other policy areas in MHP's election declarations. There was a balanced distribution among the mentioned six areas (Aytaç, 2017:10-12). However, when we look at MHP's last general election declaration, it can be said that social structure and economic elements were emphasized at an almost equal rate.

While the economy and welfare and quality of life underlined in the election declarations constituted the core of the parties' election declarations, the economy was seen as the primary issue from the citizens' point of view. As a matter of fact, the “welfare state growth", which is an important topic in the parties' election declarations, can also play a role in improving public concerns about income inequality. Considering the broad electorate spectrum of the major parties, the right-wing parties, AK Parti and MHP, attached greater priority to economic growth and infrastructure investments, while in the left-wing parties, CHP and DTP / BDP / HDP, “welfare state growth” was the main agenda item, and equality and democracy topics occupied a place in the top ranks in the policy rankings (Aytaç, 2017: 14-16). Another factor that attracts attention in election declarations is the number of pages of the declarations. As can be seen in the table above, AK Parti's election declarations had a much higher number of pages in comparison to the other parties' election declarations. Thanks to this strategy, which allowed continuous mention and more frequent coverage of the subject matter, it can be interpreted that the voter was enabled to hear what s/he wanted at a much higher rate.

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Fig 4. Content Analysis of Election Declarations of Four Big Parties Between 2002-2015

The atomization scale, as mentioned earlier, is a measure of the ability of communities to move together and is calculated as S=ln(x), which is called S social entropy. Here, low oscillation corresponds to low entropy, and the state where oscillation is the highest means higher entropy values. According to the calculations, the social entropy of AK Parti is S(A) -0.18 <Ln (A) +0.18, which denotes the most united (the least disintegrated or disrupted) party. This is indicative of stability in terms of the voters. Social entropy factor of CHP *S*(C) and the oscillation range is 0.22 <Ln (C) +0.27. Here, too, CHP is the second party where there is minimal oscillation. MHP *S*(M) and HDP *S*(H) social entropy values are -0.68 <Ln (M) +1.02 and -0.30 Ln (H) +1.44, respectively. The adding up of the oscillation intervals with the absolute and the distance between the negative and positive entropies will give us the volatility of the relevant party's S entropy.

Distance Range $S_{distance} = |Ln_{max}| + |Ln_{min}|$

$$S(A)_{distance} = |Ln(A)_{max}| + |Ln(A)_{min}| = 0{,}18 + 0{,}18 = 0{,}36$$
$$S(C)_{distance} = |Ln(C)_{max}| + |Ln(C)_{min}| = 0{,}22 + 0{,}27 = 0{,}49$$
$$S(M)_{distance} = |Ln(M)_{max}| + |Ln(M)_{min}| = 0{,}68 + 1{,}02 = 1{,}70$$
$$S(H)_{distance} = |Ln(H)_{max}| + |Ln(H)_{min}| = 0{,}30 + 1{,}44 = 1{,}74$$

In essence, in elections, the strategies that take into account the economic improvements in both micro and macro senses increase the potential of votes. In terms of the entropy volatility obtained above, AK Parti's 0.36 entropy is followed by CHP. This is followed by MHP and finally HDP. In addition to voter behaviors, the image created by the parties on voters becomes kinetic. HDP's ranking in lower percentages can be attributed to the fact that voting for the party indicated by tribal leaders depending on the tribal culture located in the east of the country instead of using the individual right of voting focuses on a single party when solidarity becomes the common goal. On the other hand, the

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social structure that is active in the city/region where the individuals live plays a central role in their political identities and preferences. The determination of the parties' social bases affects atomization over entropic relationships.

Table 1. Macroeconomic Variables

	GDP billion ($)	GDP per capita ($)	GDP growth 3%	PI year-end	Foreign Trade Balance Billion	Unemployment Rate %
014	934	12112	3	.17	63.6	9.9
015	855	11019	6.1	.81	48.1	10.3
016	861	10883	3.2	.53	40.9	10.9
017	855	10688	7.3	1.92	55.6	10.3

When the basic macro variables are examined in the light of economic data, the positive effect of the ruling party, which had the most votes and the lowest entropy rate, on the macro determinants is seen in the table above. The importance of the economy, which occupies the most space in the election declarations of the four major parties, is emphasized once again here in numbers. AK Parti, which determines the attention of the electorate and promises in its declarations that it will determine the government policies in accordance with the electorate's wishes, also becomes the party where the voters are the least likely to break up with or give up the party. It can be argued that AK Parti, which shows its stability in the elections in the election declarations, has solved one of the problems experienced by many political parties in today's world in the long-term.
To sum up,

$$\mathbf{L = E + \lambda \ lnP \rightarrow maximum}$$

In the Lagrange principle, $\lambda_A = \frac{E_A}{N_A}$ being the Lagrange Parameter, λ_A is generally interpreted as a measure of economic inequality (Barggli, 2013). The Gini coefficient, a measure of economic inequality, will be used as the temperature value. Gini Coefficient is an economic variable calculated annually by TUIK (Turkey Statistical Institute). In the coefficient calculated using the Lorenz curve, the population is divided into certain percentage slices, and the share that these percentage slices generally take from the national income generated in a country is calculated. The Gini coefficient can never be an indication of the wealth of a country. The Gini coefficient should be seen as a measure of the degree of the fair distribution of income in society.

Table 2. TSI Income and Living Conditions Survey

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Gini coefficient	.428	.406	.405	.415	.402	.404	.402	.400	.391	.397	.404
P80/P20 ratio	.6	.1	.1	.5	.9	.0	.0	.7	.4	.6	.7

E is taken as the life satisfaction level. The rate of life satisfaction level is the most comprehensive study conducted by Turkey Statistical Institution at the level of provinces in 2015 taking into account such variables as housing, work life, income, wealth, health, education, environment, safety, civic participation, access to infrastructure services, and social life (TUIK, 2015).

When the relevant statistics are examined, for example, in 2015 $P_{80}/_{20}$ was found to be 7.6. According to Pareto Analysis, $P_{80}/_{20}$ shows how many times the difference is between the income of the 20 percent group with the highest

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share of income and the income of the 20 percent group with the lowest share. In the same year, the Gini coefficient was found to be 0.397. (TUIK, 2015)

In the equation$\mathbf{L} = E + \lambda \ln P$, the life satisfaction percentage being the benefit function and the gini coefficient being the coefficient of entropy which is the constraint function as a measure of income inequality, for the year 2015

L = Life Satisfaction Percentage + Gini Coefficient * (Social Entropy)

with Political Compliance Degree

$$\mathbf{L = 0.612 + 0.397\ (0.18) = 0.68729}$$

is obtained.

4. CONCLUSION

The social compliance of the individual who is a sociophysical entity and the choices that he/she can achieve this compliance affect his/her quality of life and welfare. The heterogeneous structure in the society which is considered as a social container may change in proportion to the preference of the individual. Life satisfaction and welfare of individuals who determine their preferences based on group differences, compliance and resistance constitute the mainstream mechanism. With the political compliance to this mechanism, expectations and behaviors (loss of individuality for groups or individuals) minimizing intra-group differences modeled by Lagrange multiplier were calculated statistically by atomization scale. The four major parties in Turkey were chosen as the sample, and these expectations and behaviors were shaped according to policy areas included in the parties' election declarations. When the seven main policy areas and their related parameters are evaluated, the top areas of economy, welfare and quality of life were effective in this shaping. While AK Parti, where the least entropy was observed, attributed the most importance to the economy, in HDP and CHP, where the most entropy was observed, mostly freedom and democracy were emphasized. At this point, it was concluded that the parties that allocated the highest share to the economic agenda which affects voter behavior and preference had low entropy. The life satisfaction level (in proportion to the gini coefficient) was also formulated as a welfare variable that moved in parallel with the degree of political compliance. Another observation made is that the degree of the goodness of political compliance, which eliminates intra- and inter-group differences, positively affects welfare.

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The Effect Of Investors' Cognitive Bias On Stock Decision Making[1]

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Abstract
There have been many differences in the evolving process from the traditional economy to the behavioral economy. Conventional finance has made progress within the framework of rational choice and expected benefit asumptions. Behavioral finanse is based on expectation theory. In fact, it is based on the argument that individuals are not fully rational. Within the scope of irrational act of individuals, the ability to select stocks has been illusory. The point is that different ways of thinking occur. It is seen that buyer and seller perspectives are opposite to each other with a complex thinking. In other words, when buyers buy stocks, they think that the price is low and this may increase, and sellers think that the price is too high and may fall. In fact, it is a complex structure of how buyers and sellers in the markets are convinced that a certain price is uncertain. The aim of this study is to investigate the effect of decision-making process on investor emotional prejudices, whether the decision mechanisms are more effective when buying stocks in the market or the idea that people are competent to know more than the market.

Keywords: Behavioral Finance, Decision Mechanisms, Investor Behavior

1. Introduction

In traditional finance modeling, investors' decision-making is based on expected utility maximization. As for behavioral finance, this is based on expectation theory. In fact, it is believed that individuals have feelings. There has been a shift from rationality to limited rationality or irrationality.

It is seen that different thinking structures are transformed into individual phenomena in buying and selling of stocks; that is, in decision process more than one outcome is accepted instead of a single outcome.

The main purpose of this study is to reveal the following points: Are decision-making mechanisms more effective when buying stocks in the market? Is the idea of people thinking about they are more competent than the market when making a choice effective? What is the impact of cognitive and emotional biases on investor behavior in decision-making process? Basically, the case studies that are prominent in the literature are mentioned, and additionally, the important topics in the conceptual framework arediscussed. Finally, conclusion part is established with the consolidation of application that explain this purpose.

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2. Review of Literature

Kahneman and Tversky (1974) found that investors under uncertainty misbehave by taking irrational decisions as a result of mental shortcuts and cognitive biases. In their study, DeLong et al. (1990) supported the argument that noise traders who make additional risk by buying and selling random stocks may make inaccurate pricing. They concluded that this additional risk was priced by the market, and that the noisetraders could gain more from the rational shareholders in taking additional risks. According to the study of Lee, Shleifer and Thaler (1991), there is a positive and significant link between stock market and investor sensitivity.

According to Odean (1998), when individuals decide whether or not investors are reluctant to realize their losses, they tend to hold their losing stocks in the long-run, whereas they tend to sell winning stocks directly. Statman (1999) stated in his/her study that traditional finance theory is subject to loss of interest and confidence due to market anomalies. In traditional finance, individuals are considered rational investors. On the contrary, behavioral finance assumes that individuals are normal not rational investors. They can benefit from understanding that behavioral finance's " normal investor" has the needs and preferences that go beyond the utilitarian needs of traditional finance's "rational investor. Therefore, individuals make irrational decisions with bias and emotion rather than rational behavior. From this point of view, the researcher sought answers to the question of how human behaviors show attitude in line with financial decisions within this discipline.

Chen et al. (2009) concluded that these effects of investor sentiment on stock price performance are stronger for small, young, and high market to book ratio firms.

Kahyaoğlu (2011) examined the role of gender on the level of exposure to many emotional and psychological factors that affect investment decision-making. Nguyen and Schuessler (2012) conducted a study to determine whether psychological factors cause errors in the financial decision process of the investor and concluded that it is common among individual investors to make mistakes in Germany due to their socio-demographic characteristics.

In their study, Küçüksille and Usul (2012) examined the effects of cognitive biases on investor decisions. Kahyaoglu and Ülkü (2012) examined the impact of the risk they have undertaken, as a result of the status of representative individual investors of heuristicrisk level. Hayta (2014) addressed the factors that affect the financial risk perception of individual investors and their reflections on the investment decision process.

Aydın and Ağan (2016) considered the effects of irrational decisions on financial deposit choices. In their study, Angı et al. (2016) determined whether there is a relationship between the investment decision process of individual stock investors and demographic factors and cognitive biases.

Bektur and Atasaygın (2017) assessed the financial behavior of investors' decisions on trading stocks within the context of "overconfidence" and "representative agent" arising from cognitive error and bias. Asoy and Saldanlı (2017) defined the irrational behavior of the 423 investors , and described the demographic determinants which affect the cognitive biases of investors.

Tekin (2018) examined behavioral finance with the context of cognitive biases and heuristics within literature review.

