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Full Length Article

Intellectual capital and financial performance: A study of the Turkish Banking Sector

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Abstract

The purpose of this study is to analyze the relationship between the intellectual capital performance and financial performance of 44 banks operating in Turkey between 2005 and 2014. The intellectual capital performance of banks is measured through the value added intellectual coefficient (VAIC) methodology. The intellectual capital performance of the Turkish banking sector is generally affected by human capital efficiency (HCE). In terms of bank types, development and investment banks have the highest average VAIC. When VAIC is divided into its components, it can be observed that capital employed efficiency (CEE) and human capital efficiency (HCE) positively affect the financial performance of banks. However, CEE has more influence on the financial performance of banks compared to HCE. Therefore, banks operating in the Turkish banking sector should use their financial and physical capitals if they wish to reach a higher profitability level.
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1. Introduction

Societies have experienced four different socio-economic phases throughout history which include primitive society, agricultural society, industrial society, and information society in which we currently live. During these periods, hierarchy among production factors varied from one enterprise to another. While prior to the information society, the focus was on traditional factors (labor, capital, natural resources, and entrepreneurship), knowledge, information technologies and intellectual capital factors took priority after the information society emerged (Kandemir, 2008; Kayacan & Alkan, 2005; Yalama, 2013).

Intellectual capital can be defined as the intangible assets which are not listed explicitly on a firm's balance sheets, but positively impact the performance of it, thereby revealing the relationship between employees, ideas, and information and measure what is not measured (Edvinsson, 1997). It is common knowledge that balance sheets do not attempt to provide information on the actual value of an enterprise; instead, they are prepared for reporting purposes. Moreover, the relationship between the data obtained from financial reports (which are produced in line with the traditional accounting systems) and the value of an enterprise has weakened. In addition, traditional accounting systems fail to reflect intangible assets creating value in enterprises (Canibao, Garcia-Ayuso, & Sanchez, 2000; Lhaopadchan, 2010). Thus, practicality of the accounting data obtained from financial reports has been

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diminishing (Lev & Zarowin, 1999). In today's world, sources of economic value and wealth include not only the products manufactured by enterprises but also their intangible assets, i.e. their intellectual capital (Chen, Cheng, & Hwang, 2005; Goldfinger, 1997). It is widely believed that intellectual capital will play a greater role in creating value (Powell, 2003). In the knowledge based socio-economic period where intellectual capital has become one of the production factors, performance measurements for firm may not be possible with traditional accounting practices anymore. Therefore, there is a growing need to develop new methods taking account of the intellectual capital, as well (Berzkalne & Zelgalve, 2014; Gan & Saleh, 2008).

After it has been realized that intellectual capital has an impact on creating value and increasing the financial performance of firms, various methods have been developed to measure it (Edvinsson, 1997; Kaplan & Norton, 1996; Roos, Roos, Dragonetti, & Edvinsson, 1997; Steward, 1991; Sveiby, 1997). Most of the recent studies analyzing the relationship between the intellectual capital performance and financial performance of the firms use the value added intellectual coefficient (VAIC) model developed by Pulic (1998, 2004), Chen et al. (2005), Ercan, Öztürk, & Demirgüneş (2003), Joshi, Cahill, Sidhu, & Kansal (2013), Kayacan & Özkan (2015), Mondal & Ghosh (2012), and Yalama (2013). Firer and Williams (2003) state that VAIC is an easily applicable and effective model to measure firms' intellectual capital performance and make comparisons between firms.

Studies investigating the link between the VAIC model and financial performance suggest that intellectual capital contributes to the profitability, efficiency and earnings per share of firms (Firer & Stainbank, 2003; Makki, Lodhi, & Rohra, 2009; Tan, Plowman, & Hancock, 2007). Appuhami (2007) highlights the positive relationship between intellectual capital and capital gain of investors. Moreover, some of the studies reveal that there is a delayed relationship between investments in intellectual capital and return on investments (Vaisanen, Kujansivu, & Lönnqvist, 2007). Results of the studies (Tseng & Goo, 2005; Wang, 2008) exploring the relationship between market value and intellectual capital show that there is a positive relationship between these two variables. In some studies (Maditinos, Chatzoudes, Tsairidis, & Theriou, 2011; Mosavi, Nekoueizadeh, & Ghaedi, 2012), on the other hand, it has been suggested that human capital efficiency (HCE) is the only component of the VAIC model which has a relationship with the market value of a firm. There are also various studies (Ferraro & Veltri, 2011; Mehralian, Rajabzadeh, Sadeh, & Rasekh, 2012; Şamiloğlu, 2006) pointing out the non-existence of a relationship between intellectual capital and market value or financial performance.

