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Measuring intellectual capital: A case of football clubs in UEFA Champion League

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Measuring Intellectual Capital: A Case of Football Clubs in UEFA Champion League

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Abstract: This study mainly examines intellectual capital efficiency of 10 top football clubs in UEFA Champion League. For measurement of the total intellectual capital efficiency, the study follows VAIC model and finds that almost clubs use its intellectual capital efficiently with great coefficients, especially for Barcelona and Benfica club. However, the intellectual capital efficiency of both Roma and Galatasary is negative, showing insignificant value due to operating loss or equity loss. Another hand, this study also investigates the relationship between human capital and structural capital in intellectual capital components with an additional test. It uses regression model for investigating human capital's effect on structural capital. The regression result demonstrates that human capital, as the core of intellectual capital, has positive impact on structural capital. Our finding is significant for sports manager to make strategic management of intellectual sources to create value in football industry. It suggests that football clubs should pay more attention to intellectual capital like fan loyalty and talented players. Meanwhile, it helps sports industry to play a great role of human capital in intellectual capital and to increase competitive advantage of enterprise.

Keywords: intellectual capital, VAIC model, human capital, structural capital

I. INTRODUCTION

Intellectual capital (IC) has played a great role in business activities with the development of enterprise in information industry. It is the "packaged useful knowledge" (Andriessen, 2004). In management theory, company's competitiveness relies more on strategic management of intangibles in today's world. Intellectual capital, as a kind of intangible asset has become a key element for financial success of an enterprise. Therefore, people realize the value of knowledge assets cannot be ignored and initiate the measurement of it. Pulic (2000) developed the Value Added Intellectual Efficiency method (VAIC) to measure intellectual capital efficiency (ICE). For measurement of intellectual capital in football industry, Gürel et al. (2013), by adopting VAIC method, have found that intellectual capital of Turkish football clubs has great efficiency especially for human capital efficiency. Ricci et al. (2015) has also explored the impact of intellectual capital efficiency (ICE) on twelve football firms in the top-flight division (Serie A) of Italian football.

However, both of these two studies select data from the source in one country with quantitative approach. In order to increase the reliability and credibility of study, researching on the whole European football clubs is a better way to examine ICE with annual reports of top teams. Besides, Ricci et al. (2015) developed a quantitative analysis of some dimensions in ICE and demonstrated that human capital efficiency and relational capital efficiency can increase the value of enterprise but the relationships among intellectual capital components have not yet been illustrated. It is significant to demonstrate the effect of human capital which is the core intellectual capital on structural capital and relational capital. This study fills these gaps by measuring IC of 10 European football clubs in UEFA Champion League.

This study has two main objectives. On one hand, it aims to measure IC of football

clubs from UEFA Champion League by using VAIC method and to detect the impact of IC on football industry. On the other hand, this study also investigates the relationship between human capital and structural capital.

In previous studies, most researchers choose to concentrate on one place not randomly in several ones. It is unable to examine IC of different firms in more than two countries. For example, Riahi-Belkaoui (2003) discovered a positive impact of IC on the financial performance of US-based multinational firms. Chen et al. (2005) used VAIC method for measuring IC of Taiwanese listed companies in their financing activity. Therefore, determining research objects from different countries is a new and valuable approach to examine IC. Gürel et al. (2013) also suggests their study could be expanded by applying VAIC method for the clubs taking place in European leagues. The analysis of football clubs in European area can make a great comparison between various countries.

Through the VAIC model, this study finds that 8 of top UEFA football clubs use its intellectual capital efficiently especially for Barcelona and Benfica club. Compared with structural capital and relational capital, human capital is often stable and efficient with great coefficient of efficiency. For the investigation of relationship between human capital and structural capital, the significant results in regression model prove that human capital has a great impact on structural capital.

This study also contributes to existing literatures. In contrast with Gürel et al. (2013), the author has expanded research on the whole Europe from various countries. Europe, as the continent where football prevails, is very suitable for research on the intellectual capital efficiency of football industry. What's more, Namvar et al. (2011) made a study of internal relationship of intellectual dimensions in e-business industry. This study is a further and specific research to concentrate on football industry to explore human capital's effect on other dimensions. It brings more opportunities for company to make strategic management of human capital in sports industry.

After the introduction, the following section II shows literature review and key elements of intellectual capital. Methodology in section III presents main model of this study. In section IV, it comes out results and additional test with relationship between human capital and structural capital. Section V discusses the explanation of results, theoretical contribution, and reliability and validity of this study respectively. Finally, the author makes a conclusion in section VI.

