

# Intellectual Capital Efficiency Impact on European Small and Large Listed Banks Financial Performance

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## Abstract

The purpose of the study is to analyze the impact of intellectual capital efficiency impact on the European listed banks performance. In this paper concept of intellectual capital and its components is analyzed and empirical research is performed testing the impact of intellectual capital efficiency on European small and large listed banks financial performance. Data of the research cover period from 2005 -2014. Intellectual capital efficiency impact on banks financial performance is measured for the sample of 118 (52 small and 66 large banks) listed European banks according to their value of total assets. The intellectual capital is calculated by using Value Added Intellectual Capital Coefficient (VAIC) method. For measuring banks financial performance banks profitability, productivity and risk ratios are used. Results of the research support hypothesis that banks intellectual capital has an impact on the financial performance and differences are evident in large and small European listed banks. Authors conclude that intellectual capital had negative impact on large banks financial performance after the financial crisis and negative impact on small banks financial performance before the financial crisis.

**Keywords:** Intellectual capital efficiency, physical capital, human capital, structural capital, financial performance, financial crisis, European listed banks.

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## Introduction

Since the mid-twentieth century investors started to analyze intangible assets instead of tangible assets of the organization. One of the examples of intangible assets is intellectual capital. Majority of studies on intellectual capital are focused on theoretical analysis or valuation models of intellectual capital and only few researches provide the analysis of intellectual capital impact on organizations' results. Authors studied intellectual capital impact on companies (Wang et al., 2014; Harsh, Tandon, 2015; Morariu, 2014; Celenza, Rossi, 2014) and banks (Kang Wang et al., 2012; Mahdi et al., 2014; Mondal, Ghosh, 2012) financial performance. On the other hand, authors didn't find no research on intellectual capital impact on small and large banks performance or intellectual capital impact on performance results before, during and after the financial crisis.

The main problem raised in this article is how intellectual capital efficiency impacts performance results of banks? Problem has been analyzed taking into account the size of the bank and the impact of the financial crisis. The research object – the impact of intellectual capital effectiveness on small and large banks financial performance. The purpose of the article is to research how intellectual capital efficiency impacts the profitability, effectiveness and risk of large and small European banks. Two hypothesis are raised: (H1) intellectual capital efficiency has stronger impact on small banks results and (H2) intellectual capital efficiency components have stronger impact on small bank results.

Objectives of the research are the following:

1. To provide theoretical analysis of the intellectual capital efficiency impact on banks financial performance.
2. To compose the methodology of intellectual capital efficiency impact on European small and large listed banks financial performance.
3. To investigate how intellectual capital efficiency impacts European small and large listed banks financial performance.
4. To investigate how the components of intellectual capital efficiency impacts European small and large listed banks financial performance.

Authors present theoretical framework for analysis of intellectual capital and its impact to companies and banks financial performance. Seeking to evaluate intellectual capital effectiveness impact on banks financial performance authors apply econometrical model and VAIC model for intellectual capital efficiency valuation.

## Theoretical framework of intellectual capital efficiency

At the beginning intellectual capital has been seen as an alternative to intangible assets. R. Tamošiūnaitė et al. (2012) disagree that intellectual capital should be interpreted only as intangible asset. Nevertheless, each author chooses different indicators and methods, which might reflect the intellectual capital in the best way.

Authors distinguish 3 main components of intellectual capital. Human capital is considered to be the most important component of intellectual capital (Ghosh, Maji, 2014). Human capital is defined as the workers' individual knowledge, which employee accumulated in the organization, but which is not owned by organization – tacit knowledge (Tamošiūnaitė et al., 2012; Vaičekuskaitė, 2014). As a basic human capital are worker's experience, skills and personal qualities, such as creativity, motivation of employee (Manzara et al. 2012; Mahdi et al. 2014; Tamošiūnaitė et al., 2012). R. Vaičekuskaitė (2014) determines structural capital as the property, which cannot be separated from the organization. The examples of structural capital might be strategies and processes, relationships with consumers and other stakeholder groups, attitudes towards organization (Mahdi et al. 2014; Tamošiūnaitė et al., 2012; Manzara et al., 2012; Ghosh, Maji, 2014). In some articles, relation capital is considered as separate component of intellectual capital (Tamošiūnaitė et al., 2012; Manzara et al., 2012). In addition to this, M. Manzara et al. (2012) also has mentioned component of intellectual capital such as processes of innovation, research, development, completed capital and capital in progress of consumer, business, social, strategic capital. R. Vaičekuskaitė (2014) distinguishes social capital as a very important component of the intellectual capital.