This study analyzes the relationship between the intellectual capital performance and financial performance of 44 banks operating in Turkey between 2005 and 2014 using the VAIC model. Panel data regression analysis, which incorporates the horizontal section and time dimension into the analysis, is used in the study. While previous studies (Çalışır, Altın Gümüşsoy, Cirit, & Bayraktaroğlu, 2011; Çalışır, Altın Gümüşsoy, Cirit, Yorulmaz, & Bayraktaroğlu, 2010; Ercan et al., 2003; Kayacan & Özkan, 2015; Yalama, 2013) are covering banks as group, such as participation banks, private banks, development and investment banks, banks listed on Istanbul Stock Exchange (currently known as Borsa Istanbul) and analyze just one group at a time; we aim to find out if there is significant difference between our results and previous studies' results. In this study, we purpose to fill this gap and contribute to the literature. Therefore, it can be said that this is one of the first studies exploring the relationship between the intellectual capital performance and financial performance by incorporating all the banks which operate within the Turkish banking sector into the dataset. The results provide some clues for banks in Turkey about in which component(s) of the intellectual capital they should invest to increase their financial performance. Findings indicate that VAIC (measurement for the total intellectual capital) has not statistically significant effect on the financial performance of banks. On the other hand, when VAIC is divided into its components, it can be observed that CEE and HCE positively affect the financial performance of banks. However, findings suggest that CEE has more influence on the financial performance of banks compared to HCE. Therefore, banks operating in the Turkish banking sector should use their financial and physical capitals if they wish to reach a higher profitability level.

This study is composed of five sections. The second section explains the concept of intellectual capital and focuses on literature reviews investigating the relationship between the intellectual capital performance and financial performance of banks. In the third section, data, variables, and methods are explained and hypothesis for the study is laid down. In the fourth section, empirical results of the study are reviewed. The final section summarizes the results of the overall study.

2. Literature review

2.1. Intellectual capital

Researchers define the concept of intellectual capital in different ways. Therefore, there is no single definition explaining the concept of intellectual capital. However, intellectual capital may be interpreted as the intangible assets which are not listed explicitly on a firm's balance sheets but positively impact the performance and success of it (Brooking, 1996; Kayacan & Alkan, 2005; Mondal & Ghosh, 2012).

As there is no consensus in the literature on the definition of intellectual capital, researchers have not agreed upon the components of intellectual capital, either. Yet, it is widely acknowledged that intellectual capital encompasses three components, i.e. human capital, structural capital and relation/customer capital. Human capital can be defined as know-how which leaves an organization when people leave and it includes skills, capabilities, experience and expertise of employees. Structural capital covers the system, structure and processes of an organization and it involves non-physical components such as databases, organization chart, management processes and business strategies. However, customer

capital refers to all intangible assets which regulate and manage the relationships of an organization. It comprises the organization's relationships with its customers, suppliers, shareholders and other stakeholders (Joshi et al., 2013; Kurt, 2008; Mondal & Ghosh, 2012).

After it has been realized that intellectual capital has an impact on creating value and increasing the performance of firms, various methods have been developed to measure it. Methods used to measure intellectual capital includes market-to-book ratio, Tobin's Q ratio, calculated intangible value (Steward, 1997), balanced scorecard (Kaplan & Norton, 1996), Skandia IC Navigator (Edvinsson, 1997), intellectual capital services' IC-index (Roos et al., 1997), the technology broker's IC audit (Brooking, 1996), the intangible asset monitor (Sveiby, 1997), economic value added (Steward, 1991), market value added, and value added intellectual coefficient (VAIC) model (Çelikkol, 2008; Karacan & Ergin, 2011; Pulic, 1998, 2004; Yalama & Coskun, 2007).

This study uses the VAIC model developed by Pulic (1998, 2004) which measures the intellectual capital performances of firms. The VAIC model reveals the intellectual capability of an organization and whether its sources are used efficiently or not. In other words, VAIC measures the newly-created value per monetary unit invested in each source. The higher the VAIC value of an organization is, the more is the value added created by overall sources of that organization (Pulic, 2004).

2.2. VAIC and financial performance

The VAIC model is widely utilized to measure the intellectual capital performance of firms in various countries and within different sectors. Therefore, there is a wide range of studies investigating the impact of intellectual capital on the performance of firms by means of the VAIC model. While some of these studies (Chen et al., 2005; Chu, Chan, & Wu, 2011; Gan & Saleh, 2008; Kamath, 2008; Pal & Soriya, 2012; Tan et al., 2007) suggest that intellectual capital has positive impacts on the financial performance of firms, others (Chan, 2009a, 2009b; Ghosh & Mondal, 2009; Öztürk & Demirgüneş, 2007) fail to produce adequate evidence showing this positive relationship.