DeVault et al. (2019) stated that sentiment metrics capture institutional rather than individual investors' demand shocks. Investigating the underlying economic mechanisms, risk management and momentum trade explain a significant portion of the relation between institutions and sentiment.

3. Conceptual Framework

3.1. Behavioral Finance

When the historical process of behavioral finance is examined, it is first encountered in the study of Adam Smith. Smith's work on thesis of rationality constitutes the foundations of economic theories with the books "Wealth of Nations" and "Invisible Hand". Another important work of him, "The Theory of Moral Sentiments" which is less known than his first work, emphasizes different subjects. In this work, he explains the psychological characteristics of personal behaviors unlike rationality. The work is related to situations that emphasize human psychology and express current developments related to behavioral finance in our age (Camerer & Lowenstein, 2003: 5). In his work, Adam Smith made the first description of "loss or risk aversion" situations that is explained by behavioral finance with emphasizing individuals feeling pain and regret when they change from good behavior to bad behavior, and then they were happy when they rised to a good behavior again. (Cornicello (2004) cited by Tekin, 2016: 97-98). Behavioral finance theory is based on two approaches: limited arbitrage opportunities and other investor behavior patterns. From the perspective of the first approach, it is advocated that the bond cannot be found without risk as the arbitrage opportunities are limited by the fact that most securities do not have any real substitutes, nor are there any good

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counterparts. This is an explanation of the rapid price formation in a situation where the price flow does not move properly and as fast as necessary when encountering new information, or the explanation of the rapid price formation where there new information is not the case. The second approach mainly investigates how a cognitive process follows the generation of investors' desire for securities (Turguttopbaş, 2008: 44).

3.2. Cognitive Biases Affecting Investment Decision Process

In classical investment theories, individuals are the investors who take one type and rational decisions. However, this is the exact opposite in reality for investors that trade in the market. In other words, investors behave irrationally and seem to contradict the rationality assumption. This issue, which the classical finance view cannot answer, constitutes the fact that the psychological, mental and emotional issues of the individuals should be taken into consideration. According to behavioral finance, individuals behave according to cognitive bias at the decision process (Otto 2010 cited by Aksoy, 2016: 40). The concept of cognitive bias can be explained as deterioration in the way individuals perceive reality (Tekin, 2018: 44).In another definition; the tendency of individuals to show irrational behaviors describe as “cognitive biases” in investment decision process. All segments of society are consistently and constantly influenced by cognitive biases. There are cognitive prejudices that influence investment decisions (Hanser and Kyser, 1999 cited by Hayta, 2014: 335). Some of these concepts are discussed below:

3.2.1. Law of Small Numbers

According to the theory, a sample taken from the population represents the whole population. Individuals ramdomly confirm that the sample drawn from apopulation has the ability to effectively symbolize all the features of the population (Tversky and Kahneman, 1971: 105).

3.2.2. Herd Behaviour

It is the case that investors imitate others, instead of depending their own information flow. This behavior forces investors to imitate each other instead of having information on market fundamentals. The prerequisite for herd behavior is to behave according to the decision of other investors (Decamps and Lovo, 2002: 17).

Table 1. Basic Psychological Tendencies

	TENDENCY	DEFINITION
COGNITIVE	Framing	Give different reactions depending on how the events are presented.
	Mental Accounting	Grouping by ignoring the characteristics of assets
	Avoidance of Uncertainty	Risk aversion in case of uncertainity
	Conservatism	Inadequate evaluation of new information
	Representation	Evaluating new information using historical information
	Accessibility	Using easily accessible information when valuing assets
	Overconfidence	Overconfidence in the accuracy of own information
	Verification	Focusing on information confirming own beliefs
	Cognitive Dissonance	Inability to associate behaviors with beliefs
EMOTIONAL	Optimism	Over-focusing on scenarios with good results
	Predisposition	Holding the assest whose value is falling, selling the asset whose value is rising
	Domination	Over sensing the ability to control the situations
	Ownership	Overestimating the value of asset in hand
	Status quo	Resistance to change

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3.2.3. Sunk Cost Fallacy

They are irreversible investments in forecasting the future. It can be interpreted as the desire of investors, participated in effective investments, to continue the investment although it has been realized that the investment profitability will be very low in a certain period of the investment. Even though most investors have been aware of Buffet's "if you wish to get out of a pit, the best thing you can do is to stop digging" word and found it possible, this issue is not taken into consideration in real life. (Hayta, 2014: 339).

3.2.4. Framing Tendency

The framing tendency is called the cognitive tendency, which expresses that investors react differently according to how they make different expressions by being influenced by the presentation of events during the decision process (Sefil and Çilingiroğlu, 2011: 255).

3.2.5. Mental Accounting

It is defined as the set of cognitive activities used by individuals and households to perform, evaluate and monitor their financial activities (Thaler, 1999: 183).To sum up, the basic cognitive and emotional tendencies are summarized below (Sefil & Çilingiroğlu, 2011: 255):

4. Research Design

4.1. Method of Research and Hypotheses

The aim of this study is to determine the effect of investors' cognitive bias on stock decision making process. For this purpose, a questionnaire was prepared to measure the cognitive status in the decision-making process of behavioral finance.
The study consisted of 100 male and 100 female investors with a portfolio of 100.000 TL or more. In this study, four intermediary institutions operating in Ankara, İstanbul and İzmir that do not want to be disclosed, constitute the study.
Since the full examination of cognitive characteristics would take a long time and asking all questions would take the time of respondents which would increase the reluctance of participants. Hence, accurate information under main titles were tried to obtain with small number of questions. In the questionnaire which asked 23 questions except demography, cognitive questioning was conducted directly without mentioning the private life and the privacy of the investment. The following questions were meticulously asked. 23 of the questions prepared in the questionnaire include 5-point Likert Scale participation questions. The points emphasized in the questions prepared; "Herd psychology, accessibility of easy information, ignorant courage, focused area, deviation from confirmed information, if I say it is absolutely wrong syndrome, reaction to ego, acceptance of loss status, focus on constant".

Survey data were analyzed with SPSS 23 package program and then interpreted and evaluted.

H_1: Gender from demographic characteristics is affected by cognitive bias.

H_2: Age from demographic characteristics influences cognitive biases.

4.2. Research Findings

In light of the demographic characteristics which are shown in Table 1 the data were obtained from the participants' answers. Regression analysis is performed based on the answers given to the questions prepared within the scope of 5-point Likert Scale, and it is tried to be determined whether the investors behave with cognitive biases at the decision process.

According to Table 2, 49.5% of the total (200) investors included in the research are women and 50.5% are men. When Table 2 is analyzed, the majority (59.5%) of the participants are between the ages of 31-40.

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Table 2. Demographic Characteristics of Participants

	Characteristic	Number	(%)		Characteristic	Number	(%)
Gender	Female	99	49,5	**Age**	20-30	18	9
	Male	101	50,5		31-40	119	59,5
	Total	**200**	**100**		41-50	63	31,5
					Total	**200**	**100**
Marital Status	Married	154	77	**Province**			
					Ankara	40	20
	Single	46	23		İstanbul	130	65
	Total	**200**	**100**		İzmir	30	15
					Total	**200**	**100**

Subsequently, the majority (77%) of the participants were married. When the province of residence was analyzed, the location of participants are determined as 20% Ankara, 65% Istanbul and 15% İzmir. In the second part of the questionnaire, cognitive bias assessment is conducted under the important topics presented in the infrastructure in order to determine whether the investors have cognitive bias at the decision process. With the help of the 5-point Likert Scale, the questions were conveyed to the participants who participated in the questionnaire and the propositions of the resulting data were evaluated accordingly. Propositions are rated as; strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), strongly agree (5). Table 3 shows the distribution of responses to the questions asked to investors to determine cognitive bias.

Table 3. Cognitive Bias

Cognitive Bias	Frequency	Percent	Cumulative Percent
Herd Psychology	101	50,5	100,0
	99	49,5	49,5
Easy Accessibility of Information	40	20,0	20,0
Ignorant Courage	112	56,0	100,0
	10	5,0	44,0
Focused Area	173	86,5	100,0
	2	1,0	13,5
Deviation from Correct Information	147	73,5	100,0
	20	10,0	26,5
“If I say, it is absolutely wrong” Sendrom	180	90,0	90,0
Reaction to Ego	5	2,5	100,0
	2	1,0	97,5
Acceptance of Loss Status	140	70,0	70,0
	14	7.0	87,0

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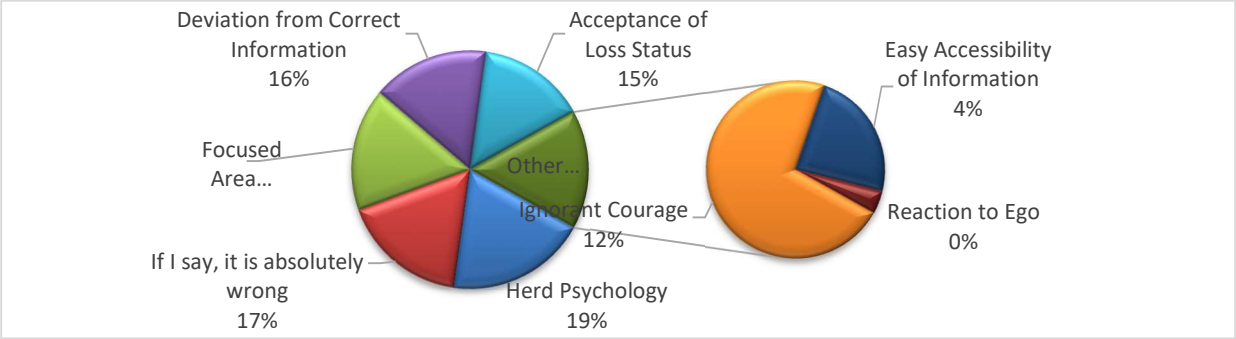
For the herd psychology, "The extent to which the comments of the crowd influence investor psychology" are measured. Here, in the part where the participants are most distributed, 101 of the investors answered "agree" and 99 of them answered "strongly agree". In order to measure the accessibility of easy information, the distribution of the response to the statement of "While I can bear the risk of loss from an investment instrument that I know will be in a negative trend, I tend to move away from a less risky and less likely to lose but less known investment decision" is demonstrated. 40 of the surveyed investors answered 'strongly agree'. In order to measure the ignorant courage, the distribution of the most responses to the statement "I exhibit an approach that places more emphasis on my own abilities when making individual investments" is demonstrated. 112 of the investors who participated in the survey answered 'strongly agree' and 10 of them answered 'agree'. For the focused area, 173 of the investors answered 'strongly agree' and 2 of them answered 'agree' for the statement "I think my perception is more in the foreground under clear language and visuality". For the deviation from the verified information, 147 of the investors answered 'strongly agree' and 20 of them answered 'agree' for the statement "There have been many times that I have decided first and then verified the information". Regarding if I say, it is certainly wrong statement, the question of "I am oftenly possessed by syndrome of 'if I say, it is certainly wrong'" is answered as 'strongly agree' by 180 of the participants. In response to the ego, 171 of the investors answered 'strongly disagree' for the statement "My investment decision is affected by my ego". 140 of the investors answered 'strongly agree' and 14 of them anwered 'agree' for the statement "I find it difficult to accept the idea of being in loss" which was directed to the investors about accepting the situation of loss.

As a result of the answers given by the 200 participants in the survey, evaluations were made and frequency distribution of the related data was shown. Based on these frequencies, the cognitive bias-investment decisions graph is formed as follows:

Figure 1. Cognitive bias and distribution of investment decisions



In Chart 1, the distribution of investors affected by cognitive biases at the decision process is shown from the most to the least. Table 4 presents multiple regression analysis of cognitive bias.

Table 4. Anova Test Results

Model		Sum of Squares	df	Average Square	F
1	Regression	2,517	2	1,258	10,740
	Residual	23,083	197	,117	
	Total	25,599	199		

*p<0.05 significant; Dependent variable: Cognitive biases; Independent variables: Gender,Age

As seen in Table 4, when we consider the whole, the results of the anova test are used to measure whether the test is meaningful or not. The model seems to be significant at p<0.05. Table 5 also includes the B and β coefficients, t values, significance levels, the rate of explanation of the dependent variable by independent variables (R2) and Durbin-Watson value.