### *Researches on banks intellectual capital*

It is important to evaluate, how intellectual capital impacts bank performance, because bank provides financial intermediation services and the accumulated knowledge is important factor in this field. This section summarizes the results of other authors' studies and their contribution to intellectual capital investigation and development.

**Profitability.** The positive link between intellectual capital and profitability was approved by the research of 9 banks listed in the Tehran during period 2007 - 2011 (Mahdi et al., 2014). T. Yong, F. Christos (2012) and G. Grow et al. (2014) approved positive intellectual capital impact on banks profitability as well. Similar results were found in 3 banks in Bosnia and Herzegovina (Sehic et al. 2014) and banks in India (Mondal, Ghosh, 2012).

**Efficiency.** Intellectual capital helps to analyze value creation and efficiency in GCC banks (Al-Musailli et al., 2012). On the other hand, C.M. Morariu (2014) investigated the relationship between intellectual capital and value creation. This study indicates that intellectual capital plays an insignificant role in both value creation and reduction of the company's production costs, so it does not affect the efficiency of the bank.

**Risks.** Based on year 2005-2009 research of Portuguese banking sector, intellectual capital can be one of the most reliable means of predicting further banking activities (Curado et al., 2014). Banks, which intellectual capital was assessed as very low in 2005, collapsed or were unable to continue their activity independently during the financial crisis.

### *Factors determining financial performance of banks*

While performing any analysis, it is important to assess factors leading to the change of other factor. Such factors overwhelm bank-specific or macroeconomic factors and are

called controllable variables (Grow et al., 2014). This section presents factors that affect analyzed variables - intellectual capital efficiency and the bank's size.

Intellectual capital efficiency. Despite the fact, that P. Harsh and K. Tandon (2014) denied the intellectual capital impact on profitability indicators, other researches approve that both intellectual capital and each its component are directly related to the profitability of banks (Ghosh, Maji, 2014; Mahdi et al., 2014). In addition to this, the growth of intellectual capital has positive impact on effectiveness of banks performance (Ghosh, Maji, 2014; Mahdi et al., 2014; Sehic et al., 2014; Mondal et al., 2012; Nimtrakoon, 2015; Harsh, Tandon, 2015; Morariu, 2014; Celenza, Rossi, 2014; Sang, Dennis, 2014). The main assumption of intellectual capital efficiency impact on banking risk is that accumulated knowledge and technological solutions can help to reduce risks faced by banks (Ghosh, Maji, 2014).

Banks' size. Large organizations can generate more value and achieve better financial performance indicators (Nimtrakoon, 2015; Mondal, Ghosh, 2012). S. Mahdi et al. (2014) states that the size of the bank has positive impact on profitability. When the bank has more employees, it also has more tacit knowledge and they are used better (Yong, Christos, 2012). Moreover, the size of the bank as a controlled variable was used in research by S.K. Ghosh and S.G. Maji (2014). Results showed that productivity and efficiency depend on the size of the bank.

### **Research methodology**

Research covers 10-year period from year 2005 to 2014. During 10 years period, various macroeconomic conditions might occur. The investigation period is divided into 3 parts: before (2005-2006), during (2007-2009) and after (2010-2014) the financial crisis.

The population of the study is all listed European banks, which provide data on intellectual capital. While collecting data it was found that only 168 banks provide indicators necessary to calculate the efficiency of intellectual capital (available on Bloomberg or in banks financial statements). Based on the formula for setting the sample 118 European listed banks have been selected - 52 small and 66 large listed European banks. The size of the bank was defined based on the size of assets. The bank was considered to be small if its assets are less than 1 billion USA dollars and bank is considered to be large if its assets are more than 10 billion USA dollars. The research data collected using the Bloomberg terminal and the bank's financial statements.