In the international literature, studies using the VAIC model predominantly focus on the banking and finance sectors. The very first study sifting through the impacts of intellectual capital on the banking sector by using the VAIC model belongs to Ante Pulic and Manfred Bornemann. In their study, the authors offer valuable information on the efficiency of the intellectual capital held by 24 major banks operating in Austria between 1993 and 1995. The authors claim that increasing the efficiency of intellectual capital is cheapest and safest way to ensure sustainable functioning of banks. Pulic (2004) emphasizes that there is a strong link between the intellectual capital and success of an organization. Additionally, the author argues that banks investing heavily in the intellectual capital and its components improve their performance (Joshi et al., 2013; Mondal & Ghosh, 2012; Ting & Lean, 2009).

In the studies analyzing the relationship between the efficiency of intellectual capital and financial performance of financial institutions, VAIC and its components (CEE, HCE and SCE) are used as indicators of intellectual capital efficiency. On the other hand, return on assets (ROA) and return on equity (ROE) are utilized as an indicator of the financial performance. Many studies in the literature assert that there is a positive relationship between financial performance indicators and VAIC. However, there has been an ongoing debate over which VAIC components improve the performance of financial institutions. Some studies (Goh, 2005; Mondal & Ghosh, 2012) suggest that the most important VAIC component having a positive impact on the financial performance is HCE; while others (Al-Musalli & Ku Ismail, 2014; Joshi et al., 2013; Kayacan & Özkan, 2015; Puntillo, 2009; Ting & Lean, 2009) claim that CEE affects the performance positively.

As for the Turkish banking sector, there is a wide variety of studies investigating the relationship between the efficiency of intellectual capital and financial performance by means of the VAIC model. These studies generally focus on the banks whose shares are traded on the Istanbul Stock Exchange (currently known as Borsa Istanbul). Ercan et al. (2003) demonstrate that there is a weak relationship between the efficiency of the value added created by these banks and profitability. Moreover, the authors argue that there is a positive correlation between SCE and profitability; however, there is a negative relationship between HCE/CEE and profitability. For the years between 1995 and 2004, Yalama and Coskun (2007) test the impact of the intellectual capital held by banks on their profitability with the data envelopment analysis. Furthermore, the authors created a portfolio based on the intellectual capital in order to test the impact of intellectual capital on profitability. As a result of the study, the authors revealed that the banks included in the analysis succeeded to turn the intellectual capital into profitability by 61.3% and that the portfolio using the intellectual capital as an input achieved maximum return. Between 1995 and 2006, Yalama (2013) surveyed the relationship between the investment in intellectual capital and bank profitability on a short and long term basis by means of the panel data regression analysis. According to the results of the study, the intellectual capital increases profitability of banks, especially in the long run. Kayacan and Özkan (2015) suggest there is a positive correlation between the intellectual capital performance of the participation banks operating in Turkey and their profitability ratio. In addition, the authors argue that CEE has a greater impact on the profitability of participation banks compared to other VAIC components. Similarly, Çalışkan (2015) demonstrate that CEE has a greater impact on the profitability of 14 banks traded on Borsa Istanbul. Çalışır et al. (2010, 2011) calculate the values of the VAIC and its components of commercial, development and investment banks operating in the Turkish banking system and make comparative analyses between the banks according to these values. Apart from the above-mentioned ones, there are also several studies investigating the impact of intellectual capital on the financial performance of the Turkish banking

sector by using different methodologies (Karacan & Ergin, 2011; Yıldız, 2011).

There are studies that examine the relationship between the intellectual capital criteria and market-to-book ratio of banks or the efficiency rates. For the period 1998–2001, Şamiloğlu (2006) argue there is no significant correlation between the VAIC (and its components) of 12 banks whose shares were traded on Borsa Istanbul and their market-to-book ratio. Ercan et al. (2003) demonstrate that there is a positive but statistically insignificant relationship between the VAIC components and market-to-book ratio. Moreover, the authors suggest that the VAIC components negatively affect the efficiency of banks. On the other hand, Yalama (2013) indicates that intellectual capital increases the market value and efficiency of banks in the long term. Çalışkan (2015) claims that HCE is more effective on the efficiency and market-to-book ratio of banks compared to SCE. The author argues that with increased investment in human capital, the difference between the book values and market values of banks may be reduced. Öztürk and Demirgüneş (2005) note that while CEE has a negative impact on the market value of banks, HCE affects it in a positive way.