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Table 5. Table of Coefficients

Model	B	β Coefficient	T-Value	R	R^2	Corrected R^2	Durbin-Watson
(Constant Value)	2,501		25,667	,314	,276	,167	1,451
Gender	,078	,110	1,344				
Age	,144	,239	2,926				

The fixed value given in Table 4 was found to be 2,501. When the β coefficient is examined, it is seen that gender and age affect the cognitive bias in the decision-making process. Especially age seems to be more effective. There is a positive relationship in the model. Generally, it is stated that between 1.5-2.5 there is no auto-correlation (Kalayci, 2010: 267). Durbin Watson coefficient was 1,451 in the study. As a result, it is understood that hypotheses are supported.

5. Conclusions and Recommendations

It has been investigated whether the individuals act irrationally in the decision mechanisms when buying stocks. In this respect, examinations were conducted with the use of cognitive decision methods. The study was conducted by using survey technique with 100 male and 100 female investors who have portfolio advisory agreements with four brokerage center/branche operating in Ankara, İstanbul and İzmir that do not want to be disclosed. In the study , research questions were prepared by meticulously according to topics of "herd psychology, accessibility of easy information, ignorant courage, focus area, deviation from correct information, if I say it is absolutely wrong syndrome, reaction to the ego, acceptance of loss status".

When the whole study is evaluated, it is seen that investors are affected by cognitive biases. They act with complex mindset in stock purchases. In traditional finance, the market is in a certain state, whereas in behavioral finance, this has become uncertain. In other words, when we think of those who know the market and those who do not, it is seen that those who know the market show professional behaviors to a certain extent.

Figure 2. Investors' cognitive bias pyramid

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For the purpose of this study, whether the decision mechanisms are more effective when buying stocks in the market or the idea that people are competent to know more than the market when making preferences and the effect of cognitive and emotional biases on the decision-making process is investigated. In fact, this complex structure can be simplified if this awareness can be increased for all groups. Investors can be oriented to awareness more quickly using the impulse method through professionals.

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A Theoretical Perspective on Behavioral Finance With Lagrangian Approach

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Abstract
Behavioral finance is a combination of economics and finance. Behavioral finance studies how emotions and biases affect financial markets. The behavioral finance approach includes the prospect theory and the efficient market hypothesis.
Prospect theory deals with investors' attitudes towards stocks, while the effect of prices on resources is examined in the efficient market hypothesis. Behavioral finance is interested in the impact of factors such as overconfidence, mental accounting, and gambler's fallacy among the factors affecting the investor's behaviors. This paper aims to explain behavioral finance and the effect of behavioral finance on the market value of a company.

Keywords: Financial Market, Behavioral Finance, Lagrange

Introduction

Behavioral finance is a discipline of finance that interacts with psychology and is concerned with how psychological factors affect investors' behavior and decisions to provide a better explanation of finance. Traditional finance ignores behavior and psychology when examining individuals' financial decisions. Traditional finance theory has two main priorities. First, human behavior is rational in the decision-making process. The second is the expected utility theory. Behavioral finance discusses these two areas. The expected utility theory always assumes individuals learning through experimentation. Investors take their feelings into account when investing. Using minds as calculators is a behavior that is unique to robots. Some traders only consider certain calculations when trading. What is rational is that individuals will consider their cognitive limitations when investing, even if they do not want to. Behavioral finance helps investors understand the market, their own investment decisions, and other investors' investment decisions. Similarly, financial markets make it easier for investors to make recommendations that are appropriate to their needs and wishes. Efforts to understand how people behave when making financial decisions have played an important role in the development of behavioral finance, which has developed further since the 1970s. Although the psychology of the investor is quite effective in the financial markets, it has been neglected from time to time. Investors are only economic when making decisions, or the way they perceive past experiences and opportunities, together with financial indicators, are effective in their decisions. Behavioral finance is the application of psychology to finance. According to behavioral finance, investors are rational. In its broadest sense, behavioral finance is the combination of economics and finance. Behavioral finance is interested in how emotions and biases affect financial decisions, companies, and financial markets. The behavior of investors is the result of prospect theory. Prospect theory describes how people evaluate and frame a decision in case of uncertainty. Framing is a common behavior that influences ideas and decisions. In the prospect theory, people reconsider every investment to examine their losses and gains. These are called mental accounting (Gazel, 2014: 6).

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In investment psychology, mistakes caused by behavioral biases stem from self-deception. Self-deception allows the natural selection process to continue at the point when people see themselves very successful and when people make a fool of others (Gazel, 2014: 7).

The economy in traditional finance assumes that the individual is rational. Accordingly, individuals always try to maximize their profits. On the other hand, in behavioral finance, people sometimes behave irrationally as a result of their biases.

Behavioral biases indicate that a person tends to make systematic mistakes in a given situation. Behavioral biases can be divided into two main categories as conscious and emotional bias. Both have a similar effect; however, emotional biases are more likely to cause mistakes when investing. Behavioral biases arising from emotions such as fear and anxiety have an impact on financial decision making.

The concept of behavioral finance began to develop in the 1980s. It has uncovered many market anomalies with the hypothesis of active markets and traditional theories. Many academics, experts and businessmen working in the field of finance and psychology have emphasized that theories are not sufficient to explain behavioral outcomes. They conducted intensive research until the 2000s. Daniel Kahneman's work on human behavior, expectations and decision-making mechanisms was awarded the Nobel Prize in 2002 (Şimşek, 2018 :20).

The behaviorism approach has been known in psychology since the 1900s. Behavioral finance dates back to older times. Behavioral finance can be traced back to Adam Smith's Theory of Moral Sentiments. In his research on behavioral finance, Smith tried to explain behavioral finance with human psychology. Without forgetting that the investor is also a human, Smith gives an example: People suffer from a transition from a good to a bad state. Then they are happy when they are in a good state again. This can be described as loss aversion and not taking risks in terms of behavioral finance (Tufan, 2003: 23).

In 1913, John D. Watson conducted a study of behavioral finance, which had already been studied by various psychologists for three hundred years. It was found that the factors that reveal behavior are not the internal thoughts but the external environment (Aslan, 2016: 26). In the 20th century, various studies were conducted on the concept of behavioral finance. Kahneman and Tversky introduced the prospect theory in 1979. This theory posits that when making investment decisions in various uncertainty situations, the effect of human intuition on investment decisions is important (Aslan, 2016: 27).

1. Factors Affecting Investor Psychology

Overconfidence

People can be overconfident. Psychologists have found that overconfidence causes people to underestimate risks. Overconfidence has two sides: Incorrect measurement and above-average effect. In incorrect measurement, people determine narrow ranges in a probability distribution. An example is a definition made using 20 questions and an 80% response range. According to the above-average effect, people believe that their abilities are better than the average person (Gazel, 2014: 11).

Mental Accounting

Instead of seeing the money they have as a pool, people allocate their capital to small accounts in line with their own goals and wishes and perform their expenditures in this way. According to mental accounting theory, individuals can make poor or wrong decisions with their expenditures. In mental accounting, poor or wrong decisions can be eliminated by trial and error. Many people often do mental accounting in their daily lives. What individuals fail to realize is that this way of thinking is actually quite rational. For example, according to mental accounting theory, individuals who make holiday plans may occasionally and deliberately defer their credit card debts to save money under the pillow. (URL-1: 2018)

Uncertainty Avoidance

Uncertainty can be an objective concept. On the other hand, where information is thought to be insufficient and unreliable by all investors, uncertainty becomes an objective concept in all markets. Uncertainty avoidance means that individuals prefer to take risks based on known probabilities rather than unknown probabilities. In real life, there are many uncertainties around the individual. The most important of these uncertainties is that individuals do not have sufficient information about the current economic situation. At this point, lack of information prevents individuals to perceive risks correctly. Furthermore, even if information exists as a definition, the meaning expressed by information depends on the mental state of the individual. Information is processed and understood in an intellectual process. This change means that the same information is interpreted differently by different people (Kojabad, 2012: 55-56).

Cognitive Dissonance

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Cognitive dissonance is to evaluate a situation according to the way it exists in memory. To give an example of traffic accidents; even if there is an increase in the likelihood of a traffic accident, drivers often do not drive more carefully. After careful driving continues for some time, it will continue to come back. This behavior is based on human mistakes. (Kuzkun, 2013: 16)

Gambler's Fallacy

It leads to an end to positive or negative returns for investors. Gambler's fallacy can accept the arithmetic mean in regression. The arithmetic mean is sometimes misperceived, and as a result, it is thought that the upward trend in the mean laws should be followed along with the downward trend. (Tufan, 2008:55)

Status Quo Bias

People tend to maintain their present state for various reasons. This situation, which William Samuelson and Richard Zeckhauser called the status quo, is seen in various situations. Although the students do not have a seating plan, all teachers know the tendency of the students to sit in the same place. However, the status quo bias is also seen in high-risk situations and can cause problems.

2. Efficient Market Hypothesis

The efficient-market hypothesis argues that in general, prices in an ideal market are created in a way that effectively allocates resources. Prices reflect all information available at any time. All prices are accessible. Markets are effective if they reflect information. The efficient-market hypothesis posits that financial instruments are priced to reflect all the information available on the market. Financial vulnerabilities are possible. Possible price changes are tried to be eliminated by "arbitrage."

Rational investors perform their valuation based on the net present value by discounting future cash assets with the opportunity cost of capital. Investors with asset value will immediately reflect the price when they learn new information. For this, the market must be competitive, and investors must be entirely rational. However, although investors are not entirely rational, markets can be rational. Irrational investors can make random decisions in the markets. Many traders who randomly act will likely eliminate the other's influence on prices. Thus, prices may occur close to the actual value. This argument is based on the lack of correlation between investors' strategies.

In the Efficient-Market Hypothesis, the decision of a single investor or a group of investors cannot affect the market negatively or positively. The efficient-market hypothesis posits that investors who want to maximize their utility functions compete with each other to accurately predict future value. As a result of numerous trading decisions, the equilibrium price is a consensus on the value of a stock and the value of prices observed at a given time is an objective estimate. According to the effective market hypothesis, investors are informed rationally and thus make the right decisions for themselves. Since the prices of stocks that change quickly and accurately with the flow of new information in the market do not show an upward and downward trend, there is no reversal adjustment (Öncü et al., 2001:5).

Poor market activity, investors, all known historical information of the market (transaction volume, prices, news, past financial statements, stories) is related to historical data. Anyone in the financial market can access this information and the market is said to be a weak market if there is no possibility of abnormal gain. Historical prices do not benefit the analyst as they are reflected in current prices. This type of activity makes technical analysis unusable (Yörükoğlu A., 2007: 9).

In the semi-strong market form, it can be said that all information disclosed to the public is fully reflected in the current price of a security. Therefore, investors do not prefer low-value securities. It is impossible for investors to use this information to obtain superior returns. The information available in the relevant productivity form is available to the public. It reflects all information such as balance sheets, dividends, income statement and earnings to market prices. This productivity form makes basic analysis unnecessary. (Yörükoğlu A., 2007: 10)

Prices that meet all public and private information in the form of strong market security are fully reflected in securities prices. In the form of an efficient market advancing strongly, accessing information faster than other investors will not yield higher profits to the investor. The reason is to focus on new prices. The actual situation of financial markets supports relatively weak and semi-strong forms of productivity and is inefficient in the market. (Yörükoğlu A., 2007: 10)

3. Prospect Theory

In their studies on the prospect theory, which they developed against the expected utility theory, which is accepted as the basis of behavioral finance, Kahneman and Tversky (1979) argue that investors are reluctant to sell depreciating stocks. Later, Kahneman and Riepe (1998) show that the deviations of investors from the superior findings of economic rationality are widespread and systematic. Similarly, De Bondt and Thaler (1985) and De Bondt, Werner and Thaler

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(1987), who presented results contrary to the classical hypothetical functioning of markets, found that investors overreact to harsh or unexpected events or information.
Kahneman and Tversky (1979) proposed the prospect theory that would be the basis for people's decisions about gains and losses. Choices between risky expectations lead to a variety of common effects that conflict with the fundamental principles of the prospect theory. Investors try to eliminate the possible risks by focusing on the outcomes that they are certain to achieve. The certainty effect increases risk aversion in options that include gains and increases the risk of dealing with choices involving losses.
The isolation effect results in inconsistent preferences when the same choice is presented in different ways. An alternative theory was developed in which value is allocated to gains/losses rather than final assets and probabilities are changed by decision weight. The value function is normally concave for gains, usually convex for losses, and steeper for losses rather than gains. Except for the low probabilities range, it is seen that decision weights are generally lower than the relevant probabilities.