### *Selection of variables*

Authors selected 3 main financial performance indicators for this research: profitability, effectiveness and risk. Based on the analyzed literature, authors use 3 main profitability indicators: net interest margin (Curado et al., 2014; Mahdi et al., 2014; Nimtrakoon, 2015; Yong, Christos, 2012), ROE (Curado et al., 2014; Mahdi et al., 2014; Nimtrakoon, 2015; Sehic et al., 2014; Mondal, Ghosh, 2012; Harsh, Tandon, 2015; Celenza, Rossi, 2014; Yong, Christos, 2012; Growe et al., 2014) and ROA (Curado et al., 2014; Mahdi et al., 2014; Sehic et al., 2014; Mondal, Ghosh, 2012; Morariu, 2014; Growe

et al., 2014). To assess the operational efficiency 2 indicators were selected: productivity of employees and general activity effectiveness. Another set of indicators were designed to assess the risk. Authors included 3 indicators as well. The first indicator represents banks liquidity (Wee, Chua, 2014; Curado et al., 2014; Ghosh, Maji, 2014; Iazzolino et al., 2013; Wee, Chua, 2014), the second - solvency (Wee, Chua, 2014), third - TIER 1 capital ratio (Wee, Chua, 2014; Curado et al., 2014).

4 independent variables were used in this study: intellectual capital efficiency and its components. 3 controlled variables were used for the evaluation of intellectual capital and its effectiveness. The last group of variables is dummy variables, which allow to evaluate the differences between small and large banks and their differences before, during and after financial crisis. Calculation of variables is shown in Table 1.

Table 1 Calculation of variables

Ratio	Formula	Variable
Capital employed (CE)	Total assets – Intangible assets	-
Human capital (HC)	Salaries + Benefits to employees+ Expenses to learning;	-
Structural capital (ST)	VA – HU;	-
Value added (VA)	OP + D + A + DU+T;	-
The efficiency of capital employed (VACE)	VA / CE;	Independent variable
The efficiency of human capital (VAHC)	VA / HU;	Independent variable
The efficiency of structural capital (STVA)	SC / VA;	Independent variable
Value added intellectual capital (VAIC)	VACA + VAHU+ STVA;	Dependent variable
Net interest margin (NIM)	(Net interest earnings/Total assets) *100	Dependent variable
Return on assets (ROA)	(Net profit / Total assets) *100	Dependent variable
Return on equity (ROE)	(Net profit / Total Equity) *100	Dependent variable
Productivity of employees (DP)	Net interest / Number of employee;	Dependent variable
General efficiency (GE)	Net interest/ Operational expenses;	Dependent variable
Liquidity (LIQ)	Loans / Deposits;	Dependent variable
Solvency (SOL)	(Net profit + Depreciation) / Total liabilities;	Dependent variable
TIER 1 ratio	Tier 1 capital / Risk weighted capital;	Dependent variable
Total assets	Log (Total assets);	Controlled variable
Financial leverage (1)	Debt / Equity;	Controlled variable
Financial leverage (2)	Equity / Total assets	Controlled variable

### *Methods of the research*

Multiple regression is usually used to analyze the impact of intellectual capital in the organizations (Nimtrakoon 2015; Harsh, Tandon, 2015; Morariu, 2014; Celenza, Rossi,

2014; Sang, Dennis, 2014). Authors use different models: fixed impact (Ghosh 2014; Al-Musaili 2012; Mahdi et al., 2014; Mondal, Ghosh, 2012) and the first-order differences (Ghosh, Maji, 2014). In this study authors apply fixed multiple regression model, which determines how intellectual capital efficiency impacts the profitability, efficiency and risk of banks. While collecting data it was discovered that some banks provide data only for two or one year, because some banks are listed only for 1 or 2 year period. Due to the delay of incorporating intellectual capital efficiency impact on the performance of banks, the survey sample was reduced until it became representative. Impact of intellectual capital efficiency on listed banks performance was calculated for the current period instead of using time lag.

Authors chose to use VAIC method for this research. The main difference between VAIC and other valuation models is that VAIC method measures the effectiveness of intellectual capital instead of intellectual capital (Harsh, Tandon, 2015). This provides ability to understand the situation on the effective use of the intellectual capital inside the organization. Another difference of applying VAIC model is that it includes both, tangible and intangible capital (Harsh, Tandon, 2015). Physical assets are included because of the direct relationship between all kinds of capital used in the enterprise (Stankevičienė, Liučvaitienė, 2012).