3. Data and methodology

By the end of 2015, there are a total of 52 banks operating in the Turkish banking system. As demonstrated in Fig. 1, banks can be divided into three main groups according to their scope, which are (1) deposit banks, (2) development and investment banks, and (3) participation banks. Deposit banks may be examined under four types, namely "state-owned", "privately-owned", "banks under The Savings Deposit Insurance Fund", and "foreign" banks. Foreign deposit banks are split into two groups: "banks founded in Turkey" and "banks having branches in Turkey". Development and investment banks can be divided into three categories, which are "state-owned", "privately-owned", and "foreign" banks. Finally, participation banks are composed of "state-owned", "domestic" and "foreign" banks. Of the 34 deposit banks operating in Turkey as of 2015, a total of three are "state-owned", a total of 11 are "privately-owned", one is a "banks under the Savings Deposit Insurance Fund", and 19 are "foreign" banks. While 13 of the foreign deposit banks have been established in Turkey, six of them have branches in Turkey. Of the 13 development and investment banks operating in Turkey, a total of three are "state-owned", six are "privately-owned", and four are "foreign" banks. Of the 5 participation banks operating in Turkey, one is "state-owned", one is "domestic", and three are "foreign" banks. The fact that 26 banks out of 52 operating in Turkey are foreign banks demonstrates the foreign capital investments aimed at the Turkish banking sector.

This study uses data of 44 banks operating in Turkey between 2005 and 2014. They consist of 28 deposit banks, 12 development and investment banks and 4 participation banks. Data have been obtained from the statistical reports uploaded to the websites of the Banks Association of Turkey (BAT) and the Participation Banks Association of Turkey (PBAT). The data that are not included in these websites have been obtained directly from websites of banks or the Public Disclosure Platform (PDP). The total number of observations is 440. Given the fact that there are 52 banks operating in Turkey as of the end of 2015, it is noteworthy that a significant number of banks were included in the sample. Seven banks have been excluded from the sample due to the lack of data for analysis. The banks and their types included in the analysis are shown in Table 2.

Value-added intellectual coefficient (VAIC) developed by Pulic (1998)and Pulic (2004)is used to measure the intellectual capital performance of the banks. The VAIC model reveals the intellectual capability of a firm and whether its sources are used efficiently or not. In other words, VAIC measures the newly-created value per monetary unit invested in each source. The higher the VAIC of a firm, the more the value added created by overall sources of that firm (Pulic, 2004).

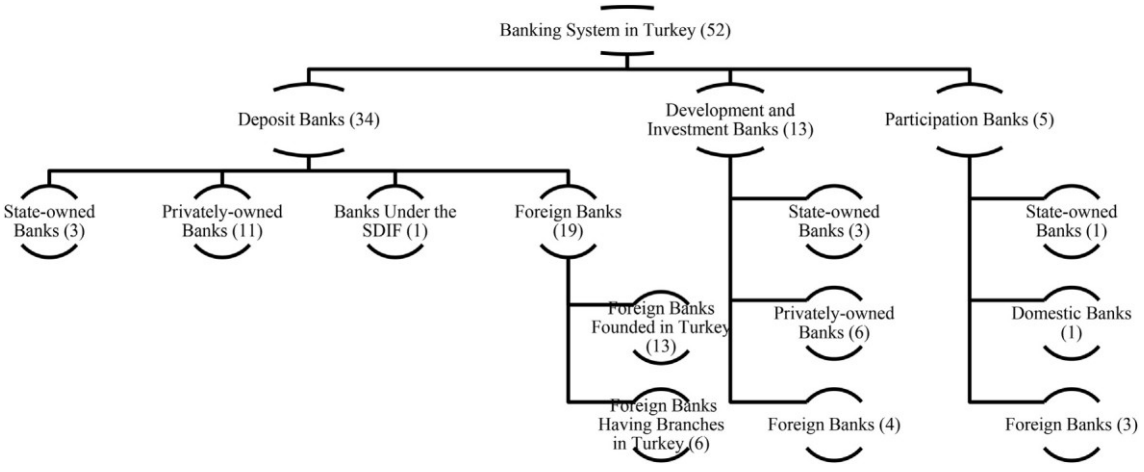

Fig. 1. Banks operating in Turkish banking sector (2015).
Source: BRSA, BAT ve PBAT

3.1. Dependent variable

In the study, return on assets (ROA), one of the traditional performance measures, is used to represent the financial performance of banks. ROA is the key measure of bank profitability (Dietrich & Wanzenried, 2011; Pasiouras & Kosmidou, 2007), and often utilized in similar studies (Joshi et al., 2013; Ting & Lean, 2009; Yalama, 2013). ROA is calculated by dividing the net profit (the loss) for the current year by total assets.

