



Investor intention, investor behavior and crypto assets in the framework of decomposed theory of planned behavior

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Abstract

The interest in crypto assets, known as an extremely volatile, risky and digital currency that first emerged in 2009, continued to increase day by day. Crypto assets, especially Bitcoin, have become very valuable and are now seen as an investment tool. Online survey data of 1,222 individuals were used in the study. The data were analyzed through the structural equation model. With the Decomposed Theory of Planned Behavior used in the research, the dimensions affecting Attitude, Subjective Norms, Perceived Behavioral Control variables and the effect of Intention on the behavior of investors, namely crypto asset investment, were investigated. According to the Standardized Regression Weights, a one-unit change in attitude affects intention 0.822, a one-unit change in subjective norms 0.048, and a one-unit change in perceived behavioral control affects intention 0.117. In addition, it has been concluded that the most important determinant of the actual behavior that reveals the investment is the intention with 0.754, while the PBC effect is 0.144. The study is a comprehensive study on crypto asset investments in Turkey, a developing country. It is aimed that the results obtained will contribute to researchers, crypto asset companies, policy makers and researchers who want to increase their market share in the sector.

Keywords Intention · Investor/Investing · Behaviour · Crypto Asset · Decomposed theory of Planned Behavior

JEL classification G11 · G41 · P33 · P45

Introduction

Cryptoassets represent an emerging innovative class of financial assets. Among these assets, the first to appear is Bitcoin (Pilatin, 2022). Bitcoin is an unregulated, decentralized, peer-to-peer crypto-asset that enables users to process transactions via digital exchanges. The characteristics of Bitcoin and other crypto assets are quite different from traditional investment instruments (Klein et al., 2018). Bitcoin's market cap is approximately \$780 billion as of April 2022, and Bitcoin is the largest of all cryptocurrencies, representing approximately 40% of the total market capitalization of

all cryptocurrencies (CoinMarketCap, 2022). Despite having a relatively small market capitalization compared to traditional investment vehicles, research shows that various investors can benefit from growing their portfolios with Bitcoin given the degree of liquidity (Sun et al., 2021).

Crypto assets are seen as speculative financial instruments because they are more volatile than other investment instruments. Although they are called “Cryptocurrency”, it has been revealed that it is not easy to use exactly like money when it is understood that goods and services cannot be traded intensively over “crypto money” (Pilatin, 2022). Global monetary authorities have started to use the term “crypto assets” to express “cryptocurrencies”, which they see as speculative financial assets, with the effect of increasing transaction volume and individual and institutional investor demand for crypto assets (Nishibe, 2016). For this reason, it will be expressed as a crypto asset (CA) instead of cryptocurrency (CC) in the study.

While crypto assets are mostly used by individual investors, they have recently been used by institutional investors

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as well. Due to the fact that crypto assets are a relatively new and rapidly growing asset class, legal regulations have not yet been made in Turkey, as in many other countries in the world. The reason why it has not yet been put into a legal framework is that states, policy makers and economists have not been able to reach a full consensus on these assets.

Brand awareness is an indicator of the popularity of cryptocurrencies. This awareness can sometimes become a supportive competitive force, especially in the institutional investor market (Presthus & O'Malley, 2017). Therefore, investors tend to decide which crypto assets to add to their portfolios based on their familiarity.

In order to achieve higher expected returns, portfolios with higher risk but higher return potential have been created by developing different asset portfolio strategies with crypto assets (Semra & Doğuş, 2021). Increasing interest and the fact that the market value of crypto assets reached 3 trillion dollars in 2021 (CoinMarketCap, 2022) has also increased the interest in crypto assets in academic terms. Much more work has been done on cryptoassets than in the early days (Sun et al., 2021; Dilek, 2022; Pilatin, 2022).

The value of crypto assets, which was at the level of 120 billion dollars at the beginning of 2019, increased to 200 billion dollars at the end of the year and 500 billion dollars at the end of 2020. In 2021, the total market value of crypto assets has seen 3 trillion dollars (CoinMarketCap, 2022). In this respect, 2021 can be seen as a record year for crypto assets. Compared to the period before 2019, it is noteworthy that crypto assets have gained a lot of value, transaction volumes have increased, while market sizes have increased, volatility has decreased considerably. New investors entering the crypto asset markets contribute to the increase in the trading volume, liquidity level and financial depth in the market, while also supporting the reduction of risk and volatility (Pilatin, 2022).

The market value of crypto assets is approximately \$1.8 trillion as of March 1, 2022. Considering that the gold asset in the world is around 18 trillion dollars, it is understood that the value of crypto assets, whose history is very new compared to gold (based on 3 trillion dollars), has reached 1/6 of the world's registered gold assets (Pilatin, 2022). This is a really high number. In addition, the share of Bitcoin, which had an average of 85% share in the crypto asset market in 2016, decreased to 32% in 2018, then increased to 65% in 2020. Although Bitcoin's share in the market was 65% until the middle of 2021, it decreased to 40% in the second half of the year. In this time frame, the share of Ethereum and other altcoins has increased. By the end of 2021, the share of Ethereum increased to 20%, Binance's share to 4%, Tether's share to 3.5% and Solano's share to 2.5% (CoinMarketCap, 2022). From this point of view, it can be said that even if crypto assets will not replace value storage instruments such

as gold, Dollar and Euro (Klein et al., 2018), it will continue to have its potential to be a valuable investment and an important reserve accumulation tool in the long run.

In this research, the factors that affect individuals' intentions and real investment behaviors through their psychology at the stages of the adoption of crypto asset technology and investments, which are an innovative investment tool, and investment in these assets are discussed within the framework of the Decomposed Theory of Planned Behavior (DTPB).

After the introduction, in the second part of the study, DTPB and crypto-asset literature are examined. In the third part, data and methodology are given, and then in the fourth part, the process of forming the hypotheses is explained. In the fifth chapter, the results of the analysis are reported, and finally in the sixth chapter, the results and recommendations are given by considering the studies in the literature.

Decomposed theory of planned behavior

This study is one of the first studies in the literature conducted in developing countries to measure investor behavior towards cryptoassets based on the Decomposed Theory of Planned Behavior. In the study, crypto asset investor behavior in Turkey was tested with 11 alternative hypotheses. The Decomposed Theory of Planned Behavior (DTPB) developed by Taylor and Todd (1995) is an improved version of the Theory of Reasoned Action (TRA) developed by Fishbein and Ajzen (1975) and Theory of Planned Behavior (TPB), which is the developed form of TRA by Ajzen (1991).

According to TRA developed by Fishbein and Ajzen (1975), an individual's intention towards a behavior is affected by attitudes and subjective norms. Attitude expresses the opinion about positive or negative behavior, while subjective norms express the social pressure to perform or not perform a certain behavior. Accordingly, the attitudes of individuals play a decisive role in estimating the resulting intention (Aziz & Afag, 2018: 3).