II. LITERATURE REVIEW

It has been acknowledged that intellectual capital is highly related to enterprise's competitiveness, profitability, market share, and even customer satisfaction in recent twenty years. There are increasing focus on the importance of intellectual capital applied into real business for employers in a knowledge society. Initially the concept of intellectual capital (IC) was vaguely mentioned but they realized these intangible assets should be disclosed (Roos, 1998). Therefore, a large number of researchers started to figure out the concept of IC, although there is no generally accepted definition for IC. For example, according to Chu et al. (2006), intellectual capital is the sum of knowledge asset to create the value of company. Torres (2006) demonstrates intellectual capital is intangible asset of an organization which not traditionally recorded in the financial statement but contains more than 80% of market value. Similarly, Pen et al. (2007) claims that intellectual capital is the sum of hidden asset without recording in balance sheet completely. It is the strong resource to strengthen sustainable competitive advantages in an organization. According to Edvinsson and Malone (1998), intellectual capital can be divided into human capital, structural capital, and relational capital with

three main components.

Human Capital

Edvinsson (1998) defines human capital as the core assets in intellectual capital such as individual skills, knowledge, talent, and experience. It mainly comprises human ability to solve company's problem and how efficiently company uses human resource to accumulate its knowledge and innovation. For example, in an organization, employees have individual knowledge, skills, experience, and intelligence. These are the resources to strongly create the value of company.

However, company cannot own human capital personally because it belongs to employee naturally. When employees are absent from company such as annual leave, sick leave, or holidays, the value of human capital will decrease. Company could increase intensive training to increase human capital.

Structural Capital

Structural capital is described as all values supported for human capital. In other words, Structural capital consists of company's brand image, company's information system, and company's database. It can facilitate the formation of organizational policies, culture, relations and so on. Compared to human capital, structural capital can remain to be preserved when employee leaves. In other words, it is owned by the company not people (Edvinsson, 1998).

There are three main types of structural capital: organizational capital, process capital, and innovation capital (Dragonetti, 1997). Organizational capital is the culture and system of the company. Process capital is the process for employees to apply their knowledge into production through program or project. Innovation capital is other intangible assets except for philosophy and process of organization like patent, goodwill, and copyright.

Relational Capital

Relational capital is also regarded as customer capital. According to Edvinsson and Malone (1998), customer capital is the total value of the relationship between the enterprise and its customers especially for the long-term relationship with customer loyalty. The strong relationship with customers can positively influence promotion of client capital compared to both human capital and structural capital. For relational capital, it involves more than the value created by customers, but also that of relations with other firms, suppliers, and related industries.

In sports industry, each component of intellectual capital shows significant values of intangible assets in enterprise. As an example of football club, talented players, one kind of human capital, fully reinforced the team. Strategies of success management of team, important structural capital, are well-implemented for the use of human resource. Fan loyalty, one basic type of relational capital, is able to both improve the performance of players and establish a strong brand. Therefore, the benefits from these intangible assets ought to be ignored especially for the core part, human capital.

III. METHODOLOGY

Data collection

The sample of study is 10 top football clubs from 7 different countries playing in UEFA Champion League over the period from 2010 to 2019. These clubs have great reputation and popularities in different countries like Spain, United Kingdom, and France. The Table 1 shows the clubs included in this study. The data is collected on the

financial annual report of club's official website severally or from Bloomberg Terminal.

TABLE 1
Clubs Included in The Study

| Club | Country |
|--------------------|----------|
| Real Madrid | Spain |
| FC Barcelona | Spain |
| Liverpool FC | England |
| Manchester United | England |
| AS Roma | Italy |
| Juventus | Italy |
| Dortmund | Germany |
| Galatasaray AŞ | Turkey |
| SL Benfica | Portugal |
| Olympique Lyonnais | France |
| Celtic | Scotland |

Source: <https://www.uefa.com/uefachampionsleague/clubs/>

Measuring intellectual capital

In order to examine the existing intellectual capital, researchers find two approaches: measuring IC separately or as a whole. Choosing combine these approaches is more logical. There are three general methods for measurements of intellectual capital including market-to-book ratio, Tobin's Q ratio, and calculated intangible value (İşeri and Kayakutlu, 2003).