3.2. Independent variables

Components of the VAIC model are used as independent variables in this study. VAIC is calculated as follows (Ghosh & Mondal, 2009; Pulic, 1998, 2004; Yalama, 2013):

$$VAIC_i = CEE_i + HCE_i + SCE_i \quad (1)$$

In equation (1), $VAIC_i$ refers to the value added intellectual coefficient of the bank i, CEE_i refers to the capital employed efficiency coefficient of the bank i; HCE_i refers to the human capital efficiency coefficient of the bank i, and SCE_i refers to the structural capital efficiency coefficient of the bank i. In order to calculate these variables, the total value added (VA_i) created by banks needs to be calculated. Total VA_i is calculated as follows (Al-Musalli & Ku Ismail, 2014; Alipour, 2012; Chu et al., 2011; Pulic, 2004):

$$VA_i = OP_i + EC_i + A_i \quad (2)$$

In equation (2), VA_i refers to the total value added created by the bank i; OP_i refers to the operating profit of the bank i; EC_i refers to the employment cost of the bank i, and A_i refers to the amortization and depreciation of the bank i.

Following the calculation of the total VA_i, the components of $VAIC_i$ (CEE_i, HCE_i and SCE_i) are calculated. CEE_i, the first component of $VAIC_i$, is calculated as follows:

$$CEE_i = VA_i/CE_i \quad (3)$$

In equation (3), CE_i refers to the capital employed (book value of assets) of the bank i; in other words, equity value of the bank i. HCE_i and SCE_i are calculated as follows:

$$HCE_i = VA_i/HC_i \quad (4)$$

$$SC_i = VA_i - HC_i \quad (5)$$

$$SCE_i = SC_i/VA_i \quad (6)$$

In equations (4)–(6), HC_i refers to the personnel expenses of the bank i and SC_i refers to the difference between VA_i and HC_i.

3.3. Control variables

As in other studies in the literature (Alipour, 2012; Mondal & Ghosh, 2012; Yalama, 2013), bank size (LNTA – Natural Log of Total Assets) and leverage (LEV – Ratio of Long-Term Debt to Total Assets) are included in the regression models (Model 2 and 4) as control variables. In addition, dummy variables (DEPOSIT and PARTICIPATION) are used to demonstrate the influence of the bank types on the bank profitability. In the models 2 and 4, DEPOSIT (PARTICIPATION) takes value 1 for banks classified as deposit (participation) banks, according to the Banking Regulation and Supervision Agency (BRSA), and 0 otherwise.

3.4. Regression models and hypothesis

Models to be tested in the study are demonstrated in Table 1. Models 1 and 2 in Table 1 test the relationship between the financial performance measure (ROA_{it}) of banks and $VAIC_i$; Models 3 and 4 examine the association between ROA_i and components of $VAIC_i$ (CEE_i, HCE_i and SCE_i). Control variables are also included in Model 2 and Model 4.

Models in Table 1 are used to test the following hypothesis:

H1. There is a significant positive relationship between the value added intellectual capital coefficient (VAIC) of the banks operating in Turkey and their financial performance measure (ROA).

H2. There is a significant positive relationship between the capital employed efficiency coefficient (CEE) of the banks operating in Turkey and their financial performance measure (ROA).

H3. There is a significant positive relationship between the human capital efficiency coefficient (HCE) of the banks operating in Turkey and their financial performance measure (ROA).

H4. There is a significant positive relationship between the structural capital efficiency coefficient (SCE) of the banks operating in Turkey and their financial performance measure (ROA).

4. Empirical results

Table 2 demonstrates the average value of the variables concerning the intellectual capital performance of the banks in the 2005–2014 period. In Table 2, Panel A shows the average value of VAIC and its components for deposit banks, Panel B

Table 1
Regression models.

Model	Regression equation
1	$ROA_{it} = \beta_0 + \beta_1\ VAIC_{it} + \varepsilon_{it}$
2	$ROA_{it} = \beta_0 + \beta_1\ VAIC_{it} + \beta_2\ LNTV_{it} + \beta_3\ LEV_{it} + \beta_4\ DEPOSIT_{it} + \beta_5\ PARTICIPATION_{it} + \varepsilon_{it}$
3	$ROA_{it} = \beta_0 + \beta_1\ CEE_{it} + \beta_2 HCE_{it} + \beta_3 SCE_{it} + \varepsilon_{it}$
4	$ROA_{it} = \beta_0 + \beta_1\ CEE_{it} + \beta_2 HCE_{it} + \beta_3 SCE_{it} + \beta_4 LNTV_{it} + \beta_5 LEV_{it} + \beta_6\ DEPOSIT_{it} + \beta_7\ PARTICIPATION_{it} + \varepsilon_{it}$

Table 2
VAIC and its components for the sample banks.