Ajzen (1985, 1991), who thinks that the Theory of Reasoned Action is insufficient in measuring various abilities, resources and opportunities, predicting the behavior of the individual, exhibiting or determining the intention, has developed the Theory of Planned Behavior (TPB) by adding the perceived behavioral control to the model. The degree to which an individual performs an action does not depend on his intention alone. It also depends on their abilities, psychology, and the opportunities and resources needed to perform the behavior (Ajzen, 2020: 319). In this framework, perceived behavioral control is used to take into account situations in which individuals do not have full control over

Decomposed Theory of Planned Behavior (DTPB)

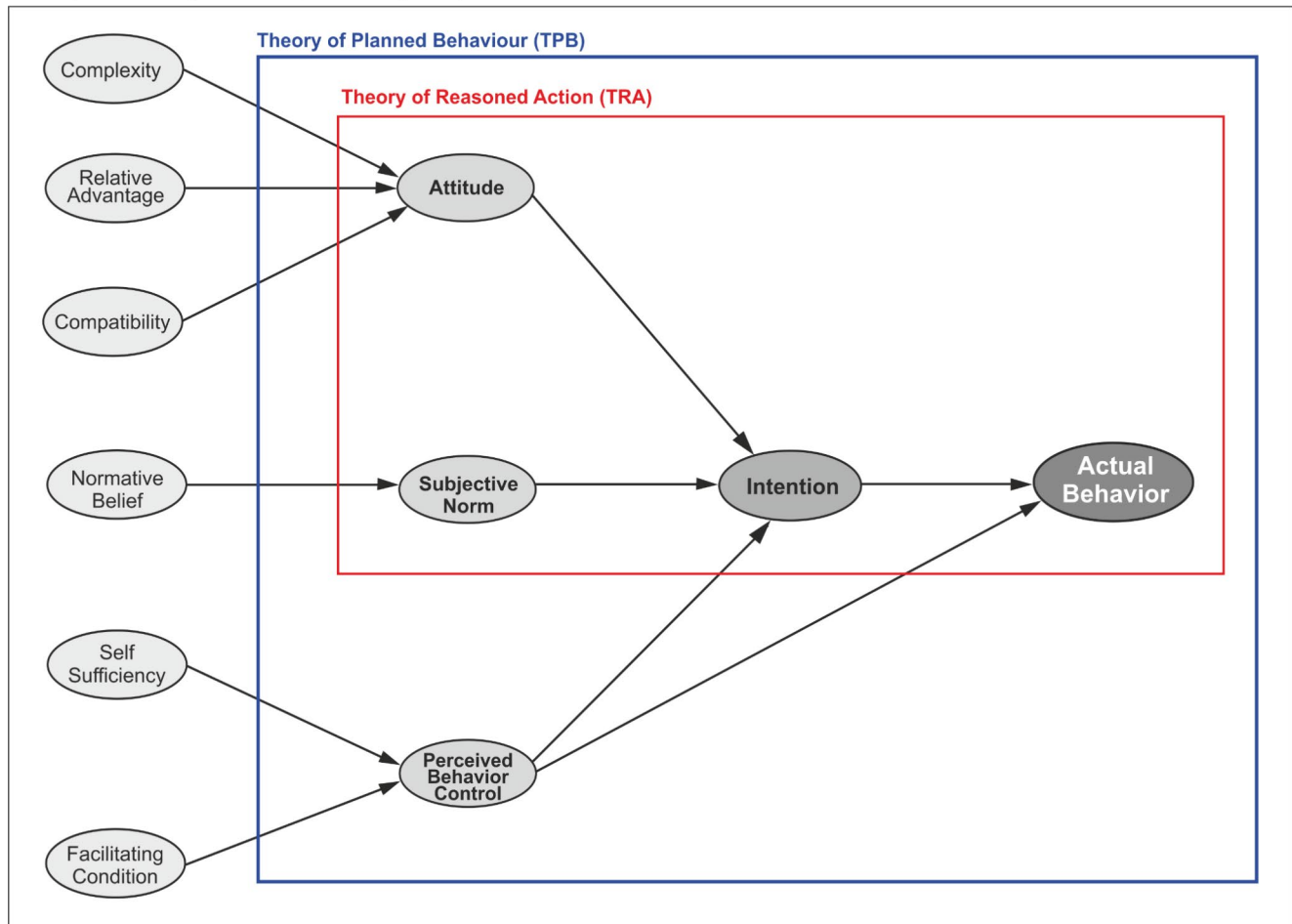


Fig. 1 TRA (Fishbein ve Ajzen, 1975), TPB (Ajzen, 1991; 2006) and DTPB (Taylor & Todd, 1995) Drawn with Corel Draw

their behavior. According to TPB, people’s social behavior is caused by certain reasons and occurs in a planned way. In order for a behavior to occur, an intention must first be formed. Intention also influences attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991).

Combining the TPB and the technology acceptance model, Taylor and Todd (1995) came up with the Decomposed Theory of Planned Behavior (DTPB), which describes attitude, subjective norms, and perceived behavioral control. (See Fig. 1)

According to DTPB, attitude; relative advantage is determined by complexity and compatibility. While the determinants of subjective norms are normative beliefs, the determinants of perceived behavioral control are self-efficacy and facilitating conditions. It has been observed that this model has higher explanatory power in determining intention and behavior compared to the other two models (Shih & Fang, 2004: 216). For this reason, DTPB has been used in many different areas in the literature such as banking (Aziz & Afag, 2018; Nor & Pearson, 2008), online/

mobile commerce (Gangwal & Bansal, 2016), purchasing/consumer behavior (Choi & Park, 2020), social networking (Al-Ghaith, 2016), tourism (Garay et al., 2019). There are different studies in the literature on crypto assets. There have been studies investigating the effects of economic news, commodity prices, global uncertainties, trade volume, prices, currencies and other economic and financial variables on crypto asset returns (Al-Khazali et al., 2018; Bouri et al., 2019; Büberkökü, 2021; Bouri & Gupta, 2021; Kim). Al-Khazali et al. (2018) discussed the effects of macroeconomic news on gold and Bitcoin. He concluded that Bitcoin prices and volatility are relatively less responsive to macroeconomic news than gold, whether the impact is positive or negative. Bouri et al. (2019) examined the asymmetric non-linear short/long-term effects of commodity prices on Bitcoin price. It took into account the global uncertainty and revealed that the global financial stress index Granger causes Bitcoin returns. Büberkökü (2021) points out that there is a strong simultaneous interaction between both return rates and volatility values of cryptocurrencies. Bitcoin, Litecoin,

XRP etc. Although some crypto assets are highly correlated with each other, it has also been determined that there are crypto assets such as ETH, TRON, BUSD that have a negative correlation with each other (Sun et al., 2021; Bourri & Gupta, 2021) state that the predictability of Bitcoin using internet search-based uncertainty measures is stronger than those taken from newspapers.

In studies on cryptocurrency experts (Ermakova et al., 2017) and investor awareness (Henry et al., 2018), individuals' intentions to adopt cryptoassets were investigated. In addition, the relevance of using crypto assets as an investment tool and the use of technology and the effect of using these assets as investment opportunities (Presthus & O'Malley, 2017) on the motivation of individuals to invest in these assets are discussed. Nishibe (2016) state that crypto assets are seen as an investment tool rather than a functional currency.

In the study in which the effects of crypto assets on portfolio risk and return are measured and interpreted (Semra & Doğuş, 2021), it has been found that when added to the portfolio content, they positively affect the portfolio in terms of risk-return balancing and offer high returns with the opposite correlation they show. Choi (2021) found in his study that a 1% increase in Tweets results in an approximately 7% increase in liquidity within five to 10 min. This study proves that tweets can significantly increase investors' buying demand for crypto assets and Bitcoin liquidity in real time.

Some studies have focused on crypto-asset investor behavior. However, most of the studies have addressed institutional investor behavior (Bouri et al., 2019; Henry et al., 2018; Mazambani & Mutambara, 2019; Sun et al., 2021), it was found that price volatility in crypto assets did not reduce the confidence of institutional investors. In addition, it was concluded that crypto-asset units with high awareness and trust can be very suitable in the portfolios of institutional investors. Lin (2021), using Granger Causality tests, concluded that there is an interaction between returns and attention. On the other hand, it was emphasized that if a crypto asset has a higher historical performance, investors may pay more attention to it. Henry et al. (2018) concluded in his study that crypto-asset investors tend to have higher financial literacy. Crypto investors also tend to have experience investing in traditional risky financial assets and use non-cash payment methods.