### **Research findings**

Verifying the first hypothesis, authors found that only one of profitability indicator (ROE) depends on the value of intellectual capital efficiency and this impact is stronger in small banks. It was discovered that none of the selected efficiency ratios depends on the efficiency of the intellectual capital. 2 out of 3 indicators (solvency and TIER 1 ratio) depend on the intellectual capital efficiency determining the impact on banks' risks, but only one ratio (TIER 1) dependency is stronger in small banks. TIER 1 capital ratio depends on intellectual capital efficiency by 0,1323 in small banks and -0,0661 in large banks. So the first hypothesis could be approved only partially, because intellectual capital efficiency impact to financial performance in small banks is not always stronger than in large banks.

Analysis of the intellectual capital efficiency impact on banks performance before, during and after the financial crisis was made in this study as well. This analysis disclosed that intellectual capital efficiency impacts the profitability of small banks before during and after the financial crisis in two different models (ROA, ROE), and in one model of large banks (ROE). Furthermore, intellectual capital efficiency impact on general effectiveness does not vary during the period in small banks, but the impact differs in large banks after the financial crisis. Impact of intellectual capital efficiency for TIER 1 capital differs in large and small banks. Impact of intellectual capital efficiency for solvency ratio is different for small banks before, during or after financial crisis. Intellectual capital efficiency impact on banks financial performance is shown in Table 2.

Table 2 Intellectual capital efficiency impact on banks financial performance

Ratio	Large banks	Small banks	Impact
Net interest margin	-0,0369	-0,0369	The same in large and small banks
Return on equity	0,1323	2,0501	Stronger in small banks
Solvency	-0,0037	-0,0037	The same in large and small banks
TIER1	-0,0661	0,1323	Stronger in small banks

In the second part of the research intellectual capital effectiveness components impact on banks financial performance was investigated. Authors analyzed whether the impact of intellectual capital efficiency in small banks is stronger than in large banks. According the results, the impact of intellectual capital efficiency in small banks is stronger for two profitability ratios (NIM and ROA), one efficiency ratio (GE) and one risk indicator (SOL).

According to the results of this research, all analyzed ratios depend on at least on one intellectual capital efficiency component. Authors confirmed that statistically significant impact of intellectual capital efficiency components differs before, during or after the financial crisis. Authors also found that human capital efficiency impact before, during and after financial crisis differs for two ratios (NIM, TIER 1) in large banks, and four ratios (NIM, LIQ, SOL, TIER 1) in small banks. Structural capital efficiency impact before, during and after financial crisis differs for one ratio (NIM) in large banks, and two ratios (NIM, ROE) in small banks. Capital employed efficiency impact before, during and after financial crisis differs for four ratios (ROA, GE, LIQ, TIER1) in large banks, and four ratios (ROA, ROE, SOL, TIER 1) in small banks. Authors conclude intellectual capital effectiveness components impact on bank financial performance differences before, during or after the financial crisis, but that depends on selected variables. Intellectual capital efficiency components impact on banks financial performance is shown in Table 3.

Table 3 Intellectual capital efficiency components impact on banks financial performance

Ratio	Independent variable	Large banks	Small banks	Impact
NIM	STVA	0,011	-0,039	Stronger in small banks
ROA	VACE	-0,707	92,235	Stronger in small banks
ROE	VAHC	-2,792	0,538	Weaker in small banks
	VACE	50,082	382,495	Stronger in small banks
DP	VACE	1,200	1,200	The same in large and small banks
GE	VACE	0,300	8,742	Stronger in small banks
LIQ	VAHC	-0,075	0,003	Weaker in small banks
	VACE	0,882	-0,028	Weaker in small banks
MOK	VAHC	0,007	-0,004	Weaker in small banks
	VACE	-0,048	1,121	Stronger in small banks
TIER1	VAHC	0,098	0,098	The same in large and small banks
	VACE	-1,6167	-1,6167	The same in large and small banks

To sum up in the majority of cases profitability indicators depend on intellectual capital efficiency and its components and sparsely intellectual capital and its components determine change of effectiveness performance indicators. In addition to this, analyzing the results from regression models before, during and after financial crisis, more variables become significant than analyzing regression models for the entire research period. Authors found that intellectual capital efficiency impact on financial performance before, during and after the financial crisis is more often different in small banks.