Bank name	CEE	HCE	SCE	VAIC
Panel A: Deposit banks				
Fibabanka	0.2108	1.1305	6.1173	7.4586
Bank Mellat	0.2925	6.2684	0.7914	7.3523
Akbank	0.2843	4.6289	0.7789	5.6921
Deutsche Bank	0.2493	4.7293	0.6940	5.6727
JPMorgan Chase Bank	0.2372	4.5333	0.7605	5.5310
Ziraat Bankası	0.4788	4.0327	0.7465	5.2580
Halk Bankası	0.3932	3.9324	0.7395	5.0652
Garanti Bankası	0.3464	3.9705	0.7414	5.0584
Vakıflar Bankası	0.2822	3.2606	0.6886	4.2315
İş Bankası	0.2949	2.9745	0.6621	3.9315
Finans Bank	0.3700	2.8451	0.6336	3.8487
Alternatifbank	0.4124	2.6367	0.5850	3.6341
The Royal Bank of Scotland	0.2880	2.6648	0.5842	3.5370
Habib Bank	0.0990	3.0775	0.1579	3.3343
Denizbank	0.3793	2.2948	0.5540	3.2282
Anadolubank	0.3715	2.2440	0.5478	3.1633
Yapı ve Kredi Bankası	0.1417	2.0792	0.7039	2.9248
Arap Türk Bankası	0.2164	2.1854	0.4544	2.8562
Citibank	0.3271	2.0603	0.4627	2.8501
Türk Ekonomi Bankası	0.3827	1.9315	0.4779	2.7922
Şekerbank	0.3763	1.9184	0.4715	2.7662
HSBC Bank	0.3423	1.9381	0.4301	2.7105
ING Bank	0.3116	1.8145	0.4324	2.5585
Tekstil Bankası	0.2176	1.5215	0.3318	2.0709
Turkish Bank	0.1471	1.4183	0.2662	1.8316
Turkland Bank	0.1948	1.2966	0.1771	1.6685
Adabank	0.0425	1.1969	0.3808	1.6202
Société Générale	0.1853	0.8554	0.2533	1.2940
Average (28)	*0.2813*	*2.6943*	*0.7366*	*3.7122*
Panel B: Development and investment banks				
Türk Eximbank	0.1168	11.2561	0.8851	12.2579
TSKB	0.2501	7.9139	0.8704	9.0343
Takasbank	0.2528	3.8891	0.7301	4.8720
Diler Yatırım Bankası	0.0897	3.9815	0.6495	4.7208
İller Bankası	0.0820	3.7365	0.7224	4.5410
GSD Yatırım Bankası	0.1529	3.0178	0.6518	3.8225
Türkiye Kalkınma Bankası	0.1967	2.5796	0.5398	3.3161
Aktif Yatırım Bankası	0.2440	2.4052	0.5346	3.1838
BankPozitif	0.1050	2.2932	0.6900	3.0882
Merrill Lynch	0.2740	1.3101	0.4199	2.0040
Standard Chartered	0.2364	1.6552	0.0852	1.9768
Nurol Yatırım Bankası	0.0604	0.7972	−0.2109	0.6467
Average (12)	*0.1717*	*3.7363*	*0.5473*	*4.4553*
Panel C: Participation banks				
AlbarakaTürk	0.3823	2.5688	0.6061	3.5571
Türkiye Finans	0.3901	2.5450	0.6050	3.5401
Bank Asya[a]	0.3152	2.3427	0.7655	3.4234
KuveytTürk	0.3705	2.1859	0.5371	3.0935
Average (4)	*0.3645*	*2.4106*	*0.6284*	*3.4036*

[a] The BRSA terminated the activities of Bank Asya in July 22, 2016. As our sample ends in 2014, we have kept its name in Table 2.

for development and investment banks, and Panel C for participation banks. Individual banks incorporated into each bank group in Table 2 are ranked according to their average VAIC. Based on Panels A, B and C in Table 2, Fibabanka (7.4586), Turk Eximbank (12.2579) and AlbarakaTürk (3.5571) are the banks with the highest average VAIC among bank groups. On the other hand, the banks with the lowest average VAIC include Société Générale (1.2940), Nurol Yatırım Bankası (0.6467) and Kuveyttürk (3.0935). When the average VAIC values are evaluated on the basis of bank groups, development and investment banks have the highest average VAIC (4.4553) and participation banks have the lowest average VAIC (3.4036). Deposit banks are in the second place with the average VAIC value of 3.7122. If the VAIC components in Table 2 are analyzed, it can be concluded that the most important component of the VAIC value for the banks operating in the Turkish banking sector is HCE. This result is also consistent with many other studies in the literature (Goh, 2005; Joshi, Cahill, & Sidhu, 2010; Joshi et al., 2013).