4. Impact of Behavioral Finance on a Company's Market Value

The methods used in market value calculations are accepted as rational choices. Emotional behaviors and cognitive deficits such as risk aversion, psychological biases, overconfidence, conservatism, and mental accounting have been observed to prevent investors from making rational decisions. Companies direct their activities for a purpose. Generally, in the 20th century, the main objective is to maximize profit. In order to maximize profits and also to increase the peace and welfare of the investor, importance is given to market value. Since the concept of firm value has been introduced, stakeholders of companies (partners/lenders/government) have sought more information. There are methods developed to determine the value of this company. Companies can always affect their market values with the different decisions they make. (Bilgili and Düzer, 2010: 75)
Another area of study of behavioral finance is: Investors who cannot predict fluctuations may tend to sell their stocks after consecutive decreases in stock prices, thinking that the company they invested for will go bankrupt. This is about how investors perceive the situation. So, the market value may not give accurate results about the company. The value of only a company is seen, and one of the variables can be found.
If there are significant results about the firm's market value, the variability of investor behavior may not occur. Traditional financial theories cannot go beyond calculating the market value of companies for investors who want to analyze the general situation of the country to invest in any company's stock.
Comparison with the other companies in the sector is important. Investors, who receive the same information and make rational decisions, and the investments will determine the market value of the company through the rational investor method. However, how well the valuation method is chosen, behavioral financing is accepted. When investors use the same valuation methods (when psychological and sociological factors are neglected), it is natural that they reach the same conclusions. On the other hand, the main factors that affect an investor's view of a firm are cognitive characteristics, the environment in which the person lives, the general situation of the country and other cultural factors.

4.1 Lagrangian Approach and Behavioral Finance

Studies on behavioral finance benefit from physics. Just like in physics, the problem is tried to be solved by the relations of subatomic particles with each other. In doing this, investors are considered as subatomic particles. Considering that human being is a physical system and the relations of environment and elements with each other are within the same physical system, it is widely suggested that at least some of the laws of physics may be the beginning of the solution of the problem.

$$L=E+\lambda \ln P$$

Provided that N is the system of the number of associated elements, P is the distribution probability of the elements, LnP is entropy, and T is the Lagrange parameter, the system is in equilibrium at the point where L (x, y) is maximum under the relevant constraint function.
According to the Lagrangian approach, entropy is expected to be low at the point where L (x, y) is maximum. At this point, the order expectation occurs. Otherwise, entropy is expected to be high, at which point disorder occurs. When the studies on sociology and anthropology are examined, it is important how individuals/communities think in order and disorder. When detailed data on behaviors are obtained, the following conclusion is made: Decision-making processes in communities/individuals living in a system of order are not free. They are dependent more on others than themselves or their environment. Moreover, it can be said that individuals/communities in the form of order create a system of low

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entropy and decisions in systems of low entropy are more predictable. Otherwise, as the entropy increases, the disorder will increase, it is clear that behaviors and investment decisions will be more erratic and unpredictable.
Considering the markets, investors looking for safe ports with low entropy have to decide in mixed systems with high entropy. From a physical point of view, it is known that market makers, who maximize their portfolio and invest at high levels in the market, try to reduce financial entropy by diversifying their investments. The transactions carried out by those who control the market bring higher entropy transactions for small and medium-sized investors.
If communities are to be modeled, it is best to apply simple methods to individual behavior. When applying the Lagrange method, the dependent variable L (x, y) is considered as a possibility of collective satisfaction. Provided that A and B are two different groups, A is an element of the first group, and B is an element of the second group, E (AA, AB, BA, BB) expresses a four-variable equation for cognitive biases, pursuing one's own ideas when making decisions, or being influenced by others' investment decisions. P(AA) is the probability that a person in group A will act according to his or her decisions, P(BB) is the probability that a person in group B will act according to his / her decisions, P(AB) is the probability that an investor in group A is affected by an investor in another group, and P(BA) is the probability that an investor in group B is affected by an investor in another group.
Looking at the relationship between AB and BA, if P(AB) = x, P(BA) = 1-x. By using the equations;

$$E_A = \frac{n(A)}{n(A)+n(B)} \; ve \; E_B = \frac{n(B)}{n(A)+n(B)}$$, constraint function can be written as follows:

$$F(E,P) = E_A\, P(AA) + E_B P(BB) + E_A P(AB) + E_B P(BA)$$

If the Lagrange transformation is to be written in its final form, λ is the degree of conflict between the people in the groups

$$L = F(E,P) + \lambda\left[ln\frac{[n(A)+n(B)]!}{n(A)!\,n(B)!}\right]$$

5. Literature Review

Barberris and Thaler (2002) studied situations that traditional paradigms cannot explain through the concept of behavioral finance, which offers a more modern approach. Basidi et al. (2013) focused on the relationship between behavioral finance and fundamental value. Kaia et al. (2003) discussed the impact of investors' behaviors and organizational cultures on the value approach. Hirshleifer (2001) studied investor psychology and asset pricing. Damodaran (2003), in his work where he also interprets investors' behaviors, grouped investors as active and passive. According to Shleifer (2000), behavioral finance models explain both current financial data better than the efficient markets hypothesis and produce new empirical estimates. These models can explain anomalies such as superior performance of stock values, high returns of stocks in market indices, the persistence of stock price bubbles, and even the collapse of several well-known hedge funds in 1998.
Traversky and Kahneman (1974) said many of the probabilistic questions with which people are concerned belong to one of the following types: What is the probability that object A belongs to class B? What is the probability that event A originates from process B? What is the probability that process R will generate event A? In answering such questions, people typically rely on the representativeness heuristic, in which probabilities are evaluated by the degree to which A is representative of B, that is, by the degree to which A resembles B. For example, when A ib highly representative of B, the probability that A originates from B is judged to be high. On the other hand, if A is not similar to B, the probability that A originates from B is judged to be low

Conclusion

Behavioral finance deals with the extent to which investors' behavior is influenced by psychological factors and how the decision is shaped. In behavioral finance, investors look at past experiences as well as economic and financial indicators when making decisions, and act by the influence of psychological factors.
The main purpose of the individuals who make investments is to get returns. Therefore, the most appropriate investment tool should be selected. However, many investors make systematic mistakes. The reason for this is considered to be psychological biases.
According to behavioral financing, investors are the result of their investments. Investors who begin to see their mistakes begin to deceive themselves by saying what they know, exaggerate their talents, produce excuses to support their own views only, try to improve their talents and also try to attribute their failures to misfortune.

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According to behavioral finance theory, individuals cannot always make effective decisions or may make wrong financial decisions because of their biases or psychological perceptions.
When individual investors occasionally suffer losses in investments whose consequences they cannot predict, they might tend to think "I knew this would happen." By doing so, they try to "avoid the risk with the least psychological harm." When making investment decisions, individuals tend to behave irrationally because their cognitive abilities are limited.

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Software Development Methodology Selection with Human Resource Management Approach and a New System Design on Database: Blockchain Application

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Abstract

The aim of the study is primarily to investigate the applicability of Blockchain technologies in the design of the ongoing recruitment process in the companies. This can bring a more professional perspective especially to the international companies by providing document transaction in fast and secure way.

Many of the problems in Human Resources departments includes recruitment problems. Today's recruitment process built on accessing information about candidates and eliminating those who does not meet job requirements based on their resumes. Therefore, Human Resource specialists often use career websites and it is significant to have an impressive number of resume in their resume pools. In the end, there is a resume pool that has been built with a very large unqualified and even false information about candidates. In addition, there are difficulties in getting the employees' equivalence certificates or transcripts about their education and proving their experience and certificates gained abroad. This causes delays in gathering and verifying the information and documents of job applicants. Although some mistakes are difficult to remedy, it is of great importance to be against fraud and to improve the hiring process. This is possible thanks to Blockchain Technologies and strategic process flow approach. Since Blockchain's main asset is solving the problem of trust between individuals, Blockchain based model is recommended with a new recruitment approach. BHR Platform represents a Platform which can be used for keeping records and transaction of documents in secure way. This platform recommends to create a decentralized Peer to Peer(P2P) network which stores reliable, trusted, transparent information. This will assure an effective recruitment process while decreasing operational costs.

Keywords: Blockchain Technology, Human Resource, Information Management.

1. Introduction

Today's Human Resources departments, previously called as Industrial Relations departments, are established to increase employee's productivity and organize relations with industrial union. The process that started with the aim of making people work harder in the organization and protect worker's health. Later on it reached to the today's HRM(Human Resource Management) approach.

As a result of living in a digital world, employees use online platforms where they leave a small part of their identity every day. Therefore, one of the most important trends in the HRM is digitization of the processes. It is seen that most of the functions performed by the Human Resources departments have been transferred to the web environment as e-HRM. For instance, companies use career websites such as "indeed.com" or "kariyer.net" in Turkey, to find employee for their empty position and job seekers create their profile included their personal information, back ground and references to apply jobs. There are many reasons for this, such as saving time, reducing bureaucracy and costs are prioritized. With the increase in the use of communication technologies and applications to create an internal database, online applications have become widespread especially for recruitment process. This kind of HR(Human Resources) solution provides a structure that requires monitoring and management of many document-based processes.

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One of the most important elements in recruitment ecosystem is the verification of the information contained in the applicant's resume or his/her profile in the online career platforms. Today's hiring approach is based on the personal experience of the recruiter, and the first elimination (automatic or manual) among candidates is based on two factors:

- The characteristics of the applicant corresponding to the job description,
- The evaluation of the experience by the Human Resources (HR) expert.

There is always a possibility that the job seeker may distort the perception of the employer because of the online support he receives to make his profile look better. False information can be used, even in official government documents, which could lead to errors in data about employees. This potential risk to misrepresentation can lead to companies spending a significant amount of money, especially for high- value positions, to verify candidate's information. In addition, time and cost are spent to ensure that a candidate is the most appropriate person for the proposed role. Besides, the trust issue between the candidate and the recruiter is also come out when a person wants to find a job in a different countries. It is necessary to determine the target groups correctly in order to learn the motivation of these groups. There are 3 target groups for the recruitment process:

- Individuals: Job seekers or professionals who want to boost their profiles,
- Companies / Headhunter / Other Agents: Business oriented websites,
- Governments/Institutions that earn income indirectly.

Since Blockchain's main asset is solving the problem of trust between individuals, Blockchain based model is recommended with a new recruitment approach. The motivation behind this paper is to gives individuals the ability to control their official records. It aims to find a solution model to eliminate time consuming routine activities in recruitment process, reduce inefficiency of record keeping by increasing security of documents.

2. Several Studies

Ideas and experiments with regard to today's Blockchain concept have been carried out since the early 1990s, but only in 2008, with the publication of an official report by a group called "Satoshi Nakamoto", it has been widely adopted(Nakamoto, 2008). The first and most commonly known Blockchain concept is the crypto currency, thait is called Bitcoin(BTC). Bitcoin refers to network protocol which is underlying of the crypto currency.

On traditional server architectures, every application has to set up its own servers that run their own code in isolated silos, making sharing of data hard. If a single app is compromised or goes offline, many users and other apps are affected. On a blockchain, anyone can set up a node that replicates the necessary data for all nodes to reach an agreement and be compensated by users and app developers. This allows user data to remain private and apps to be decentralized like the Internet was supposed to work ("Ethereum", 2019).

The Blockchain provides a continuous public record protected against changes maden in the institution or against the loss of private records(Sharples & Domingue, 2016). There have been several studies for an employee to monitor and recruit someone's work experiences and the training credentials of that person. The approach of initiatives such as Fiduxa and Aworker to these problems is to create a pooled information network that confirms the identity information and work experiences of a job seeker(2018). One of the first examples is platform named "checkdiploma.org"("Diploma-Blockchain", 2017). It has been tried to produce a solution by the method of using a smart contract in the Etherium network for the storage of information.