The results of the study indicate that there is different intellectual capital efficiency and its components impact on large and small banks financial performance. According to the research results, small banks would have higher benefit increasing intellectual capital efficiency than large banks. Small banks more often have positive and stronger impact of intellectual capital efficiency on financial performance results than large banks. Positive results of increased intellectual capital efficiency on financial performance of the small banks are discovered for the very first year. For example, if VAIC increases 1 unit, the return on equity increases 0.1323 percentage in large and 2.0501 percentage in small banks. Also, although in the large banks VAIC increase by 1 unit reduces TIER 1 capital ratio by 0.0661 unit, in small banks that would increase TIER 1 ratio by 0.1323 already in the same year. Research results show that increasing intellectual capital efficiency in large banks after the financial crisis might negatively affect profitability, effectiveness, and risk. Results in small banks are opposite. The profitability, effectiveness, and risk could be impacted negatively in small banks if intellectual capital efficiency is raised before financial crisis.

For managers which are planning financial performance results of a bank, it is important to know how intellectual capital and its components efficiency impacts different financial performance ratios in case of large and small banks. Authors discovered that structural capital efficiency impact is stronger in small banks. Nevertheless, structural capital efficiency, which is statistically significant for profitability, has a negative impact in small banks and positive impact in large banks. On the other hand, human capital efficiency has mostly positive impact in small banks and negative impact in large banks. For example, human capital efficiency has positive impact on liquidity and profitability ratios. To sum up, anticipating positive results, large banks should invest to structural capital and small banks should invest to human capital efficiency. Moreover, it is worth to increase physical capital expecting better results of efficiency and profitability ratios in small banks.

Overall, this study presents that physical capital efficiency in majority of cases is statistically significant. On the other hand, sparsely statistically significant intellectual capital efficiency component is structural capital. It was found that the physical and human capital efficiency can lead to profitability, efficiency and risk changes, and structural capital efficiency depends only on profitability ratios. Seeking to improve profitability indicators large banks have to increase structural capital and small banks have to increase human capital efficiency. Regardless of the economic situation, the increase of structural and physical capital increases operational efficiency. The impact of human, structural and physical capital efficiency is different for all risk indicators. Moreover, the impact differs before, during and after financial crisis, so it is impossible



to determine which component of intellectual capital should be increased in small and large banks to achieve better financial performance.

## Conclusions

The main components of intellectual capital are human, structural and relations capital. They could be assessed by both qualitative and quantitative indicators. The most important intellectual capital efficiency component defined literature is human capital expressed in terms of knowledge of the workers. Structural capital is the knowledge that belongs to the organization. Researches use VAIC method for intellectual capital efficiency valuation. This model differs from others because it evaluates intellectual capital efficiency instead of intellectual capital.

Most common ratios used to evaluate banks profitability are NIM, ROA, ROE ratios. Productivity of employees and general efficiency are used to evaluate the effectiveness of the bank. CAR, solvency, liquidity and Tier 1 capital ratio are risk indicators used in other studies most often.

The research overwhelms 10-year period (2005 -2014 years). For the study there were selected 118 listed European banks - 52 small and 66 large. Fixed impact econometric model was applied seeking to explore how intellectual capital efficiency impacts financial performance.

Authors found that VAIC impact on small bank performance is not stronger for all selected indicators. Study results showed that for small banks it is more useful to invest to the intellectual capital efficiency increasing than for large banks. Increase in VAIC after the financial crisis might negatively affect the profitability of large banks. Small banks financial performance could be negatively affected if the intellectual capital efficiency is increased before financial crisis.

Increase of structural capital efficiency in large banks helps to increase the net interest margin. On the other hand, increase of human capital efficiency leads to higher profitability ratios in small banks and better risk ratios in large banks. Increased physical capital efficiency determines increase in profitability for small and operational efficiency in both - small and large banks groups. VAIC components affect all risk indicators differently, so this field requires deeper investigation.

## Discussion and recommendations

This research results are useful for bank management team. Decisions about the investment to intellectual capital should be based on the results of this study. The study focuses on the differences between large and small banks. It was found that it is more useful to increase intellectual capital efficiency in small banks, if positive result is anticipated for the same year. Nevertheless, investing only to structural capital also increases the performance results in large banks. It is also found that VAIC and its components effect differs before, during and after the financial crisis. Negative VAIC effect in small banks is before financial crisis and after financial crisis in large banks.

This research can be developed, according to study limitations that are primarily related to the sample of the investigation. This study analyzes the intellectual capital efficiency impact on banks financial performance in the same period. Nevertheless, the research could be made taking time lags into account

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