In the study (Schaupp et al., 2022), which is the only study similar to this study, it was determined that the DTPB model explained 63.5% of the variance in the intention to adopt the cryptocurrency. In this study, all pathways to behavioral intention were found to be significant in hypothetical directions. However, no evaluation has been made regarding the transformation of intention into actual behavior, that is, crypto asset investment. In this study, unlike the

Table 1 Population and Sample

Region	Population	%	Applied Survey	%
Marmara	24.899.126	30,2	360	29,5
Central Anatolia	12.896.255	15,8	200	16,3
Mediterranean	10.584.506	13,0	160	13,0
Aegean	10.477.153	12,9	150	12,2
Southeastern Anatolia	8.576.391	10,6	135	11,0
Black Sea	7.696.132	9,6	125	10,0
Eastern Anatolia	6.513.106	7,9	92	8,0
Total	81.642.669	100	1222	100,0

Source: <https://icisleri.gov.tr/turkiyenin-nufus-haritasi-10072021>

studies in the literature, the effects of intention and perceived behavioral control on crypto asset investment behavior were examined. This feature and the fact that it was conducted in a developing country are the most important contributions of the study to the literature.

Data, methodology and research model

Descriptive statistics on variables

Table 1 shows the number of surveys applied in proportion to the population of the regions. In the Marmara Region, which is the most populated region, 29.5% of the questionnaires were applied. Central Anatolia Region ranks second with 16.3%. This is followed by the Mediterranean Region with 13%, the Aegean Region with 12.2%, the Southeastern Anatolia Region with 11%, the Black Sea Region with 10% and the Eastern Anatolia Region with 8%.

Descriptive statistics of the variables are given in Table 2. Accordingly, the effect levels of the factors affecting the purchase of crypto assets by investors are as in Table 2 in the form of those who do not invest in crypto assets and the total.

Methodology

In this study, the factors affecting the use of Crypto Assets in Turkey according to TPB were analyzed. TPB argues that the behaviors of individuals occur due to certain reasons and take place in a planned manner. For this reason, in order for a behavior to occur, there must first be an intention for that behavior. There are variables that enable the intention to emerge. Attitude, Subjective Norms, and Perceived Behavioral Control are also factors that affect Intention (Taylor & Tood, 1995). The questionnaire form was created by using the original scale expressions developed for TPB (Beck & Ajzen, 1991) and for DTPB (Taylor & Todd, 1995) and scales in other studies (Chen & Tung, 2014) using this model. The survey prepared to determine the emergence of crypto asset purchasing behavior in Turkey consists of two

Table 2 Descriptive Statistics

N = 765	AB	I	A	CB	RA	CL	SN	NB	PBC	SS	FC
Non Investor											
Mean	1,794	1,985	2,332	2,272	2,383	3,435	2,208	2,549	2,966	3,413	2,709
Std. Deviation	0,928	0,966	1,037	0,985	0,854	0,733	0,913	0,646	1,027	0,804	1,018
Std. Error of Mean	0,33	0,035	0,037	0,036	0,031	0,027	0,033	0,023	0,037	0,029	0,037
Minimum	1	1	1	1	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5	5	5	5	5
N = 403 Investor											
Mean	4,178	4,153	4,202	3,790	3,669	3,172	2,839	3,058	4,193	4,471	4,155
Std. Deviation	0,765	0,777	0,759	0,908	0,879	0,859	1,068	0,860	0,762	0,627	0,738
Std. Error of Mean	0,037	0,039	0,038	0,045	0,044	0,043	0,053	0,043	0,038	0,031	0,037
Minimum	1	1	1	1	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5	5	5	5	5
N = 1168 Non Investor + Investor											
Mean	2,885	2,733	2,977	2,796	2,827	3,344	2,426	2,725	3,390	3,778	3,208
Std. Deviation	1,345	1,372	1,301	1,200	1,057	0,789	1,014	0,766	1,109	0,901	1,157
Std. Error of Mean	0,39	0,040	0,038	0,035	0,031	0,023	0,030	0,022	0,032	0,026	0,034
Min.	1	1	1	1	1	1	1	1	1	1	1
Max.	5	5	5	5	5	5	5	5	5	5	5
Sum of Square	1146.8	1241.5	922.7	608.8	436.1	18.26	105.0	68.52	397.12	296.7	551.94
F	1382.6	1513.9	1021.8	661.7	585.3	30.10	111.7	129.70	445.92	528.59	637.05
Sig.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: Avcite Behaviour (AB), Intention (I), Attitude (A), Compatibility (CB), Relative Advantage (RA), Complexity (CL), Subjective Norms (SN), Normative Belief (NB), Perceived Behavioral Control (PBC), Self-Sufficiency (SS), Facilitating Conditions (FC).

Table 3 Research Hypotheses

H_{1a}:	Complexity (CL) has a positive and significant impact on attitude (A) towards crypto asset transactions.
H_{1b}:	Relative advantage (RA) has a positive and significant impact on attitude (A) towards crypto asset transactions.
H_{1c}:	Compatibility (CB) has a positive and significant impact on attitude (A) towards crypto asset transactions.
H₁:	Attitude (A) has a positive and significant effect on the intention (I) to adopt crypto asset investments.
H_{2a}:	Normative belief (NB) has a positive and significant effect on subjective norms (SN) for crypto asset investments.
H₂:	Subjective norms (SN) have a positive and significant effect on the intention (I) to adopt crypto asset investments.
H_{3a}:	Self-Sufficiency (SS) has a positive and significant effect on individuals' perceived behavioral control (PBC) towards crypto asset investments.
H_{3b}:	Facilitating conditions (FC) have a positive and significant effect on individuals' perceived behavioral control (PBC) towards crypto asset investments.
H₃:	Perceived behavioral control (PBC) has a positive and significant effect on the intention (I) to adopt crypto asset investments.
H₄:	Perceived behavioral control (PBC) has a positive and significant effect on the actual behavior (AB) of investing in crypto assets.
H₅:	Intention (I) has a positive and significant impact on the investing actual behavior (AB) of individuals investing in crypto assets.

parts. The questionnaire consists of a total of 57 questions, the first part of which is 7 questions describing the demographic characteristics, and the second part is 50 questions that make up the scale. While preparing the scale questions, TPB (Ajzen, 1991), TRA (Fishbein & Ajzen, 1975) and PBC (Taylor & Todd, 1995) models were used.

The data set of the research consists of the cross-sectional data set obtained from the surveys conducted in 7 regions of Turkey. These 6 sets of data were obtained in a 3-month period between March 2021 and May 2021. Convenience sampling method was used in the application phase of the questionnaire. The surveys were conducted through social media platforms and announcements and posts made on investor blogger sites such as Investing, TradingView, foreks, crypto, MyNet stock market throughout Turkey. Due to the Covid-19 global epidemic, the surveys were applied to 1,222 people online.

Attitude scale consists of 5 statements, Subjective Norms scale consists of 4 statements, Perceived Behavioral Control scale consists of 4 statements, Intention Scale consists of 5 statements and Actual Behavior Scale consists of 2 statements (See Table 3). The scale was evaluated with a Likert type scale defined as “1 = Strongly Disagree... 5 = Strongly Agree”. The data were evaluated using reliability (Cronbach’s alpha) and factor analysis.

The Cronbach’s Alpha value indicates the reliability coefficient and takes values between 0 and 1. If this coefficient is 0.7 and above, the reliability of the scale is considered