Market-to-book ratio is calculated by market value – market price per share of common stock multiplied by the number of outstanding shares – divided by the book value shown on company's balance sheet. It indicates how a company evaluates its current value related to book value. In other words, it compares a company's net asset available in relation to the sales price of stock. It is a simple way to measure IC but limited by external factors which may influence stock price. The stock price is mostly likely to be changed by economic environment. On the other hand, depreciated historical costs are flexible and result in underestimating the actual value of book value (Gürel et al., 2013). The equation for market-to-book ratio is as follows:

$$M/B = \text{Market Capitalization} / \text{Total book value}$$

Another method for measurement of intellectual capital is Tobin's Q ratio. It can be used for measuring IC both separately and as a whole. Compared to market-to-book ratio, Q ratio replaces book value of tangible assets with replacement cost of tangible assets (Gürel et al., 2013). The replacement cost is the cost for producing new product to replace the essential asset. If Tobin's Q ration is higher than 1, it indicates company has a high value of intellectual capital with great profits. The function is displayed as:

$$\text{Intellectual Capital} = \text{Market Value} / \text{Asset Replacement Cost}$$

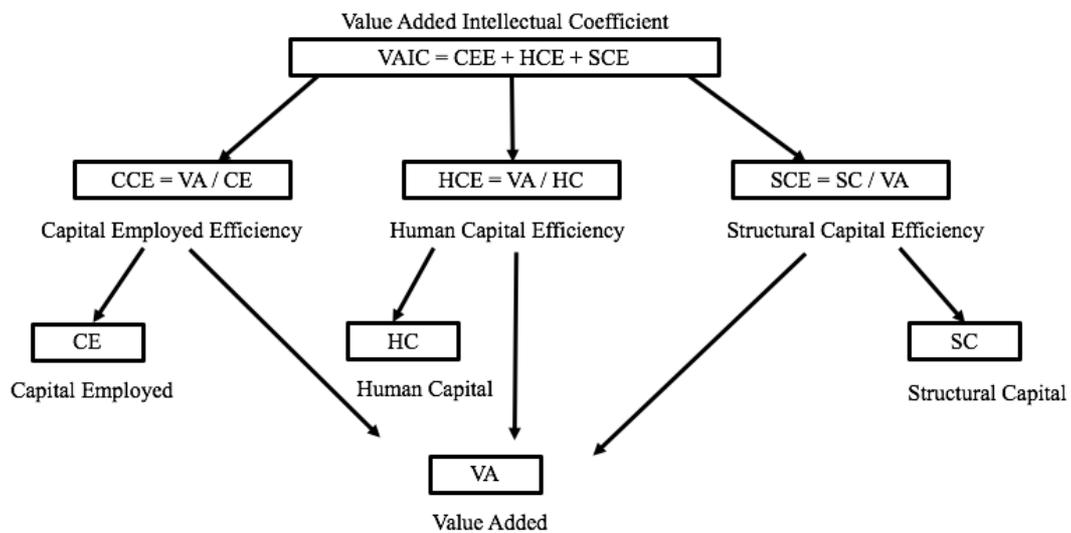
The final method, calculated intangible value (CIV), describes as recording the fixed value of intangible asset such as goodwill and copyright, which is not affected by market value of enterprise. Generally, the value of intangible asset is determined by market value of tangible assets subtracting book value of tangible assets. However, the variability of market value cannot be ignored. CIV method takes additional factors into

consideration like pretax earnings and returns on asset. Especially for ROAs, CIV compares industrial average of ROA with the company specific ROA (Aho et al., 2011).

Value Added Intellectual Coefficient (VAIC) Method

In this paper, the intellectual capital efficiency of each football club is calculated with VAIC method, which was developed by Ante Pulic (2000). This method intends to measure how efficient company uses intellectual capital based on value added in assets of enterprise. There are three components showing in the Figure 1. Each of intellectual capital efficiency is calculated by individual equation.

FIGURE 1:
Value Added Intellectual Coefficient (VAIC) model (Pulic, 2000)



Before calculation of them, the total value added in enterprise should be figured out (Pirjo et al., 2011). In a sports company, total value involves a lot of accounts in financial statement. The function is as follows:

$$VA_i = P_i + C_i + D_i + A_i$$

VA = Total value added of enterprise

P = Operating profit of enterprise

C = Total salary and wage costs of enterprise

D = Write-downs of enterprise

A = Depreciation expense of enterprise

IV. RESULTS

Based on VAIC method (Pulic, 2000), capital employed efficiency (CEE), human capital efficiency (HCE), and structural capital efficiency (SCE) are calculated with individual equation. According to the model, the coefficient of capital employed is calculated as follows:

$$CEE_i = VA_i / CE_i$$

CEE = Capital employed efficiency coefficient of enterprise

VA = Total value added of enterprise
 CE = Capital employed for the enterprise

This Table 2 indicates the calculation of capital employed efficiency coefficient in ten UEFA Champion League clubs. The value added of enterprise is calculated by the function mentioned in methodology section. The capital employed of each club is interpreted as the book value of enterprise, which is the net asset of a club. For calculation of total value added and capital employed, the author took the average of ten-year data from 2010 to 2019 for each club. It can be observed that the coefficient of Barcelona ranked first at 9.714. It suggests that investing 1 capital employed can create 9.714 additional value, showing great efficiency. Following Barcelona, both Juventus and Benfica also have great capital employed efficiency close to 5. On the contrary, the coefficients of Roma and Galatasaray for capital employed are negative with inefficiency due to negative capital employed collected in these clubs' financial statement. Compared to eight other clubs, Roma and Galatasaray are unable to create extra value from capital employed.