The University of Nicosia was the first educational institution that started to use blockchain architecture for the storage of diplomas and qu alification characteristics. Since the university is a member of various European educational organisations, their diplomas are accepted worldwide (Chen et al., 2019).

Another study have been started for this purpose is "The Fourth Pillar Platform". It is one of the first steps in the way of digital business identity checking, provides a way to personnels to activate the first BlockchainId ledger and register the information related to their job experience. It is therefore an indispensable tool for today's and future's employers to provide assistance in the recruitment process("4th Pillar Project", 2019).

The Massachusetts Institute of Technology Media Lab has developed a pilot application named "Block-certs" for verifictaion system. Blockcerts is a MIT Media Lab project utilizing the Bitcoin blockchain for digital notarization. The system allows MIT students to access and have their diplomas in a secure and certified digital file. This digital diploma being provided in addition to the standard physical diploma("How blockchain technology could impact HR and the world

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of work", 2017). The University has runned pilot program on the Blockchain technology in the summer of 2017 by enabling certificate validation service("Blockchain Credentials", 2017).
In this context, the system was implemented by Bahçeşehir University (BAU) to reach documents such as certificates and transcripts with blockchain while saving time. It is the application named CertifyIST which was first established in the BAU International University Washington DC campus. Beginning with the diplomas of the first graduates in Washington DC, they immediately issued an application whereby all students can hold all kinds of documents related to their certificates, diplomas and studies. There will be both mobile and website application. In this sense, CertifyIST is the first blockchain project in the university("Blockchain Uygulaması ile Sahte Diplomanın Önüne Geçilecek", 2018). Another Turkısh initiative is a project named "KryptEd" strives to create an ecosystem, supporting cryptocurrency and blockchain education through e-learning and physical academies, to educate the world ("KryptEd", 2018).
The University of Lefkoşa is the first education institution to produce authenticated academic certificates through the Blockchain(2017). The University of Bermingham also has maden the project named "BTCert" which is Blockchain based academic certificarte authentication system available to the public by publishing the academic certificates online (LiWu, 2018). Thus, the costs arising from repeated verification of the same information can be significantly reduced and the confidence in the input data is assumed to be correct.

2. Overal Design of Study

BHR Platform helps to create the information and protect it for companies that need this information in the future. It is an open decentralized database that authoritizes everyone in the chain to view and justify the details of every record. BHR Platform allows transactions to be performed in shared, distributed and encrypted ledgers and in an environment where everyone in a business process accepts and verifies the transaction. The architecture is designed with the main philosophy of DLT (Distibuted Ledger Technology). Institutions using paper-based documents, wet signature, invoice or certificate can get benefit from BHR Platform. Because of some new and robust algorithms, such as cryptography, transactions of documents can take place between electronic wallets without central mechanisms.
BHR Platform provides a way to store up safe and reliable data about candidates or employees. It can be accessed by anyone if they have membership and permission. BHR Platform is a system that automates and accelerates the process of validating applicant's identity cards, prevents employers from being in need of multiple sources to check their back ground, reduces the use of counterfeit resumes, and reduces the total time spent by experts on recruitment. BHR Platform can also be developed to transform the payroll process, which adds an extra time and cost, by eliminating the intermediaries (such as banks) in the process.
BHR Platform allows the evaluation of skills (not only technical skills) which is very important for recruiters. This can solve the problem of the subjectivity of job interviews and allow employees get digital keys and own their identity. They sign into platform/apps locally without remote server or identity providers. BHR storage system allows users to fully control the data related to them. But storing a document on a blockchain is not the digital copy but rather a cyriptographic copy. Data is encyripted and easily shared between applications. For example, an employer may use BHR Platform to verify a candidate's certification. To do this, data needs to be allowed to the access through BHR Platform by the certifying institutions, which gives candidates more control. It also reduces the time that employers spend to verify information about candidates.
It also allows people to check their personal data and earn money (personal information, contact information, etc.) from the data displayed by companies. BHR platform uses Ethereum and other cyriptocurrencies for simple p2p payments. Thanks to smart contracts, everyone in the recruitment process receives an award as "ETH token". Tokens will have static pre-determined price in dollar ($) and will not increase or decrease based on crowd sale. If someone wants to buy the tokens they send a particular amount of ether, when the contract acknowledges that this transaction is done, they receive their corresponding amount of ETH tokens ("What is An Ethereum Token: The Ultimate Beginner's Guide – Blockgeeks", 2018).
It is very easy to create a new token, issue a given number of tokens, and trade these tokens with Ethers – the Ethereum cryptocurrency, which has a monetary value – according to a given exchange rate. The contract stores the addresses of the token owners, together with the amount of owned tokens, and allows transfers only

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if the sender shows the ownership of the private key associated with the address. As you can see, Ethereum is by far the most used platform. Using the Ethereum address, when present, publicly available APIs is queried, gathering information about the total token supply, the number of token transfers, the number of token holders. It is also possible to obtain information on each transaction, and each holder, but this is beyond the scope of this paper.

The primary difference between Ethereum and any other cryptocurrency is that it's not just a currency, it's an environment. Here anyone can take advantage of the blockchain technology to build their own projects and DAPPS (decentralized applications) through smart contracts. This is a very important distinction because this very thing shows you the true scope of what is possible in Ethereum. The entire Ethereum network is a giant mass of nodes (computers) connected to one another. In fact, the entire network can be visualized as a single entity called the "Ethereum Virtual Machine" or EVM for short. All the transactions that have happened and will ever happen in this network are automatically updated and recorded in an open and distributed ledger.

In this case, all payments take place transparently in any part of the world. ETH token are directly linked to closure of job positions or placement of people. Also people can earn ETH Token each time they share their identity information with businesses through BHR platform and companies use the limited number of ETH tokens to find and hire employees. For transaction, if the sender has the requested amount of tokens in their balance, then the code will deduct the said amount of token from the sender balance and then add that value to the recipient's balance ("*What is An Ethereum Token: The Ultimate Beginner's Guide – Blockgeeks*", 2018). Users will obtain currency via buying it with ether currencies.

The platform should be able to store large amounts of private data (notes, transcripts, etc.). Educational institutions should be able to open private data only to the payer. The platform must guarantee the fairness of data transaction without the involvement of third-party agents.

The platform must work on confidential data based on its nature. Unauthorized Blockchains, such as Ethereum or EOS, require disclosing data publicly. While there are some others, such as Hyperledger, gives permissions to accessibility and lacks of public verification. Hyperledger wants to establish a distributed systems infrastructure for institutions and business networks ("Blokzincir", n.d.). The programmability is common with the Ethereum Platform and comes from the intelligent contract logic (Ölmez, 2018).

It is important to note that it is possible to use encryption schemes to store private data in public ledgers. This approach seems applicable but, suffer from incentives and scalability issues. Blockchain nodes would have to keep every document given by all educational institutions and uploaded from all over the world.

Therefore, education records should be available to the public. Moreover, the data disclosure process will be difficult to do in such an environment, in case of disagreement, Blockchain model will be used as an arbiter.

2.1. ERC20 Ethereum Standard For Tokens

The ERC20 standard is basically a specific set of functions which developers must use in their tokens to make them ERC20 compliant. While this is not an enforced rule, most DAPP developers are encouraged to follow the standards to ensure that their tokens can undergo interactions with various wallets, exchanges and smart contracts without any issues. This was great news for everyone because now they at least had an idea of how future tokens are expected to behave. When executed, the following 4 basic activities are what all the ERC20 tokens required to do:

- Get the total token supply.
- Get the account balance.
- Transfer the token from one party to another.
- Approve the use of token as a monetary asset.

ERC20 tokens have gotten widespread approval and most of the DAPPS sold on ICO's have tokens based on the ERC20 standard.

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2.2. Procedure

The use-case scenarios that can be used by educational institutions and candidates are simple. Individuals should upload their original professional and academic letter of recommendation and download documents approved by institutions through BHR Platform. Institutions are charged a minimum amount for each document they upload to the Platform. This fee prevents misuse of the BHR Platform. Organisations may be rewarded when they upload employee's data into the platform. If the applicant's profile (including all relevant documents) is hidden, it has to be authorized by the applicant to download the document. If applicants unhide his own profile to the public domain, institution that downloads the document does not have authorization, but a fee is charged for this service. The candidate search engine and analysis tools are unhided to premium account users. Users are charged a monthly or annual fee for the premium account.

Applicants receive their documents showing their experiences and training information for free. In case of the loss of experience or training certificates cannot be verified, the effect of the previous employer will be eliminated due to the fact that all information is stored securely in the Blockchain.

All documents are stored forever, after the Blockchain based, end-to-end encrypted, distributed object is loaded into the storage area. Each file is fragmented, encrypted and distributed to the network. Only the parties and applicants have access to data regarding to applicant's certificates and references. Verification applications is shown in the Figure 2 and Information flow in the Platform is shown in the Figure 3.

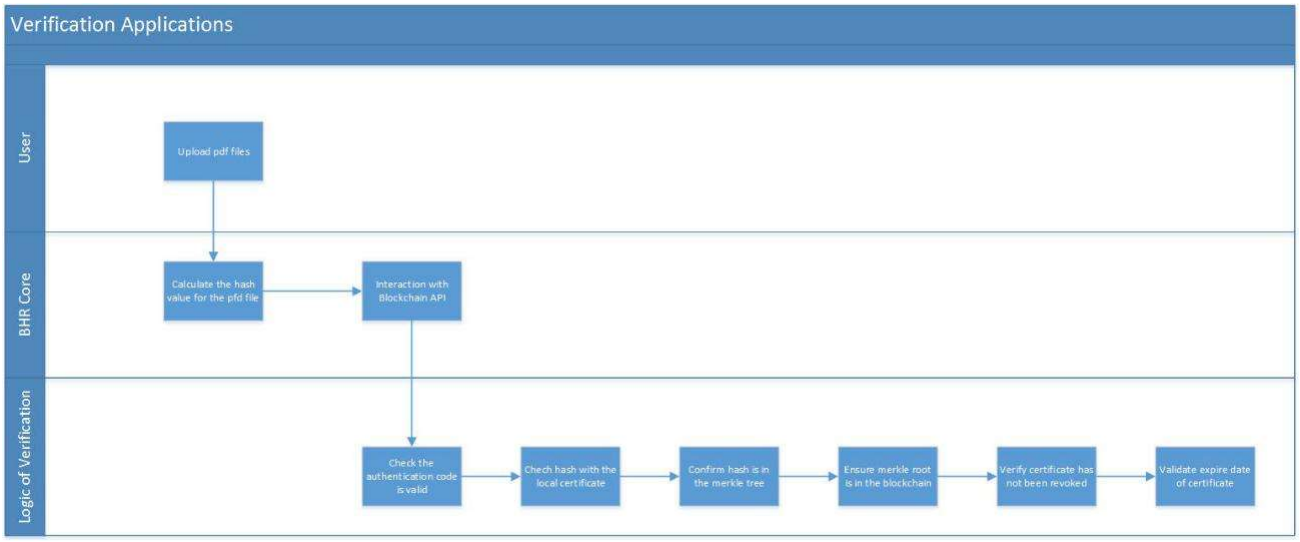

Fig 2. Verification Applications

2.3. Protocol Design

The infrastructure of the system consists of the following three products: BHR Protocol, PlatfromId and PlatformHr. BHR Protocol is a DLT based protocol which also forms the basis of the second product. PlatfromId establishes the self-directing individual identity. The creation of this digital identity opens up new possibilities, such as recruitment based on verified data and this is the third product concept called PlatformHr.

BHRProtocol is a protocol that allows users to securely exchange their assets in a digital environment without agents. It is fast, safe, inexpensive and DLT based solution. Exchange of documents and electronic delivery system(e-delivery) are promising issues of the future.

PlatformId is a protocol which gives chance to users to create self-governing identity beyond the user-centric identity. It allows verification of the user's identity and its approval in the DLT.