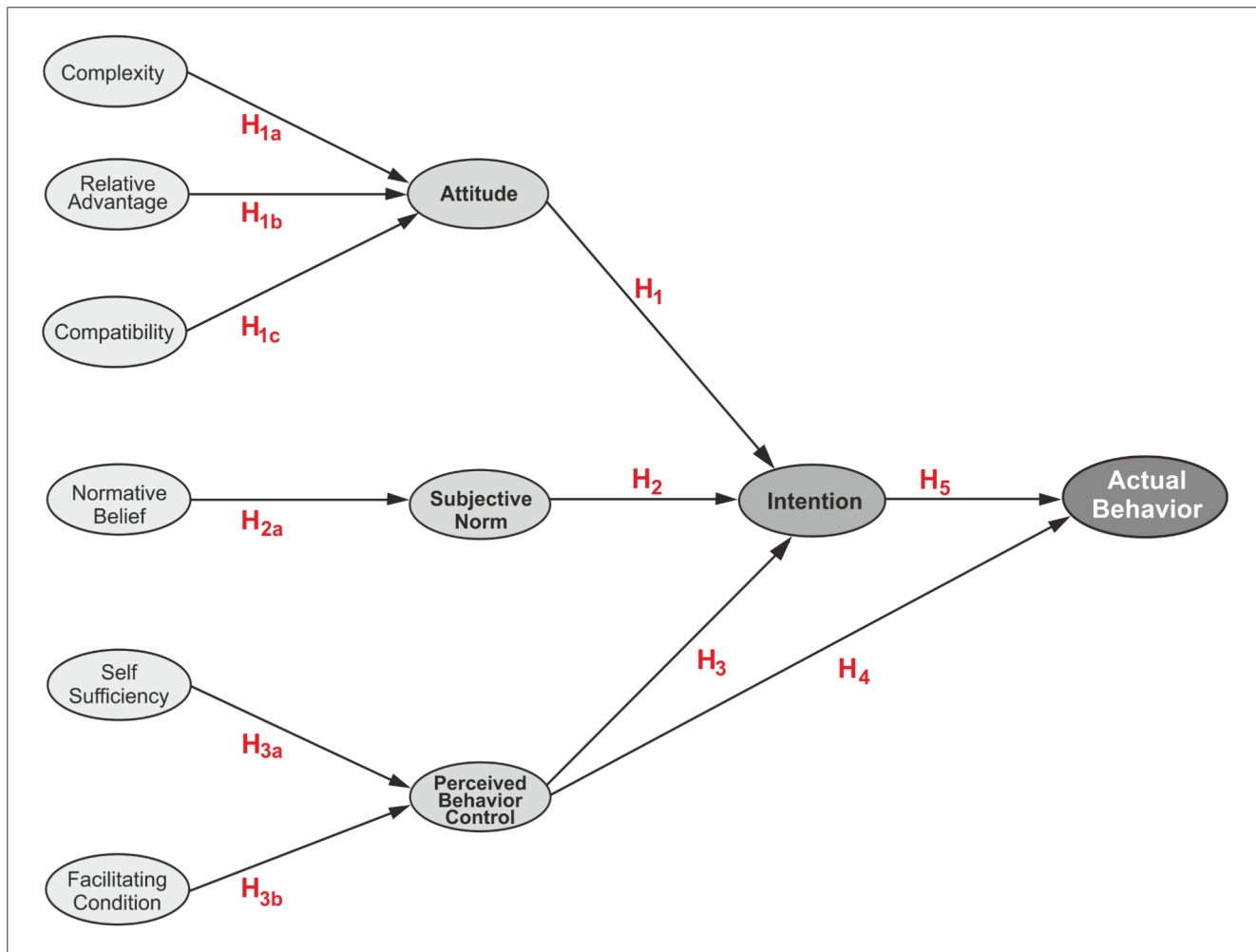


Fig. 2 Research Model (Taylor & Todd, 1995). Drawn with Corel Draw

sufficient (Kılıç, 2016). With Bartlett's Test of Sphericity, it was tested whether the statements forming the scale were consistent with each other (Bartlett, 1954) and whether the KMO value and the sub-dimensions constituting the scale were suitable for the analysis (Kaiser, 1974). A KMO value below 0.5 is unacceptable, while 0.5–0.7 is considered weak, 0.7–0.8 is adequate, and above 0.8 is high (Coşkun et al., 2015).

After the necessary prerequisites were met, confirmatory factor analysis was performed first, and then hypotheses were tested with structural equation modeling (SEM). It was examined whether the values of goodness of fit obtained as a result of confirmatory factor analyzes were within the recommended values (Doll et al., 1994: 456). In order to obtain goodness-of-fit values, covariance was added between the modifications suggested by the AMOS program (See Fig. 2) and the sub-dimensions that needed to be removed were removed from the model (See Table 4).

Hypothesis development

Complexity, relative advantage, compatibility, and attitude

Attitude is determined by three factors. These are relative advantage, compatibility, and complexity (Taylor & Todd, 1995). Relative advantage refers to the degree of benefit from an innovation's pioneer (Lin, 2021; Rogers, 1983) defines complexity as the degree to which an innovation is perceived as complex to understand, learn, or operate, while adaptability is the degree to which an innovation fits the previous experiences, current values, and needs of potential users. The only study on the use of crypto assets with direct DTPB shows that compliance has a significant and positive effect on attitude (Schaupp et al., 2022). While relative advantage is expected to have a positive effect on attitude towards cryptoassets, complexity is expected to have a negative effect (Shih & Fang, 2004).

Table 4 Demographic Characteristics

		Sayı	%
Gender	Female	507	41,5
	Male	715	58,5
Marital status	Married	500	41,0
	Single	722	59,0
Age	18–25	420	34,0
	26–35	380	31,5
	36–45	250	20,5
	46–55	110	9,0
	56 and +	62	5,0
Education level	High school and below	312	25,5
	Associate, Undergraduate	628	51,0
	Graduate	282	23,5
Jobs	Public Personnel	398	32,5
	Student	350	29,0
	Private sector	280	23,0
	Craftsman, Self Employed	110	9,0
	Worker, Retired	84	6,5
Income (TL)*	4500 and below	455	37,3
	4501–9000	417	34,0
	9001–13,500	205	16,8
	13,501–18,000	110	9,0
	18,001 +	35	2,9

* As of 18.05.2022, 1 US Dollar = 15.74 TL.

Based on this, the following hypotheses were formed.

Hypothesis 1a Complexity (CL) has a positive and significant impact on attitude (A) towards crypto asset transactions.

Hypothesis 1b Relative advantage (RA) has a positive and significant impact on attitude (A) towards crypto asset transactions.

Hypothesis 1c Compatibility (CB) has a positive and significant impact on attitude (A) towards crypto asset transactions.

Fishbein (2001) attitude; people's feelings towards an object, behavior or event as their positive or negative tendencies. Previous experiences, knowledge gained from these experiences and environmental factors play a role in the formation of attitudes. In many different studies, it is seen that the positive effect of attitude on intention is high. For example, in the use of Islamic banking services (Saptasari & Aji, 2020; Amin et al., 2012; Pilatin & Dilek, 2022), use of mobile banking (Jouda et al., 2020), use of internet banking (Shih & Fang, 2004), investor behavior (Sudarsono, 2015), gift buying behavior (Yoldaş & Dilek, 2020), food consumption (Öztürk et al., 2016).

Studies on the use of crypto-assets have shown that positive attitudes affect the investment intention towards crypto-assets (Schaupp et al., 2022; Soomro et al., 2022;

Mazambani & Mutambara, 2019). From this point of view, the hypothesis established to investigate the effect of attitude on the intention to adopt crypto-asset investments in Turkey is as follows.

Hypothesis 1 Attitude (A) has a positive and significant effect on the intention (I) to adopt crypto asset investments.

Normative belief and subjective norms

Subjective norms are people's perceptions of the social pressures they place on themselves to perform or not perform the behavior in question. (Ajzen, 1985: 12). Normative belief, which is the determinant of subjective norms, has two forms as precautionary normative belief and descriptive normative beliefs. The precautionary normative belief is the expectation that a particular reference individual or group (friends, family, spouse, person's doctor, etc.) approves or disapproves of performing the behavior in question. Descriptive normative beliefs, on the other hand, are beliefs about whether people whose behavior is important carry out this behavior themselves (Ajzen, 2020: 315). It has been observed that normative beliefs have a significant and positive effect on subjective norms regarding internet banking use (Shih & Fang, 2004) and crypto assets (Schaupp et al., 2022).

From this point of view, the hypothesis regarding the effect of normative beliefs on subjective norms was formed as follows.

Hypothesis 2a Normative belief (NB) has a positive and significant effect on subjective norms (SN) to crypto asset investments.

Ayedh et al. (2021), Mazambani and Mutambara (2019) studies, it has been observed that subjective norms have a positive effect on investment intention for crypto assets (Schaupp et al., 2022; Huong et al., 2021) in many studies. These results show that individuals can make investment decisions by being influenced by their relatives who advise on crypto-asset investments. From this point of view, the hypothesis regarding the effect of subjective norms on intention was formed as follows.