| | <i>VA</i> | <i>CE</i> | <i>CEE</i> |
|---------------------------|-----------|-----------|----------------|
| <i>Machester United</i> | 328.25 | 434.55 | 0.755 |
| <i>AS Roma</i> | 147.04 | (79.80) | (1.843) |
| <i>Juventus</i> | 276.19 | 53.63 | 5.150 |
| <i>Dortmund</i> | 195.78 | 211.35 | 0.926 |
| <i>Galatasaray</i> | 52.63 | (43.99) | (1.196) |
| <i>SL Benfica</i> | 129.54 | 25.57 | 5.066 |
| <i>Olympique Lyonnais</i> | 105.68 | 153.52 | 0.688 |
| <i>Celtic</i> | 61.01 | 62.06 | 0.983 |
| <i>Liverpool FC</i> | 168.01 | 45.23 | 3.715 |
| <i>FC Barcelona</i> | 447.12 | 46.03 | 9.714 |

For the calculation of coefficients for human capital, we use the equation in VAIC method as follows:

$$HCE_i = VA_i / HC_i$$

HCE = Human capital efficiency coefficient of enterprise

VA = Total value added of enterprise

HC = Total salary and wage costs for enterprise

Human capital efficiency is the coefficient for measuring efficiency of human resource applied into creating company's value. Human capital can be regarded as employee expense (Pirjo et al., 2011). The author collected total salary and wage costs in reported income statement of each club as human resource investment. For some clubs without the total salary and wage costs account, human capital for them are interpreted as personnel expense, which is similar to employee benefit expense. Table 3 demonstrates human capital efficiency coefficients of UEFA clubs, showing how

efficient company creates additional value invested in human resource. The highest human capital efficiency coefficient belongs to Benfica club. Overall, all clubs got efficient human capital, each of which is close to or higher than 1. The value “1” presents that total value added has been affirmatively transferred into human resource costs, showing efficiency of human capital as the part of intellectual capital.

| | VA | HC | HCE |
|---------------------------|-----------|-----------|--------------|
| <i>Machester United</i> | 328.25 | 216.82 | 1.514 |
| <i>AS Roma</i> | 147.04 | 129.21 | 1.138 |
| <i>Juventus</i> | 276.19 | 204.40 | 1.351 |
| <i>Dortmund</i> | 195.78 | 123.14 | 1.590 |
| <i>Galatasaray</i> | 52.63 | 61.67 | 0.853 |
| <i>SL Benfica</i> | 129.54 | 60.28 | 2.149 |
| <i>Olympique Lyonnais</i> | 105.68 | 99.81 | 1.059 |
| <i>Celtic</i> | 61.01 | 49.12 | 1.242 |
| <i>Liverpool FC</i> | 168.01 | 147.09 | 1.142 |
| <i>FC Barcelona</i> | 447.12 | 336.46 | 1.329 |

Another component of intellectual capital efficiency is structural capital efficiency. It measures how much extra capital created by total value added of enterprise. The equation for calculation of structural capital efficiency is as follows:

$$SCE_i = SC_i / VA_i$$

SCE = Structural capital efficiency coefficient of enterprise

SC = Structural capital for the enterprise

VA = Total value added of enterprise

In VAIC model, structural capital is the difference between produced value added and human capital (Pulic, 2000; Pirjo et al., 2011; Fijałkowska, 2014). It is recorded as a traditional accounting and financial variable rather than a specific class as structural capital. (Pirjo et al., 2011) Structural capital is the value for human capital to function. If the total value added is smaller than human capital, the value of structural capital will be negative like SC of Galatasary club in Table 4. Therefore, CEE for Galatasary is also negative. Except for this club, other clubs have positive value but each of them is smaller than 1. Among ten clubs, the highest structural capital efficiency belongs to Benfica. This result is also similar to human capital efficiency in Table 3. It shows Benfica club creates about 0.535 units of capital for enterprise through structural capital. Compared to Benfica, Olympique Lyonnais club achieves less efficient capital for enterprise with CEE at 0.506.