Table 3 presents the average annual values of the variables (CEE, HCE, SCE and VAIC) used in the analysis concerning the impact of intellectual capital on the financial performance of banks. The average VAIC of all banks is 3.8868 for the 2005–2014 period. When this value is compared with the results of studies conducted in other countries (Al-Musalli & Ku Ismail, 2014; El-Bannany, 2008, 2012; Joshi et al., 2013; Ting & Lean, 2009), it can be observed that it is lower than the average VAIC of the banks operating in the United Kingdom (10.80) and the United Arab Emirates (7.94); but higher than the banks operating in Australia (3.67), Saudi Arabia (3.65) and Malaysia (1.78). Only 15 of the 44 banks included in the analysis have a higher average VAIC than this one (see Table 2). Moreover, average VAIC values for the years apart from 2006, 2007 and 2009 are lower than this value. Table 3 demonstrates that the most important component for the VAIC is HCE.

Pearson correlation analysis results related to the variables used in the analysis are shown in Table 4. There is a statistically significant positive correlation between ROA and VAIC, CEE and HCE. Among independent variables, HCE is the variable with the highest correlation with ROA ($r = 0.5593$). SCE has a negative but statistically insignificant relationship with ROA. It is observed that there is no strong correlation between independent variables. This result suggests that multicollinearity problem between independent variable is weak or non-existent.

Table 5 demonstrates the results concerning the Model (1, 2, 3 and 4) which show the relationships between the profitability of the banks operating in Turkey and their intellectual capital performance. Regression results suggest that all models put forward in the study are statistically significant. When explanatory power of the models is compared, it can be concluded that

Table 3
VAIC and its components from 2005 to 2014.

Year	CEE	HCE	SCE	VAIC
2005	0.2918	2.9179	0.4265	3.6362
2006	0.2690	2.6977	1.9498	4.9164
2007	0.3043	3.1922	0.7536	4.2501
2008	0.2777	3.0547	0.3796	3.7120
2009	0.2788	3.4521	0.4784	4.2092
2010	0.2483	2.9793	0.5257	3.7533
2011	0.2443	3.0326	0.5492	3.8260
2012	0.2503	2.9385	0.5463	3.7351
2013	0.2168	2.5603	0.5134	3.2905
2014	0.2085	2.7016	0.6289	3.5391
2005–2014	*0.2590*	*2.9527*	*0.6751*	*3.8868*

Table 4
Pearson correlations between variables.

	ROA	VAIC	CEE	HCE	SCE	LNTV	LEV
ROA							
VAIC	0.3271***						
CEE	0.3871***	0.1524***					
HCE	0.5593***	0.6139***	0.2593***				
SCE	−0.0375	0.7847***	−0.0630	−0.0057			
LNTV	−0.0504	0.1128**	0.3623***	0.1414***	0.0136		
LEV	−0.2890***	−0.0412	0.4169***	−0.1353***	0.0280	0.6467***	

*** and ** represents statistical significance at 1% and 5% levels, respectively.

Table 5
Regression results.

Independent variables	Model 1	Model 2	Model 3	Model 4
C	0.0098 (1.3179)	0.0160 (0.6778)	−0.0233[a] (−3.3425)	0.0182 (0.9241)
VAIC	0.0025 (1.2695)	0.0023 (1.2407)		
CEE			0.0683[a] (2.6596)	0.0933[a] (3.5985)
HCE			0.0086[a] (3.9881)	0.0056[a] (4.1304)
SCE			0.0000 (0.4224)	0.0000 (0.7647)
LNTV		0.0028 (1.6257)		0.0011 (0.9814)
LEV		−0.0656[a] (−2.8514)		−0.0760[a] (−5.7509)
DEPOSIT		0.0014 (0.1811)		0.0011 (0.2014)
PARTICIPATION		0.0066 (0.9869)		0.0011 (0.1808)
Adjusted R^2	0.0818	0.1718	0.5235	0.5123
F-statistics	40.1159	17.9999	11.4863	66.8880
p-value	0.0000	0.0000	0.0000	0.0000

The figures in the parentheses are the t-statistics.
After applying several tests (F test, LM test and Hausman test) with respect panel data analysis, Models (1, 2, and 4) are estimated using one-way individual-specific random effect model and Model (3) is estimated using one-way individual-specific fixed effect model. In order to deal with heteroscedasticity for all four models, White (1980) heteroscedasticity-consistent standard errors are used.
$ROA_{it} = \beta_0 + \beta_1\ VAIC_{it} + \varepsilon_{it}$ (Model 1)
$ROA_{it} = \beta_0 + \beta_1\ VAIC_{it} + \beta_2\ LNTV_{it} + \beta_3\ LEV_{it} + \beta_4\ DEPOSIT_{it} + \beta_5\ PARTICIPATION_{it} + \varepsilon_{it}$ (Model 2)
$ROA_{it} = \beta_0 + \beta_1\ CEE_{it} + \beta_2\ HCE_{it} + \beta_3\ SCE_{it} + \varepsilon_{it}$ (Model 3)
$ROA_{it} = \beta_0 + \beta_1\ CEE_{it} + \beta_2\ HCE_{it} + \beta_3\ SCE_{it} + \beta_4\ LNTV_{it} + \beta_5\ LEV_{it} + \beta_6\ DEPOSIT_{it} + \beta_7\ PARTICIPATION_{it} + \varepsilon_{it}$ (Model 4)
[a] Represents statistical significance at 1% level.