Hypothesis 2 Subjective norms (SN) have a positive and significant effect on the intention (I) to adopt crypto asset investments.

Self-efficacy, facilitating conditions and perceived behavioral control

Perceived behavioral control is determined by self-efficacy and facilitating conditions. Self-efficacy can be expressed

as being sure of the ability to act successfully in a situation (Bandura, 1982: 122). Facilitating conditions can include many factors such as time, money and access to other special resources. It is expected to have a positive impact on crypto asset investments due to the ease of accessibility thanks to the technological infrastructure (Shih & Fang, 2004: 21).

From this point of view, hypotheses regarding the effect of self-efficacy and facilitating conditions on perceived behavioral control were formed as follows.

Hypothesis 3a Self-Sufficiency (SS) has a positive and significant effect on individuals' perceived behavioral control (PBC) towards crypto asset investments.

Hypothesis 3b Facilitating conditions (FC) have a positive and significant effect on individuals' perceived behavioral control (PBC) towards crypto asset investments.

ADK is people's perceptions of their ability to perform a certain behavior (Ajzen, 2020: 316). While there are few studies that detect a negative (Huong et al., 2021) relationship between the intention to adopt crypto-asset investments and PBC, there are also studies regarding the existence of a positive relationship between the two variables. For this reason, the existence of the relationship between the related variables was sought in the study. From this point of view, the hypotheses related to this are determined as follows.

Hypothesis 3 Perceived behavioral control (PBC) has a positive and significant effect on the intention (I) to adopt crypto asset investments.

In addition, it is seen in many studies (Albashir et al., 2018; Farah, 2017) that ADK has a direct effect on actual behavior. The hypothesis established to measure the effect of ADK directly on actual behavior;

Hypothesis 4 Perceived behavioral control (PBC) has a positive and significant effect on the actual behavior (AB) of investing in crypto assets.

Mediator variable: intent

Intent; It is related to the effort that the individual is willing to spend while performing a behavior (Cordano & Frieze, 2000: 636). Intention can also be expressed as the tendencies or plans of individuals to perform or not perform the relevant behavior (Kocagöz & Dursun, 2010). Intention as a mediating variable; Attitude is determined by subjective norms and perceived behavioral control and is also the determinant of actual behavior. Rehman et al. (2007)

state that strong intentions increase the likelihood of actual behavior. Many studies in the literature (Echchabi & Aziz, 2012; Mahardhika & Zakiyah, 2020) have shown that intention has a positive and significant effect on actual behavior. This study focused on providing an explanation of the mediating role of intentions in the relationship between attitudes, subjective norms, and perceived behavioral control in crypto-asset investments.

A hypothesis measuring the effect of intention on actual behavior towards crypto-asset investment in Turkey.

Hypothesis 5 Intention (I) has a positive and significant impact on the investing actual behavior (AB) of individuals investing in crypto assets.

Actual behavior

Fishbein and Ajzen (1975) define behavior as an observable action performed or not performed towards a product or service in a particular situation. Purchasing behavior is a decision-making process that includes individuals' purchasing and using products and services (Durmaz & Bahar, 2011: 61). The degree of willingness of individuals to purchase a product or service depends on the effort they plan to spend to use that product or service and the motivation of the intention (Ajzen, 1991). When the model of the study in Fig. 3 is examined, it is seen that the actual behavior, that is, the behavior of investing in crypto assets, is determined by the intention and perceived behavioral control.

Findings

Demographic features

As seen in Table 5, 4.5 of the participants are female and 58.5% are male. When their marital status is examined, it is seen that 41% are married and 59% are single. Looking at the age ranges; 34% are 18–25, 31.5% are 26–35, 20.5% are 36–45, 9% are 46–55 years old, and 5% are 56 and over. 25.5% of the participants are high school or below, 51% are associate degree and undergraduate, 23.5% graduate.

When the occupations are examined, it is seen that 32.5% are public personnel, 29% are students, 23% are private sector employees, 9% are tradesmen and self-employed, 6.5% are workers and retired. 37% of the participants are between 4500 TL and below, 34% between 4501 and 9000 TL, 16.8% between 9001 and 13,500 TL, 9% between 13,501 and 18,000 TL, 2.9% between 18,001 Has an average monthly income of TL or more.

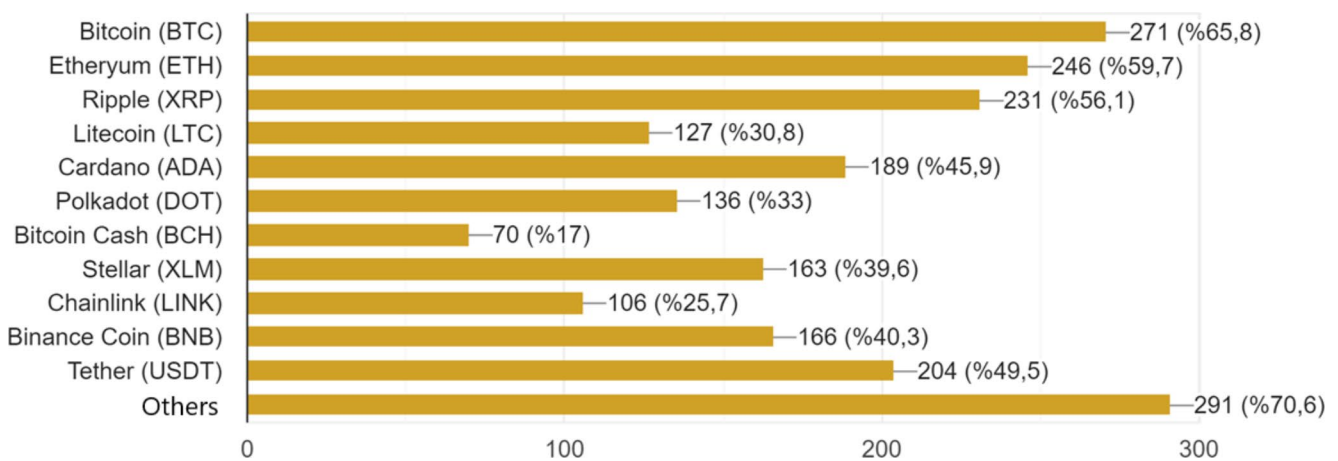


Fig. 3 Most invested crypto assets in Turkey (Drawn with Exel)

Table 5 Status of Investing in Cryptocurrency

Investing	Count	%
Yes	410	33,5
No	812	66,5
Total	1222	100,0

As seen in Table 6, it was determined that 33.5% of the participants invested in crypto money, and 66.5% did not invest in crypto money. These results show that approximately one out of every three people in Turkey invest in cryptocurrencies.

As seen in the figure, the most invested crypto assets in Turkey consist of sub-various coins (70.6%). It is followed by Bitcoin (59.7%), Ethereum (56.1%), Ripple (56.1%), Tether (49.5%) and Cardano (45.9%).

Data nad results

The factor loadings of the variables and other statistical values are given in Table 7. A Bartlett’s Test of Sphericity result of $0.000 < 0.001$ indicates that the statements that make up the scale are consistent with each other (Bartlett, 1954), and a KMO value of $0.962 > 0.70$ indicates the suitability of the data set for analysis (Kaiser, 1974). The Cronbach’s Alpha values calculated for each factor are as follows. Actual behavior ($\alpha = 0.935$), intention ($\alpha = 0.966$), attitude ($\alpha = 0.975$), conformity ($\alpha = 0.932$), relative advantage ($\alpha = 0.875$), complexity ($\alpha = 0.716$), normative belief ($\alpha = 0.772$), perceived behavioral control ($\alpha = 0.919$), self-efficacy ($\alpha = 0.899$), facilitating conditions ($\alpha = 0.916$), and subjective norm ($\alpha = 0.922$). The fact that Cronbach’s Alpha results are > 0.70 , indicates that the scale is reliable (Altunışık et al., 2016: 184).