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PlatformHr is a recruitment tool that can be measured and operated based on user's real backgorund. So far, employment processes have been based on recommendations and paper based informations and their resumes. PlatformHr will facilitate to the candidate search process.

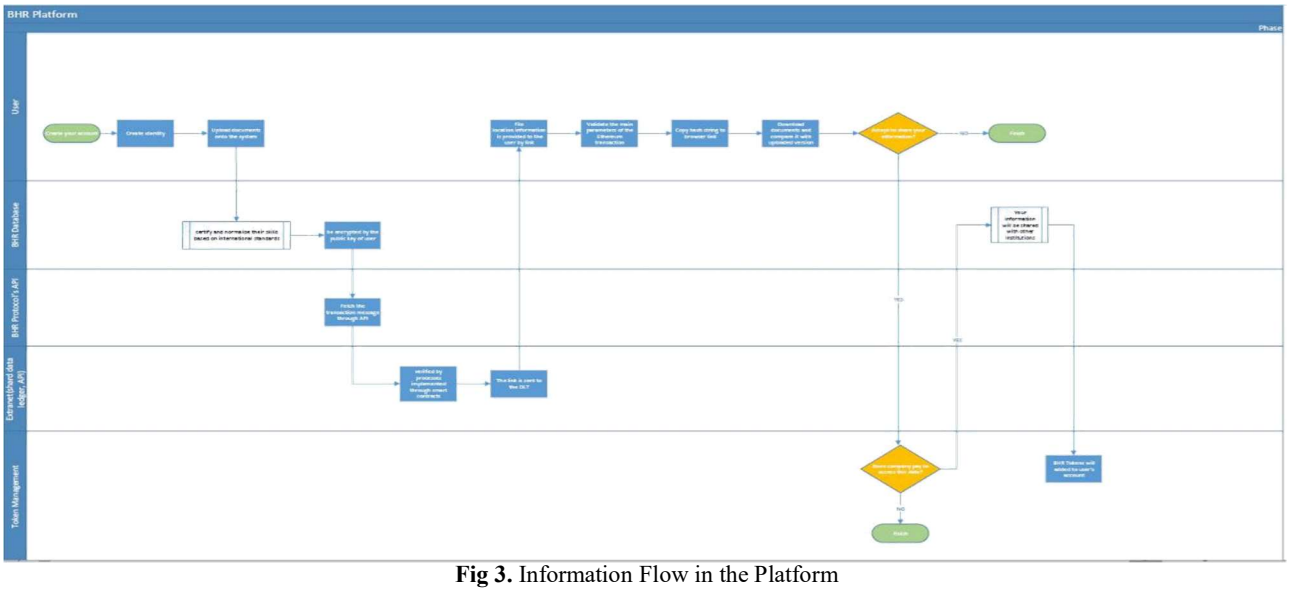

Fig 3. Information Flow in the Platform

2.4. Architecture Design

BHR Platform can connect to career sites such as; Linkedin or Monster.com and finds and removes the resumes of eligible candidates. Creates a field for each position and transfers all required data there. The key entities of the BHR Platform architecture are students, recruiters, witness, educators.

The architecture here divides the blockchain into two layers as special layer and open to the public. First one contains confidential data such as student's transkript and second one contains the information necessary to verify the integrity and accuracy. While students and educational institutions in the private layer, witnesses and recruiters are in the public layer.

Certificate applying operations are designed to merge the hash of the certificate in a merkle tree (as it is not possible to store and kept large sized digital fikes in blockchain, data needs to be hashed) and send the merkle root to the Blockchain with a timestamp, signing by the majority of community members. The role of the certification authority in the process is necessity of signing in identity (like checking a driver's license). This authority has it's own key pair and uses it's private key to sign a digital certificate for the key holder.

User's personal data is stored on the private chains of the educational institutions. The public part of the network has only hashes of this data. The private segment does not allow any data except hashes to open access. This is done to

Store private and personal user data, as well as those materials that are protected by copyright or commercial confidentiality. Witnesses (to check the validity of transactions in public chain) will manage public chain of blocks, on which data created within each school is hashed. The witnesses won't have access to the data itself, only to the hashes of the data. Proof of stake consensus algorithm will be used in order to check the validity of transactions in public chain. This will provides energy-efficient PoS minting. In the Proof of Stake system, verification is performed randomly depending on the amount of coins in the wallet of the users. Accounts with a high amount of coins in the system are more likely to be used as validators and therefore receive more shares from each transaction (Akbaş, 2017).

When a user (sender and receiver) wishes to share documents, they must first go through onboarding process (eg: ID is only required for the first registration). Document can be selected and specifically be encrypted by the public key of registered users stored in the database. When this step is complete, the BHR Protocol is activated. It is sent to the BHR Protocol's API(Application Programming Interface)) which is a set of clearly defined communication methods between various components. The document is then redirected to the BHR Protocol Repository, which is securely copied and

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stored. File location information is provided to the user by link in order to access to the document. This link is then collected on the DLT by a smart contract, and can be accessed by the reciever. The receiver Access the link provided by the smart contract. After the document is downloaded can be decrypted with user's private key. Documents are encrypted by a common-private key combination and stored in the data store. The links to access to the documents are saved in the smart contracts.

Receipt is sent to the receiver, the file location is saved in wallet. When it is received, recipient's private key is confirmed as proof that it is delivered to the address. In the event of an error, the sender is informed about this. The more document is confirmed, the originality of that user increases. In this way, a series of digital identity is authorized and verified by senders, the receiver becomes as "authenticated user". It creates a self-sovereign digital identity. The following steps of the BHR Protocol are:

- The document is sent to the BHR Protocol's API.
- The document is stored in the repository.
- The user is also provided with a link of the saved file location address.
- The link is sent to the DLT.

The receiver can download the document and the document can be decrypted with the password saved in the user's browser.

3. Results

Thanks to the developing technology, access to information is now very easy. It has also affected many business processes with the increase of online platforms and the use of electronic documents rather than written documents. This has changed traditional business manner in organisations. Since the HR unit has a strategic importance in order to achieve organizational goals, the HR processes are affected by these developments with a new Blockchain system.

Traditionally, some of the processes including recruitment and talent management face many problems such as difficulity to reach the right information. This causes the increase in the number of fraudulent crimes and damages the confidence of people. Verification systems have been developed in order to regain all of these, but these systems have not been easily accessible by users because of their expensive and central location. Blockchain technology, which provides solutions to problems, provides a safe environment and easy access to the right information from a decentralized and cheap way. Blockchain will continue to offer more opportunities while providing new way of management. There are three crucial point for this;

- Decentralization (allowing different parties who do not trust each other to share information without the need of a central manager),
- Irrevocable history (Blockchain databases can store not only the information of presents, but also all the previous information),

Anonymity and transparency (p2p network allows everyone to create a shared recording system at the same time, each node in the network agree about what blocks are valid and which are not by consensus mechanism).

The results of comparison between Blockchain platforms for applications is given in Table 1.

Ethereum and OBC are far in front of the other platforms in terms of usability. Both have multiple methods for interacting with the platform with even more planned for the near future. Ethereum has the most extensive documentation and the most support options of all the platforms investigated(Macdonald, Liu-Thorrold & Julien, 2017).

Ethereum(ETC) blockchain is one of the leading blockchain platform, due to the existence of a complete smart contract logic. It is built specifically for creating smart contracts; it has the ability to repeat or jump instructions when certain conditions are met and store information as variables. Therefore, public blockchain solutions like Ethereum, which store all of their transactions in open access, is acceptable.

The platform benefits from Ethereum Blockchain based technology to improve the services provided to users in recruitment and Human Resources industry. This encourages users to adopt and use the platform while providing transparency at a high level and eliminate the factors of instability.

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Table 1. Comparison of Blockchain Platforms

Platform	*Mechanism*	*Prog. Language*	*Data storage*	*Currency*	*Advantage*	*Disadvantage*
Ethereum	Proof-of-work algorithm called Ethash, has a dynamic block size limit	Solidity, Facilitate the developme nt of smart contracts	Data and contracts are not encrypted, all data is public ("What is Ether", n.d.)	Ether; Tokens via smart contract	Allows development of smart contract and applications (Omohundro, 2014)	Ether is only available by mining, weak against 51% attacks, llack of privacy
IBM Open	Part of the Linux foundation, BFT and PoET consensus algorithm	Golang, Java and Javascript	No mention of how documents would be achieved	None, but one can be created using chaincode	Best suited for business orienmted applications	Distinct levels of permissioning, replay attack resistance mechanism is not available
Hyperledger project	Governed by Linux foundation, PBFT consensus algorithm	Golang, Java	Account based data model	None, Tokens via chaincode	Provide privacy, no fee required for transaction	Vulnerability to sidechannel attacks
Eris	Tendermint (BFT) consensus algorithm,	Solidity or Serpent	Account based data model	None, currency is depend on how the platform is composed	Partnered with a few other organisationslik e Ethereum	Only certain nodes have the job of validating transactions, involves third parties, needs to be developed
Sawtooth lake	Proof of elapsed time(PoET), open source and an Intel project	Python	Account based data model	Users are able to define their own currency	Smart contract application	Have not been fully implemented yet. Not suitable for security sensitive applications

Blockchain structure can be selected according to software language used in the platform. When defining the business model, proper Blockchain should be Ethereum Blockchain since it has a high rate of unit processing per second, especially for the contract structure it provides.

3.1 Overall Characteristics of Target Group

20 years ago, when the accounting experts began to replace paper bills with electronic invoices, the situation they went through is happened in the recruitment process today. As a result of increased productivity, business margins have also improved, and the same is happening in the Human Resources sector. In the last 8-10 years, there has been a significant change in HR Technologies. HR solutions were switched to cloud-based platforms.

According to the Robot Vera Report, the volume of investment in new solutions for recruitment reached $ 2.4 billion in 2015, which is 60% more than in the previous year ("Robot_Vera_Wp_Eng_1.3.2.pdf", 2017). In the coming years, it will continue to reshape the customer experience, and to place advanced mathematical analyzes and social media into the new platforms.

Today, 38% of companies are already working on digital HR, but only 9% believe they are fully prepared for this("How blockchain technology could impact HR and the world of work", 2017). If Blockchain's capabilities are fully utilized, technology will create more accurate and effective approaches to Human Resources. All processes from recruitment to payroll transactions will change with Blockchain and allow HRM to become different.

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4. Discussion

Blockchain technology is still in testing phase and there are some issues in the application for free encrypted security system. Benefits and some of the quality problems in Blockchain application are discussed below.

4.1. Privacy and Security Awareness

Most of the people applying for job positions need to translate documents (previous experiences etc.) if they are in foreign languages. This can also change the content of the entire document in the wrong translation because it means another possible trap for the employer. It is important that job seekers have control over their personal information, as well as employers know the information correctly and reliably.
The structure behind Blockchain is that a copy of a process note book is shared between each node on the P2P network. This note book is synchronized with a reconciliation algorithm, and updates are shared as soon as each new block is processed and added to the previous block. All this is encrypted for extra security. If a node attempts to log in incorrectly, it will not be voted on by other nodes and fake data will be rejected.
It enables employees to confirm their training, skills, performance information and evaluate new members and allocate them to the most appropriate roles. In return, it gives people a comprehensive, Blockchain based reliable record of training, skills and performance.

4.2. Performance Evaluation

Human Resources experts have difficulty in evaluating the candidate in an unbiased manner because they do not have an objective source of information. The candidate can write down information about himself on his resume but these informations might not be true at all. BHR platfrom, enables employees to confirm their training, skills, performance information and evaluate new members and allocate them to the most appropriate roles. In return, it gives people a comprehensive, Blockchain based reliable record of training, skills and performance.
Employees' performances can be recorded for years without requiring any special effort or cost and this will make evaluation easier. The fact that the database is built through mathematical planes will be an excellent advantage for the employer in both the evaluation and recruitment process. It is also a program will be enabling to scan the area or region needed when running a project(“4th Pillar - Blockchain Sisteminin İnsan Kaynakları Alanına Uyarlanması”, 2018).