adjusted R^2 values (0.5235 and 0.5123, respectively) of the Model 3 and 4 are higher than the adjusted R^2 value of the Model 1 and 2 (0.0818 and 0.1718, respectively). This result proves that the components of VAIC are better at explaining the profitability of banks than the VAIC alone (Chen et al., 2005; Joshi et al., 2013; Ku Ismail & Karem, 2011).

Results of the Models 1 and 2 presented in Table 5 shows there is a positive but statistically insignificant relationship between VAIC and the financial performance indicator (ROA) for the period 2005–2014. This finding implies that VAIC has no impact on the profitability of banks. Joshi et al. (2013) also put forth similar findings for the financial institutions operating in Australia. Moreover, the authors indicate that most of the recent studies (Maditinos et al., 2011; Mehralian et al., 2012) present various findings showing that ROA is not affected by VAIC.

Results concerning the Models 3 and 4 presented in Table 5 show the relationship between the components of VAIC (CEE, HCE and SCE) and ROA. Findings imply there is a statistically significant positive relationship between CEE and ROA. In other words, an increase in CEE enhances the profitability of banks. There is also a statistically significant positive relationship between HCE and ROA. However, CEE has a greater statistically significant effect on profitability compared to HCE. These results suggest that the profitability of banks in Turkey is affected by CEE rather than HCE. In other words, banks operating in the Turkish banking sector use their financial and physical assets efficiently in an attempt to reach a higher profitability level.

According to the results of Model 3 and Model 4 imply that there is no statistically significant relationship between SCE and ROA. Ting and Lean (2009) and Joshi et al. (2013) also suggest that SCE does not have a statistically significant effect on the profitability of financial institutions in Malaysia and Australia.

Finally, the empirical evidence obtained regarding the control variables in Model 2 and 4 shows that bank size and bank type do not have a positive or negative effect on the profitability of banks. Leverage ratio, on the other hand, has a statistically significant effect on the profitability of banks but in a negative way.

5. Conclusion

The relationship between intellectual capital and financial performance of banks has been the subject of countless

studies. If the literature on this subject is reviewed, it is observed that the intellectual capital has a positive impact on financial performance of banks. In this study, the intellectual capital efficiency of 44 banks operating in Turkey between 2004 and 2015 is calculated by means of value added intellectual coefficient (VAIC) and it analyses how intellectual capital affects the financial performance of these banks (ROA). The study provides significant inputs to the current literature by including 44 banks (out of 52) in the sample and analyzing the VAIC values according to bank types. Considering that most of the studies in Turkey focus only on the banks traded on Borsa Istanbul (Ercan et al., 2003; Şamiloğlu, 2006; Yalama, 2013; Yalama & Coskun, 2007), this study is a step forward in the relevant field.

The findings of the study suggest that intellectual capital of the Turkish banking sector is primarily affected by human capital efficiency coefficient (HCE). On the other hand, capital employed efficiency coefficient (CEE) and structural capital efficiency coefficient (SCE) is less effective in creating value in the banking sector compared to HCE. Goh (2005), and Joshi et al. (2010, 2013) have drawn similar conclusions for the financial institutions in Malaysia and Australia. Average VAIC of all banks in the analyzed period is 3.8868 and approximately 34% of the banks included in the analysis have a higher average VAIC than this value. In terms of bank types, development and investment banks has the highest average VAIC.

The regression results show that both CEE and HCE affect the financial performance of banks in a positive way. On the other hand, contrary to expectation, CEE has more influence on the financial performance compared to HCE. Therefore, banks operating in the Turkish banking sector should use their financial and physical capitals if they wish to reach a higher profitability level. SCE does not have a significant effect on the financial performance of banks. These results are also consistent with other studies in the literature (Joshi et al., 2013; Ting & Lean, 2009).

While the banking sector, the key component in the Turkish financial system, is analyzed, other financial institutions (such as insurance companies and investment trusts) have not been included in this study. In addition, there are various methods (i.e. market-to-book ratio, Tobin's Q ratio, balanced scorecard) other than VAIC to measure the intellectual capital performance. Thus, future studies may cover all companies operating in the finance sector and apply to other methods to measure intellectual capital performance of financial institutions. Therefore, the foregoing study will constitute an important reference point for future studies.

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