Following these results, first confirmatory factor analysis was performed with the AMOS21 program and then hypotheses were tested with structural equation modeling (SEM).

It was determined that the goodness of fit values obtained as a result of confirmatory factor analysis were not within the recommended values (Doll et al., 1994: 456). For this reason, covariance has been added between e27-28, e31-34, e2-6, e2-3, e12-14, e14-16, e38-39, e42-43, e43-44, e18-21, e19-20 error terms, taking into account the modifications suggested by the AMOS program. In addition, error terms e1, e4, e23 and e26 (respectively, questions K2, K5, NI3, NI6) that were not suitable for the model were removed from the model. The goodness-of-fit values obtained as a result of the modifications were within the recommended values. The results are as shown in Table 8.

In the tests performed to determine the reliability of the structural equation model, it is required that the mean variance extracted (AVE) value of the dimension is greater than 0.50 (Fornell & Larcker, 1981) and the CR value of the dimension is greater than 0.70 (Hair et al., 2014). As can be seen in Table 4, the AVE and CR values of all variables meet these conditions.

The results of confirmatory factor analysis and reliability tests to be used in this study show that it is suitable for analysis with SEM. In this framework, the analyzes were made with the AMOS program. Structural model results for the relationship between variables are shown in Fig. 4.

The loads of the estimators of the variables in the structural model are shown in Table 4. Accordingly, It was understood that dimension GA3 with highest effect on Relative Advantage, dimension K4 with highest effect on Complexity, dimension U2 with highest effect on Agreement, dimension NI2 with highest effect on Normative Belief, dimension O5 with highest effect on Self-Efficacy, the dimension KK4 with the highest effect on Facilitating Conditions, dimension T3 with the highest effect on Attitude, dimension SN4 with the highest effect on Subjective Norms, and N1 with the highest effect on Intention. It was determined that the

Table 6 Factor Loads of Variables and Other Statistical Values

	Factor Load	Cronbach Alfa	Explained Variance		Factor Load	Cronbach Alfa	Explained Variance
Actual Behavior		,935	7,120	Normative Belief		,772	5,305
AB1	,774			NB1	,510		
AB2	,718			NB2	,628		
Intention		,966	9,457	NB3	,838		
I1	,870			NB4	,594		
I2	,868			NB5	,714		
I3	,850			NB6	,705		
I4	,810			Perceived Behavioral Control		,919	2,947
I5	,789			PBC1	,851		
Attitude		,975	8,205	PBC2	,850		
A1	,871			PBC3	,829		
A2	,867			PBC4	,623		
A3	,876			Self-Sufficiency		,899	2,854
A4	,851			SS1	,657		
A5	,833			SS2	,720		
Compatibility		,932	7,315	SS3	,510		
CB1	,808			SS4	,755		
CB2	,769			SS5	,666		
CB3	,806			SS6	,629		
CB4	,575			Facilitating Conditions		,916	2,305
Relative Advantage		,875	11,952	FC1	,698		
RA1	,555			FC2	,638		
RA2	,678			FC3	,614		
RA3	,705			FC4	,589		
RA4	,622			FC5	,523		
Complexity		,716	9,620	Subjektif Norm		,922	7,324
CL1	,792			SN1	,824		
CL2	,603			SN2	,875		
CL3	,859			SN3	,808		
CL4	,856			SN4	,872		
CL5	,701						
Bartlett's Test of Sphericity: 0.000 KMO = 0,962				Total Variance Explained: %74,404			

Table 7 Goodness of Fit Values of the Research Model

Criteria	Results	Acceptable Fit
χ^2/df	4,975	$0 < \chi^2/df \leq 5$
GFI	,830	$,80 \leq GFI \leq 1$
RMSEA	,060	$0 \leq RMSEA \leq ,08$
CFI	,934	$,90 \leq CFI \leq 1$
TLI	,928	$,90 \leq TLI \leq 1$
AGFI	,806	$,80 < AGFI \leq 1$

dimension with the highest effect on Actual Behavior was D1.

The hypotheses for the existence of the relationship between the variables in the structural model were evaluated. For this purpose, p values showing the direction and strength of the relationship, standardized regression weights and R^2 values showing the extent to which independent variables explain the dependent variable were examined. These results are shown in Table 10.

Table 8 AVE and CR Values of the Structural Model

Variables	Composite Reliability (CR)	Average Variance Extracted (AVE)
Relative Advantage	0,869	0,625
Complexity	0,832	0,626
Compatibility	0,936	0,787
Normative Belief	0,878	0,650
Self-Sufficiency	0,889	0,577
Facilitating Conditions	0,920	0,703
Attitude	0,974	0,884
Subjektif Norm	0,912	0,723
Perceived Behavioral Control	0,897	0,745
Intention	0,963	0,840
Actual Behavior	0,938	0,884

CR > ,70 and AVE > ,50

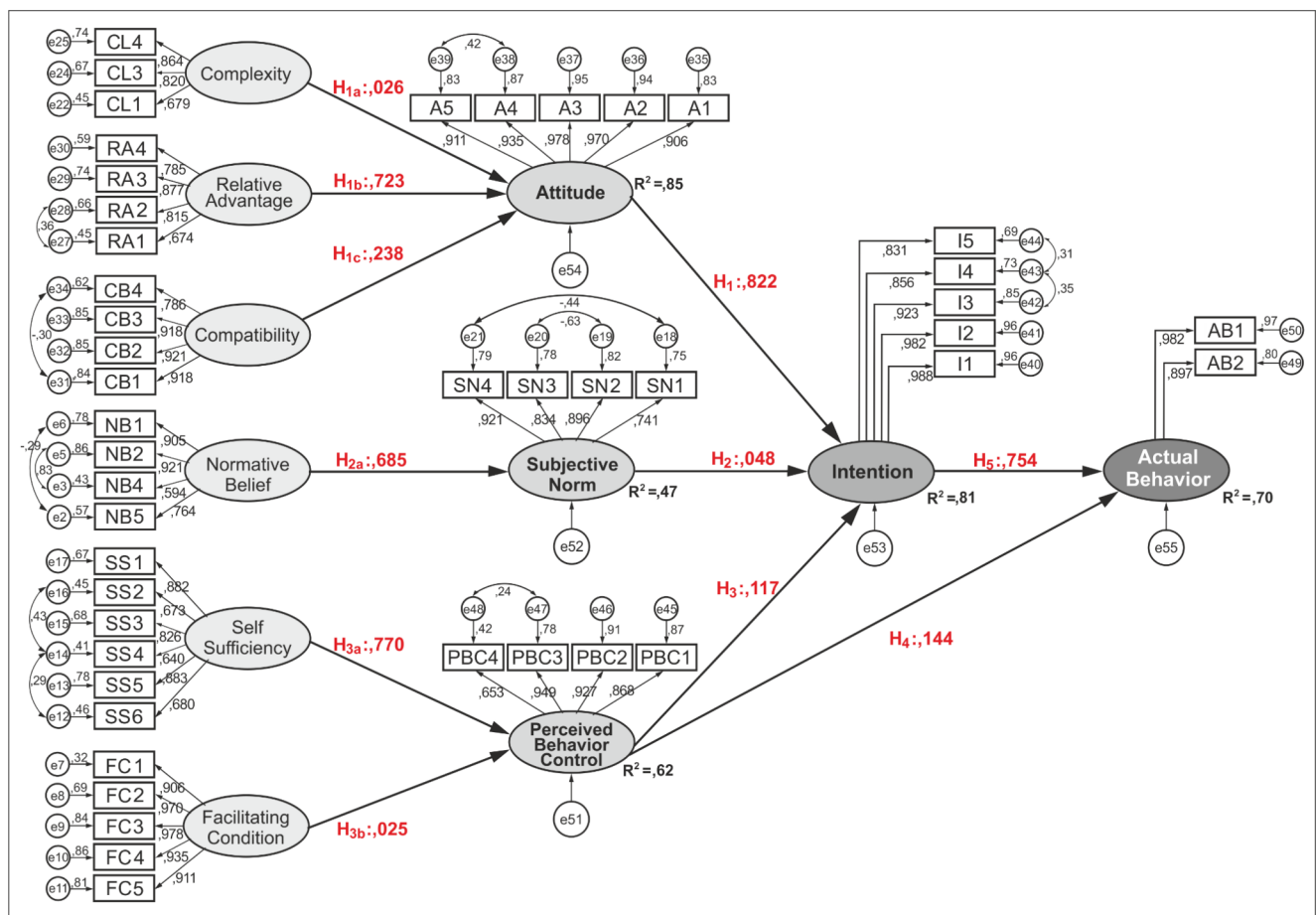


Fig. 4 Structural Equation Model Result (It was produced with the AMOS program. Drawn with Corel Draw)