4.3. Scalability Issues

One of the most challenging problems encountered in Blockchain applications is scalability. To ensure theoretically proven security, the Blockchain application must have a large number of full nodes. Otherwise, the application may cause a less centralized system, such as Bitcoin. Blockchain's scalability limits depend on the size of the data in the Blockchain, the processing speed and the delays in data transmission. On the other hand, the delay between transaction submission and approval is affected by the reconciliation protocol.
For example in Bitcoin (block per block, 10 minutes block interval and 6 minute block approvals) required time between transaction submission and confirmation is approximately 1 hour and in Ethereum it is about 3 minutes;12 second block confirmation(Chen, Xu, Lu & Chen, 2017).

4.4. Wasted Resources

According to the Bitcoin Energy Consumption Index, Bitcoin mining spent 13% of the toral energy consumption and energy used in mining is about $ 15 million a day. The annual average electricity consumption of Bitcoin is around 32 TWh. In this case, Bitcoin consumes more energy than the energy spending on 20 countries in Europe and total 159 countries all around the world(Yli-Huumo, Ko, Choi, Park & Smolander, 2016).

Time issues is another example, a resume in PDF format takes about 3mb space in kariyer.net platform database, or a video uploaded to Linkedin takes about 20mb space in its database. This information is stored in databases. But a bitcoin

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transaction in a distributed ledger takes a small space with around 250 bytes. This means that takes about 1/85000 of a space of an average video in the database.

4.5. Legislation and Risk Reduction

With Blockchain, important steps are being taken to ensure that different sectors in the international arena are integrated with technology. In this context, we can give examples of several attempts for blockchain technology. Sweden have been taken a step to perform the storage and management of the registry records with blockchain(Chavez, 2016). The global technology company Bitfury aimed to place all the electronic data of the country into the infrastructure of the system by realizing the largest state blockchain agreement with Ukraine ("Ukraine launches big blockchain deal with tech firm Bitfury", 2017). The collaboration between Propy, California-based blockchain company, and the State Agency for eGovernance of Ukraine will allow for real estate transactions to be settled online, making use of smart contracts. Widely accessible, this means of buying real estate will open the market to foreign investors(Nation, 2017). This shows that, recognition of the documents are requested to be recognized and there will be no discrimination on any grounds thanks to Blockchain's secure structure.
BHR Platform provides a safe infrastructure which is capable of direct document Exchange, compatible with the legislation without intermediaries. It is required to have the document digitization solution for secure document transmission and legislation sould be arranged for ICO in Turkey.

4.6. Challenges and Benefits in Practice

It facilitates multinational enterprises to manage their international payments, including tax liabilities, by enabling them to create their own corporate currency. This also increase productivity by automating and reducing routine tasks and data driven processes such as payrolling. Ensures the prevention of counterfeiting, including both employees and companies, and enhances security in Human Resources departments.
The most important benefit of the system is that it is fast. For employees, having a fast, reliable distribution mechanism will bring savings. It is also a very pleasing method for the employer, since international documents and the funding via other channels will cost a lot. The system used in the evaluation of employees will be subject to automation rather than subjective opinions. This will bring a more professional perspective to the company("4th Pillar - Blockchain Sisteminin İnsan Kaynakları Alanına Uyarlanması", 2018).
Because of this structure, many candidates will create public profiles, and institutions will have a wider candidate pool, more information about people, and more precise search results. It encourages the employer to choose these candidates instead of others who do not have validated documents.
However, the quality of the coding must be tested and guaranteed. Just like we've been using the Internet for years, but we continue to see the cyber attack, the Blockchain needs to evolve to be safer, user-friendly and verifiable before it becomes as common as the Internet.

5. Conclusion

Thanks to the developing technology, access to information is now very easy. It has also affected many business processes with the increase of online platforms and the use of electronic documents rather than written documents. This has changed traditional business manner in organisations. Since the HR unit has a strategic importance in order to achieve organizational goals, the HR processes are affected by these developments with a new Blockchain system.
Traditionally, some of the processes including recruitment and talent management face many problems such as difficulity to reach the right information. This causes the increase in the number of fraudulent crimes and damages the confidence of people. Verification systems have been developed in order to regain all of these, but these systems have not been easily accessible by users because of their expensive and central location. Blockchain technology, which provides solutions to problems, provides a safe environment and easy access to the right information from a decentralized and cheap way. Blockchain will continue to offer more opportunities while providing new way of management.
According to findings, worldwide successful and well-established organizations are willing to continue their path with more conventional systems and does not target to capture the rapidly changing technology. Unlike financial practices, recruitment process do not trustworhy in the current situation. This means that the use of Blockchain technology in Human Resources will probably be limited to justifying educational back ground at first. As it is explained before, applications related to Blockchain technology are still in an experimental phase and have not been fully implemented yet. Most of

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people trust third parties that is why this technology is not accepted by most of the corporate institutions. The reason for the rise of coin cost is large players. In the following periods, all of the coins will be fixed to move in a certain range. Otherwise, it will not be possible to use them as an investment tool.

People can communicate with each other even if they do not know and do not trust each other. The cost of translating the student transcript is now costs a lot. When the original of the document should be delivered, it is not possible to perform the same operation over and over again. With Blockchain system; the transaction fee can be $ 5 and can be done in 10 minutes while providing secure, automatic and fast document submission while acting as a notary for remittances. The greatest advantage of Blockchain is to prevent document fraud and inability to change data. These are the issues that central systems cannot provide to us.

However, if privacy is the sole purpose and trust is not a problem, block chain databases do not provide an advantage over a central database. Therefore, different sectors are willing to use DLT to take advantage of their different features. There is a potential that this situation will change and develop in the coming years. There has been a transition from Blockchain 1.0 to 2.0. Scripts and scenarios are prepared for Blockchain 3.0. As the use of Blockchain systems becomes widespread, this solution will be used in online platforms, which are used today in many countries. In short, in this way Blockchain's HR applications will be widely adopted and used in many different areas.

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Using Blockchain and Cryptocurrency: A Model of Resources Based Economy

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Abstract
Although this work seems utopic, it is an alternative or can work together with existing economic model. The goal is the idea of a coin that will gain value with respect to real economic resources, with high security, which can be mining according to the requirements, using blockchain or derivative technology shaped according to needs. In other words, it is to develop the financial instrument of the resource-based economy.

Keywords: Blockchain, Cryptocurrency, Economy Model.

Introduction

The money in our country is based on the gold reserves and is printed by representing the trust in the countries that use fiat money like America. There is no reference point for the amount to be produced during the mining (production) of crypto coins. Let's imagine that a crypto coin is issued according to the country's sources. Among the biggest problems of today are the negativities that exist in the economy. Various solutions and models related to these topics are presented. The inequality of income distribution is economic crises and scarcity are the first ones that come to mind. It will be assumed whether the monetary and economic policies that exist at the axis of the problems are of benefit or harm, to what extent the resource-based economy will be an alternative, and to what extent the crypto-money. Also we investigate ho we can such an economy can be solutions to the problems.

1. Blockchain

1.1. What is Blockchain?

A blockchain[2] (The Economist, 2015; Moris, 2016; Popper, 2016), originally block chain (Brito and Castillo, 2013; Nakamoto, 2016) is a growing list of records, called blocks, which are linked using cryptography (The Economist, 2019; Narayanan, Bonneau, Felten, Miller and Goldfeder, 2016) . Each block contains a cryptographic hash of the previous block (Narayanan et. al., 2016), a timestamp, and transaction data (generally represented as a Merkle tree).
The Hash function is an algorithm or sub program that maps variable-length data sets to fixed-length data sets.
By design, a blockchain is resistant to modification of the data. It is “an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way”[3] (Iansiti and Lakhani, 2017) . For use

[1] *Corresponding Author: onuruygun@gmail.com*
[2] The technology behind bitcoin lets people who do not know or trust each other build a dependable ledger. This has implications far beyond the crypto currency.
[3] The technology at the heart of bitcoin and other virtual currencies, blockchain is an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way.

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as a distributed ledger, a blockchain is typically managed by a peer-to-peer network collectively adhering to a protocol for inter-node communication and validating new blocks. Once recorded, the data in any given block cannot be altered retroactively without alteration of all subsequent blocks, which requires consensus of the network majority. Although blockchain records are not unalterable, blockchains may be considered secure by design and exemplify a distributed computing system with high Byzantine fault tolerance. Decentralized consensus has therefore been claimed with a blockchain.

Blockchain was invented by a person (or group of people) using the name Satoshi Nakamoto in 2008 to serve as the public transaction ledger of the cryptocurrency bitcoin (The Economist, 2019). The identity of Satoshi Nakamoto is unknown. The invention of the blockchain for bitcoin made it the first digital currency to solve the double-spending problem without the need of a trusted authority or central server. The bitcoin design has inspired other applications cryptography (The Economist, 2019; Popper, 2016), and blockchains which are readable by the public are widely used by cryptocurrencies. Blockchain is considered a type of payment rail (Brennan et. al, 2018).

In the light of this information in front of the blockchain technology for the management of an economy or a more advanced version. It can be updated according to need (manageable), flexible structures such as economy will benefit from a sensitive issue.

The security of the decentralized structure has proven itself, bitcoin etherium and so on. brims have unexpectedly gained popularity and eventually turned into a preferred investment instrument.

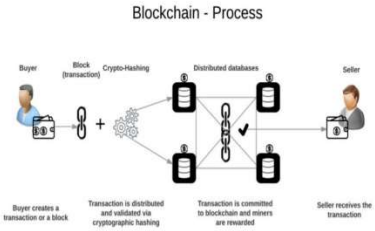

Fig1. Blockchain Process

1.2. Blockchain Security?

Bitcoin uses an algorithm called SHA-256 (Lewenberg, Bachrach, Sompolinsky, Zohar and Rosenschein, 2015). As can be seen from the table, the algorithm used by Bitcoin is the most complex algorithm among general use algorithms.

The critical factor in using the hash algorithm in the Bitcoin system is that it enables both the input data to be transmitted over time without disturbance and to be turned off from external intervention (*Lee, et. al., 2015).*

Table 1. Complexity of Some Hash Functions

Algorithm	Çıktı Boyutu	Çarpışma Hesaplama Karmaşıklığı	Pratikteki Karmaşıklık
MD5	128	<64	128
SHA-1	160	<80	160
SHA-224	224	112	224
SHA-256	256	128	256

1.3. Why Cryptocurrency Preferred

As banks and other credit institutions can no longer meet the requirements of the era, the cryptocurrencies which have emerged in response to the conventional system and international financial policies, has expanded rapidly to the world financial ecosystem. In the contemporary digital cycle, especially in banking transactions (deposits or withdrawals) such as banks charging commissions during the client transactions, transaction costs, credit card annual fees to accelerate the world's transition to cryptocurrencies. Crypto coins and blockchain is the fastest train we live. the disturbing financial policies, will lead to more powerful economy alternatives. It is necessary to make use and improve at this break point. This structure, which is under the monopoly of banks and some economic forces, contains as much risks.

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2. Effects of Blockchain in Economy

In the last months of 2017, the crypto coins, which almost exploded, were faced with uneasiness by the banks and the states. It is even banned in some countries. Algeria, Bolivia, Ecuador, Bangladesh, Nepal, Cambodia, Indonesia, Pakistan, China, Iceland. With the introduction of 2018, although it experienced a significant depreciation especially in January, February and March, it did not lose its popularity and started to rise again.

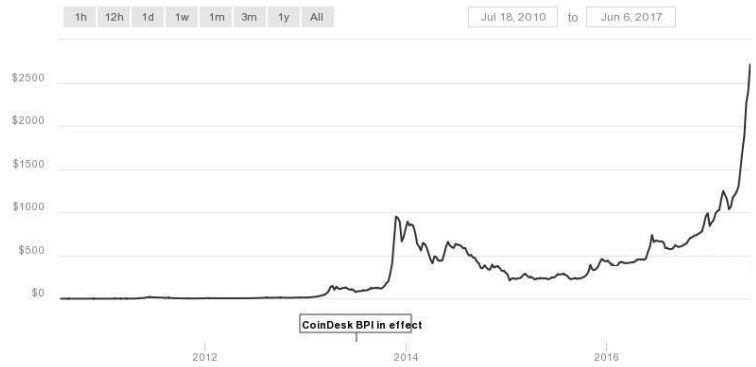

Fig 2. Bitcoin graph until the end of 2017

Some economists have interpreted it as revolution, some as balloons. Crypto coins have not yet slowed down. Serious investments are still underway. In the long run, investors' expectations are very high.