According to the R^2 values, it was understood that the variables of complexity, relative advantage and compatibility explained the attitude variable by 85%. While the normative belief variable explained the subjective norm variable with a rate of 46.9%, the variable of self-efficacy and facilitating conditions explained the variable of perceived behavioral control at the rate of 61.7%. It is seen that the variables of attitude, subjective norm and perceived behavioral control explain the intention variable at the rate of 81.1%. In addition, it was determined that the perceived behavioral control and intention variable explained the actual behavior by 69.7%.

According to the model results, the hypotheses H_{1a} , H_{1b} and H_{1c} , which state that the sub-dimensions of complexity, relative advantage and compatibility have an effect on attitude, were accepted. Among these sub-dimensions, it was understood that the relative advantage (0.723) sub-dimension affected the attitude the most. The factor that affected the attitude the least was complexity (0.026). This result may be due to the extremely risky, volatile and intensive technology use of crypto assets, which are an innovative investment tool.

The H_{2a} hypothesis, which states that the normative belief sub-dimension is effective on subjective norms, was accepted. It was understood that the normative belief sub-dimension significantly affected the subjective norm dimension (0.685). The H_{3a} hypothesis, which states that the self-efficacy sub-dimension affects the perceived behavioral control variable, was accepted, while the H_{3b} hypothesis, which states that the facilitating conditions sub-dimension affects the perceived behavioral control variable, was rejected. It was found that the perceived behavioral control variable was mostly affected by the self-efficacy sub-dimension (0.770).

According to the results of SEM, the main hypotheses H_1 , H_2 and H_3 , which state that the variables of attitude, subjective norm, and perceived behavioral control have an effect on intention, were accepted. It has been understood that these three variables have a significant and positive effect on individuals' intention to purchase cryptoassets. It has been determined that the attitude variable (0.822) affects intention the most among these three dimensions. Hypotheses H_4 and H_5 , which measure the effect of intention and perceived behavioral control variables on actual behavior,

Table 9 Structural model results

Questions		Variables	Estimate
CL1- Learning to invest in crypto asset is difficult	<---	Complexity	0,679
*CL2- Investing in crypto asset is risky			
CL3- Investing in crypto asset is complex	<---	Complexity	0,820
CL4- Investing in crypto is difficult	<---	Complexity	0,864
*CL5- I don't trust crypto asset investment			
RA1- Investing in crypto asset makes you feel more confident than other investment vehicles	<---	Relative Advantage	0,674
RA2- The advantages of investing in crypto asset outweigh the disadvantages	<---	Relative Advantage	0,815
RA3- Investing in crypto asset provides more returns than other investment tools	<---	Relative Advantage	0,877
RA4- Crypto asset includes lower commission, transaction fee compared to other investment instruments	<---	Relative Advantage	0,785
CB1- Buying crypto asset suits my lifestyle	<---	Compatibility	0,918
CB2- Buying crypto asset makes me feel better	<---	Compatibility	0,921
CB3- Buying crypto asset gives me additional benefits	<---	Compatibility	0,918
CB4- Buying crypto asset gives me prestige	<---	Compatibility	0,786
NI1- My family thinks I should invest in crypto asset	<---	Normative Belief	0,905
NI2- My family thinks I should invest in crypto asset because it will give me prestige	<---	Normative Belief	0,921
* NI3- I generally give importance to my family's opinions.			
NI4- My friends think I should invest in crypto asset	<---	Normative Belief	0,594
NI5- My friends think I should invest in crypto asset because it will give me prestige	<---	Normative Belief	0,764
*NI6- I generally give importance to the opinions of my friends			
SS1- I can buy crypto asset easily if I want	<---	Self-Sufficiency	0,822
SS2- It is important that I can easily purchase a service	<---	Self-Sufficiency	0,673
SS3- I am comfortable buying crypto on my own	<---	Self-Sufficiency	0,826
SS4- It's important to be comfortable when hiring a service on my own	<---	Self-Sufficiency	0,640
SS5- I can buy crypto asset without anyone's help	<---	Self-Sufficiency	0,883
SS6- It is important for me to make an investment without help from anyone	<---	Self-Sufficiency	0,680
FC1- Lack of legal restrictions on cryptocurrencies encourages buying crypto asset	<---	Facilitating Condition	0,560
FC2- Conditions in the country lead me to invest in crypto asset	<---	Facilitating Condition	0,831
FC3- Possibility to buy multiple crypto assets drives me to invest in Crypto	<---	Facilitating Condition	0,914
FC4- Having the opportunity to buy and sell crypto asset 24/7 leads me to crypto asset money investment	<---	Facilitating Condition	0,927
FC5- Increasing technologies and digitalization lead me to invest in crypto asset	<---	Facilitating Condition	0,904
A1- I like the idea of buying crypto assets	<---	Attitude	0,906
A2- It is wise to buy crypto asset	<---	Attitude	0,970
A3- It's a good idea to buy crypto asset	<---	Attitude	0,978
A4- It is useful to buy crypto asset	<---	Attitude	0,935
A5- Crypto asset is worth buying	<---	Attitude	0,911
SN1- People who influence my decisions think I should buy crypto asset	<---	Subjective Norm	0,741
SN2- People who influence my decisions think that I should invest in crypto asset because it will provide prestige	<---	Subjective Norm	0,896
SN3- People I care about think I should buy crypto asset	<---	Subjective Norm	0,834
SN4- People whose opinion I care about think that I should invest in crypto asset because it will provide prestige	<---	Subjective Norm	0,921
PBC1- I have the knowledge, skills and resources necessary to invest in crypto asset	<---	Perceived Behavior Control	0,868
PBC2- I know how to use the knowledge, skills and resources necessary to invest in crypto asset	<---	Perceived Behavior Control	0,927
PBC3- I am confident that I can easily invest in crypto asset	<---	Perceived Behavior Control	0,949
PBC4- The control/decision is entirely mine in the process of investing in crypto asset	<---	Perceived Behavior Control	0,653
I1- I intend to buy crypto asset	<---	Intention	0,988
I2- I'm planning to buy crypto asset	<---	Intention	0,982
I3- I make an effort to buy crypto asset	<---	Intention	0,923
I4- I am willing to bear the cost to buy crypto asset	<---	Intention	0,856

Table 9 (continued)

I5- I am ready for the possibility of loss when I buy crypto asset	<---	Intention	0,831
AB1- I invest in crypto asset	<---	Actual Behavior	0,982
AB2- I trade crypto asset frequently	<---	Actual Behavior	0,897

* Questions extracted from the SEM model in order to provide the recommended goodness-of-fit values

Table 10 Hypothesis Results

	Hypotheses	R ²	B1	S.E.	P	Results
H_{1a}	Attitude <---Complexity	,850	,026	,028	,100*	Accept
H_{1b}	Attitude <---Relative Advantage		,723	,065	,000***	Accept
H_{1c}	Attitude <--- Compatibility		,238	,031	,006***	Accept
H_{2a}	Subjective Norm <--- Normative Belief	,469	,685	,037	,000***	Accept
H_{3a}	P. Behavior Control <--- Self-Sufficiency	,617	,770	,063	,000***	Accept
H_{3b}	P. Behavior Control <--- Facilitating Conditions		,025	,045	,365	Reject
H₁	Intention <---Attitude	,811	,822	,022	,000***	Accept
H₂	Intention <---Subjective Norm		,048	,022	,001***	Accept
H₃	Intention <---Perceived Behavioral Control		,117	,019	,000***	Accept
H₄	Actual Behavior <--- P. Behavior Control	,697	,144	,021	,000***	Accept
H₅	Actual Behavior <--- Intention		,754	,021	,000***	Accept

***, **, * denote significance levels of 0.01, 0.05 and 0.10, respectively p < 0.05, (B1: Standardized Regression Weights)

were also accepted. It has been determined that these two variables have a significant and positive effect on crypto asset purchasing behavior. Of these two variables, it is seen that the intention variable affects the actual behavior, that is, buying crypto assets more (0,754).