Table 2 Price increases and trading volume for the last 24 hours as of 16.6.2019

MARKETS

BTC USDC ETH XMR USDT

ASSET	LAST PRICE	24H CHANGE	24H HIGH	24H LOW	24H VOLUME
BTC Bitcoin	8969.00000018	4.28%	8973.12000000	8575.50794107	4195734.078
ETH Ethereum	269.85971769	2.37%	271.83000005	260.11100000	1121127.170
XRP Ripple	0.41793788	3.45%	0.42048662	0.40033907	724024.305
LTC Litecoin	135.24971348	0.56%	139.60126023	133.40058933	496550.106
EOS EOS	6.97499999	4.62%	6.97499999	6.57961448	153994.344
STR Stellar	0.12718598	1.40%	0.12790000	0.12373000	136503.056
XMR Monero	95.16187737	3.56%	96.00000000	91.63741330	116898.537
ATOM Cosmos	6.17072077	0.07%	6.24500000	6.10000005	110792.602
DASH Dash	155.86304837	1.02%	156.59999996	152.72727272	95218.829
ZEC Zcash	92.32996488	1.64%	93.07330002	90.11864439	90690.636
ETC Ethereum Classic	8.56461393	0.67%	8.66496990	8.38000000	64940.556

When we look at the figures, it seems that it will continue to be a more stable investment instrument in the future.

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However, we need to take advantage of the opportunities that will arise and participate in this trend with new ideas to support.

3. Applicability

3.1. Design

Storing Records

The numerical value of the amount of the existing value is obtained by the determination of the source items and the entries made from the data collection points. Records are backed up on the data processing nodes to be created on the p2p network. It is also possible to synchronize with a central database for faster processing of this data

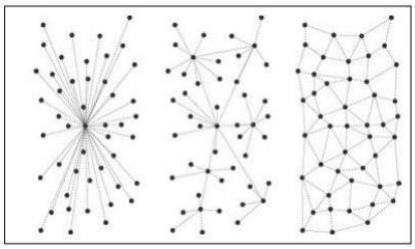

Fig 2. Blockchain security process validation transaction

Inspection

Government, central bank or independent institutions. The security of a blockchain and a derivative technology to be designed will be at the highest level. Distributed data recording system that can be connected with a database can provide rearranging errors. Inspection can be performed against incorrect record entries when records that are not consistent with the previous statistic of a particular data entry point are entered. In addition, people who p2p network transactions, companies and so on. IDs are associated with the database and name information is kept in order to prevent the unregistered economy and corruption, even it can be tax reduction.

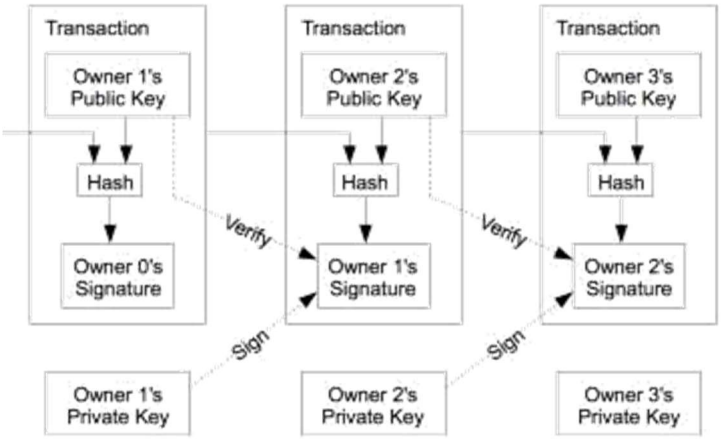

Fig 3. Authority Structures of Virtual Currencies (www.jrc.ec.europe.edu)

Measurement of Unit Values

Similarly, if the purchase value of money is available, it is necessary to install a coin value which is equivalent to resources. The actual amount of production is the capacity to produce rather than its quality or quantity. The main source at this point is growth and durability in production. To illustrate, it is not the value of the agricultural product produced for that year, but the increase in production quality, quantity and holding in the market against the previous level, or soil fertility. Similarly, information and technology is a continuously used resource without a limited lifetime.

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Mining Quantity ≡ Growth in Resources

Mining should be under the supervision of the state or central bank because they can ensure that the measurement and control of resources are consistent.
The amount in which the value represents the real money in the economy will be realized with the purchase demands. In this case it is necessary to exit the blockchain definition and create a different distributed data system.
The increase in the output of resources and the growth in production reveals a situation that contradicts the economy. The more something, the lower the value. In this case, the meaning of the word growth should be the following, It is to be understood that there is a corresponding market or demand. Otherwise, it would be more accurate to define it as waste.

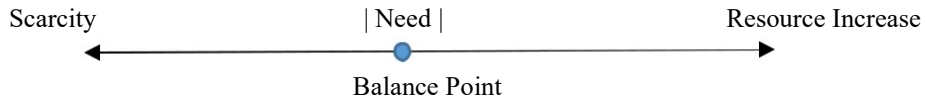

Fig 4. Balance of output from source

The change in equilibrium becomes a means of warning and the state, individuals and institutions have taken precautions in advance. For example, if urbanization increases more than the need can be considered as an unnecessary waste.

3.2 Sample Model

3.2.1 Application of the Model

Classification of Resources
In order to apply this model, resources should be classified first. The common set of intersections should also be factors affecting the existing economy. Resources can be grouped under three main classes.

1. Humanities
2. Capital and Technology
3. Natural Resources

Humanities Resources
In addition to the standards such as occupation, education level, life span, human resources, increase in the number of entrepreneurs, how much innovation took place in that country, sports achievements, the plurality of people prone to art, in short human productivity and achievements can be shown among the sources. Although these features are indirect, they contribute to the economy. For example, if we were to adopt an indicator of business discipline and this was an accepted variable all over the world, it would be possible to provide incentives for investors or firms to carry out joint projects.
More simply an example; To work with Japan (at infrastructure and architecture projects of turkey) whose experiences about the earthquake and work disciplines are known. In this respect, people can be encouraged to work more efficiently.

Capital and Technology
Capital and technology can be regarded as the most dominant sources. As a requirement of the era, knowledge is more valuable than many elements. These can be a reference for monitoring progress. Already today's stock markets and investments are predominantly based on the foundations here.
The model to be implemented can be placed as a backbone of the stock market. It can also benefit from this. Instant stock market movements can cause losses. The model we will produce can be a safe haven for those who can invest with long term. The values may change momentarily, but unless you have no resources, what you have is a value that will be raised with caution. However, there will be a warning mechanism for the economy mentioned in horizontal movement or downward movement. If a similar model had been applied in our country and the graph of the decline in the industry in recent years had affected the economy as in the graph, people would be sensitive to this issue as well as the dollar. There could be a perception that would make domestic products more preferred.

Natural Resources
Natural resources are important elements for the development of countries. It can give direction to many things. Countries with rich resources or managing resources can be more stable in the economy.

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So natural geographic resources are relatively more stable and changes take longer time.

If we want to group them;
Underground mines,
Natural richness of vegetation,
Geopolitical location,
Environmental pollution rate, we can say.

For example, if we talk about natural wealth, the length of a country's coastline contributes to the tourism of that country. Contributes to the economy in tourism. Similarly underground resources too. At this point, apart from the existence of these resources, it also brings the element of management. To ensure the continuity of resources, they need to be managed and protected. Wind turbines for energy production can be made by looking at the geographical structure of the country where there is no source such as oil. In this way, we have accelerated up the static resource into dynamic.

Associating a Resource with a Crypto Currency

The required part of a crypto currency to be mined in the hands of an impartial authority should be kept as a deposit on behalf of the state. These resources normally belong to the state and the society within it. Some amount can supply as a commodity.

It will gain value against currencies as investment gets, will be mining when resource increase is achieved.

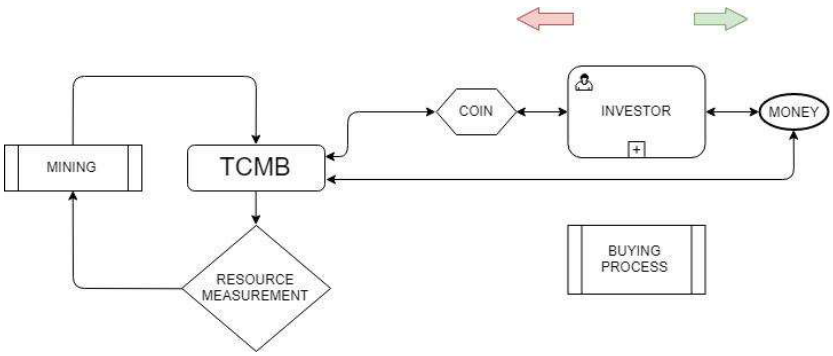

Fig 5. Coin mining & buy-sell process (www.cryptocoinsociety.com)

Products and outputs from sources indicate the efficiency of the activity of that source. It is also important that the output from the source to be measured is consumed as much. As we said before, not too much production, but the aim should be to increase production in a growing market. Otherwise it will only lower its value unless there is too much product and output market and more products that can not find the market will point to extravagance.

Production control should be supported by the production mechanism as much as this need, and innovation with higher capacity should be applied in order to ensure a different usage in this case.

The increase in production will only be at the specified deposit price. The increase in the stock exchange will be achieved by selling-buying transaction volume again. Of course, the decrease in deposity will again affect the transactions in the stock market. In this way, we have achieved a non-zero value and a model that can gain as the correct steps are taken.

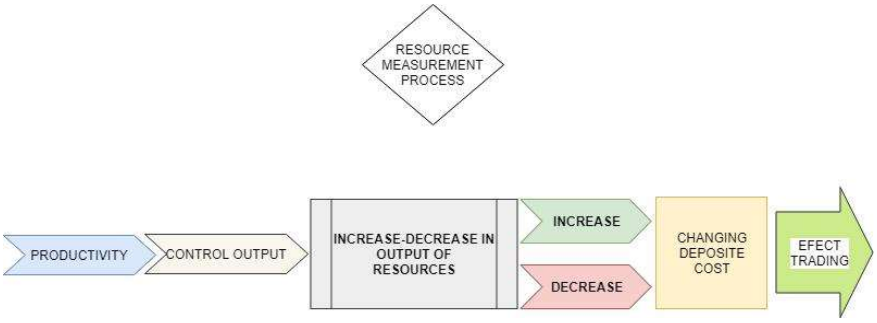

Fig. 6. Resources control and effect of deposite cost of coin (research.binance.com)

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3.2.2 Mechanisms

Here, the most important mechanisms are data entry points, evaluation, audit mechanism, stock exchange to be implemented. It is important that the information is accurate and able to describe the truth. The process of entering and evaluating real data without being manipulated and streamlining is important for investors' trust. Unpredictable risky processes can be experienced because the resources modeled here are not only providing value to a crypto currency, but also aiming to virtualize existing money.

3.2.3 Usage

Tax, public, debt, sgk payments, payments to government-related institutions can be made with this crypto money. In this way, it is actually used as a payment tool at the moment it is put on the market. Even a discount in payments may increase the frequency of use and business firms may be encouraged to keep their deposits as crypto currency. Since the system includes its own monitoring mechanism, it relieves the burden of financial audits. Other than that, it is possible that the accounting norms will be change because companies provide us with a decentralized general ledger structure for all account transactions and payments.

4. CONCLUSION

A crypto currency released by the state or the central bank will attract attention. The aim is to produce an alternative investment tool that can be preferred in addition to the existing economic structure. Their investments are less risky, put on the market by the central bank and a reliable coin currency, interest, alternative to the stock market can create. In addition, with the investment provided here, resources can be expanded and improved.

Apart from this, it will attract foreign investors with its stability and popularity. A situation in which overseas stock exchanges are being traded means that they finance us for the development of our resources. Here we need to think about the possibility of investing in every person in the world who could invest in with $ 1 rather than the big investors.

Again, this coin will increase in developing resources. Just as a small negative or positive development will have an impact on the economy, it is possible that in this model, the crypto money will gain value due to the increase in the resources of the fuel.

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