Results

Today, when changing and developing technology affects every stage of human life, money has also been included in the digitalization process. Crypto assets, which are under the control of a central authority, are not tied to a central authority, are only numbers, can be stored in an external memory and are now very valuable, have emerged. The restrictive regulatory initiatives of some countries for cryptoassets and the existence of some legal loopholes cause cryptoasset investments to be approached with suspicion. However, in addition to the rapid developments in technology, international institutions, companies and investment banks started to add crypto assets to their portfolios, they gave their customers the right to buy and sell, the increase in the number of individual and institutional investors, the decrease in risk and volatility with the transaction volume reaching very high figures, the investors' interest in crypto assets increased. The total value of crypto assets, which approached 3 trillion dollars in 2021, is around 1.8 trillion dollars as of March 2022. In addition to Bitcoin (BTC), which is the first of the crypto assets and still has the highest share in the market, there are approximately 2,000 crypto assets in the market today.

Despite the increase in the number, use and trading volumes of crypto assets, there are few studies in the literature that focus on investigating the factors that affect the adoption of crypto-asset investments. In addition, the inability to find a comprehensive study in a developing country and the volume of assets in question constitute the main motivations for this study. The demand for crypto assets is truly remarkable, although from a human psychology perspective, new, unknown assets are seen as risky and individuals tend to stay away. In this study, for the first time, Decomposed Theory of Planned Behavior (DTPB) is used to reveal the factors that enable the adoption of investments in crypto assets in Turkey. Crypto assets are very important as a future investment vehicle or currency, even if they are seen as low probability by some (Klein et al., 2018). These assets are, and will continue to be, a good example of disruptive innovation in terms of the impact it has had on some industries. Considering all these, this study will open the door to new studies as well as filling the gap in the literature. According to the DTPB model; While complexity, relative advantage and compatibility variables determine attitude, normative belief affects subjective norms. Perceived behavioral control is determined by self-efficacy and facilitating conditions. Attitude, subjective norms and perceived behavioral control affect intention, while intention and perceived behavioral control affect actual behavior.

According to the R² values obtained as a result of the analysis; It has been determined that complexity, relative advantage and adaptability variables explain individuals' attitude variable by 85%, normative belief variable explain subjective norm variable by 46.9%, self-efficacy and

facilitating conditions explain perceived behavioral control by 61.7%. It was concluded that the variables of attitude, subjective norm and perceived behavioral control explained 81.1% of the intention variable, while the variable of perceived behavioral control and intention explained the actual behavior by 69.7%. It was determined that the variable that most affected the attitude was relative advantage (0.723), the perceived behavioral control variable was most affected by self-efficacy (0.770), and subjective norms were affected by normative beliefs (0.685).

It has been understood that individuals' intention to purchase cryptoassets is significantly and positively affected by each of the variables of attitude, subjective norm, and perceived behavioral control. Among these variables, it was determined that the variable with the highest effect on intention is attitude (0.822), which supports other studies (Schaupp et al., 2022; Mazambani & Mutambara, 2019). Considering this high effect of attitude on intention, it is recommended that companies that produce crypto assets or act as intermediaries in buying and selling should focus on activities that will increase their positive attitudes towards investors. For this purpose, in addition to ease of transaction, speed, 24/7 trading and transfer opportunities, giving importance to innovative technology activities will increase positive attitudes towards crypto assets.

Huong et al. (2021) concluded that PBC has a negative effect on crypto-asset investment intention, in this study, as in many other studies (Schaupp et al., 2022; Soomro et al., 2022; Mazambani & Mutambara, 2019) it has been determined that it has a positive effect on the attitude and it is the second factor that determines the intention after the attitude. This result means that investors have sufficient knowledge, skills, resources and confidence to invest in crypto assets. Therefore, it can be said that investors do not perceive it as difficult and complex to invest in crypto assets. In addition, with the spread of legal and technical regulations for crypto assets in the upcoming period, it is expected that the impact rate of PBC, which already has a positive effect on crypto asset investment intention, will increase even more.

Analysis results on the intention of SNs to invest in cryptoassets Ayedh et al. (2021) and Mazambani et al. (2019) shows that it has a positive effect on the contrary. This effect, Huong et al. (2021), it was determined that it was not very high and not in the first place, but it was positive and lower as in other studies (Soomro et al., 2022; Schaupp et al., 2022). It is known that the statements made by institutional investors, analysts, global company owners such as Elon Musk, using the power of social media, affect the crypto asset market (Shahzad et al., 2022). Because crypto assets are newer than other investment tools and still have dark spots for investors, it is expected that different opinions will

be affected in crypto asset investments. In the light of these data, it can be said that similar statements regarding crypto assets will continue to affect SNs in the coming period.

It has been determined that intention and perceived behavioral control variables have a significant and positive effect on crypto asset purchasing behavior. As in many studies in different fields in the literature (Pilatin & Dilek, 2022; Mahardhika & Zakiyah, 2020; Dilek, 2022; Öztürk et al., 2016, Doğan et al., 2015; Echchabi & Aziz, 2012; Shih & Fang, 2004), it has been observed that the intention variable, which is one of these two variables, has a high effect on the crypto asset purchasing behavior. The study result shows that a one-unit change in intent will cause a 0.754 change in crypto-asset buying behavior. Accordingly, it has been determined that 75 out of every 100 people who intend to invest in crypto assets have invested in crypto assets.

In conclusion, if crypto-asset companies and exchanges want to make crypto-assets more reliable and investable in the future, they need to ensure that individuals, and especially investors, achieve a certain level of crypto-asset literacy, from the technology on which crypto-assets are based, to the applications. In this context, in addition to ease of transaction, safe trading, speed, 24/7 trading, prevention of stock market crashes and transfer opportunities, giving importance to innovative technology activities will increase the attitude and therefore the intention towards crypto asset investment. But if states and policy makers are still undecided about crypto assets, they must first produce announcements, directives and policies for investor attitudes.

This study may have some limitations that should be taken into account. First of all, it is classified as a cross-sectional study, which means that the variables used in the study are collected in a fixed time. However, variables that affect investors' intention may change over time. Therefore, the results are comprehensive but may represent the current situation. In addition, this research was conducted only in developing Turkey. For this reason, the same research model may change the results to be conducted in countries with different levels of development and culture. Therefore, research needs to be supported in the context of countries with different development and cultures. In future studies, research can be conducted to determine the maturity understanding and investment strategies and psychology of crypto asset investors. Finally, future studies may also focus on the share of crypto assets in investors' portfolios.

Author contribution Corresponding author AP conceived this study and was involved in conducting the experiments, processing data, and writing the manuscript. ÖD was involved in conceiving this study, data interpretation and writing the manuscript.

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Data availability The data that support the findings of this study are

available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Code availability Not applicable for that section.

Declarations

Conflict of interest The author declares that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval and consent to participate Ethical board approval was obtained from Recep Tayyip Erdogan University. Informed consent was obtained from all individual participants included in the study. This article does not contain any studies with animals performed by any of the authors.

Consent to participate All respondents gave informed consent.

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