| | SC | VA | SCE |
|-------------------------|-----------|-----------|------------|
| <i>Machester United</i> | 111.43 | 328.25 | 0.339 |

| | | | |
|---------------------------|--------|--------|---------|
| <i>AS Roma</i> | 17.83 | 147.04 | 0.121 |
| <i>Juventus</i> | 71.79 | 276.19 | 0.260 |
| <i>Dortmund</i> | 72.65 | 195.78 | 0.371 |
| <i>Galatasaray</i> | (9.04) | 52.63 | (0.172) |
| <i>SL Benfica</i> | 69.26 | 129.54 | 0.535 |
| <i>Olympique Lyonnais</i> | 5.88 | 105.68 | 0.056 |
| <i>Celtic</i> | 11.89 | 61.01 | 0.195 |
| <i>Liverpool FC</i> | 20.92 | 168.01 | 0.125 |
| <i>FC Barcelona</i> | 110.66 | 447.12 | 0.247 |

In order to measure intellectual capital efficiency of each club as a whole, three types of intellectual capital efficiency are summed up to analyze. In the last stage of VAIC model, as the value added intellectual coefficient (VAIC), the company's intellectual capital efficiency (ICE) is calculated as follows:

$$VAIC_i = CEE_i + HCE_i + SCE_i$$

The author makes a comparison between clubs and identify the potential of club's value creation. Table 5 illustrates total intellectual capital efficiency coefficient of each club with ten-year average data. The main result is that except for Roma and Galatasaray, eight other clubs have great intellectual capital efficiency with more than "1" value. The higher the coefficient, the greater the ability and efficiency for club to create value and make resources utilization (Fijałkowska, 2014). Barcelona, one of top football clubs in Spain, ranked the first in UEFA clubs with the total VAIC at 11.29, which is much higher than any other clubs. It means Barcelona has the greatest labor productivity and the most efficiency of creating capital among ten clubs. Following Barcelona, Benfica whose coefficient is 7.75 also used its intellectual capital efficiently. On the contrary, the intellectual capital efficiency coefficients for both Roma and Galatasaray are negative, presenting inefficiency. VAIC model cannot apply into negative book value or negative profit for enterprise. It suggests incorrect productivity through creating value by intellectual resources (Fijałkowska, 2014).

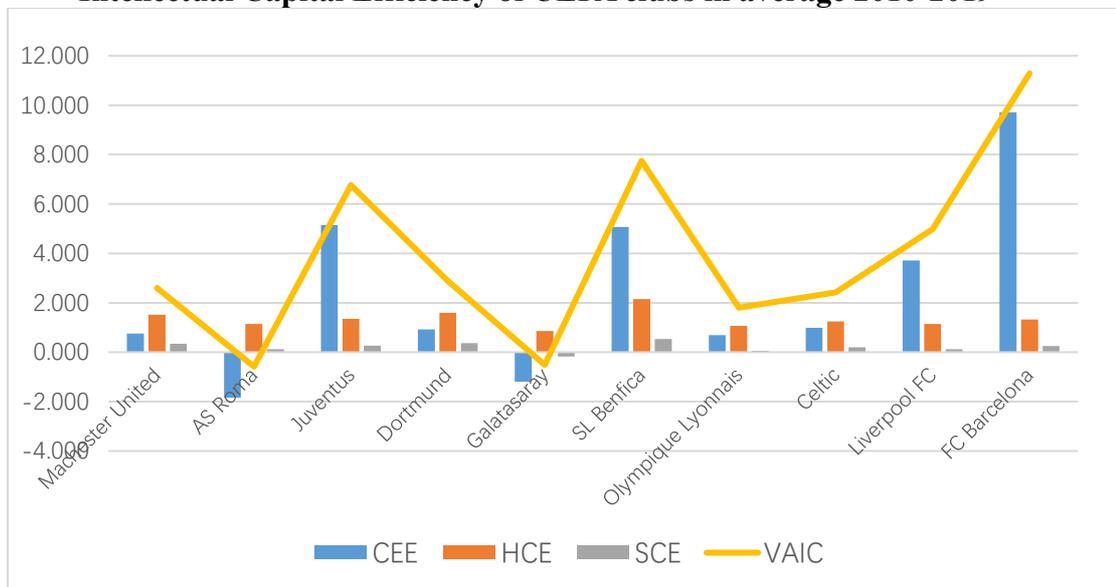
TABLE 5
Intellectual Capital Efficiency of UEFA clubs in average
2010-2019

| <i>Club</i> | <i>VAIC (ICE)</i> |
|---------------------------|-------------------|
| <i>Machester United</i> | 2.609 |
| <i>AS Roma</i> | (0.583) |
| <i>Juventus</i> | 6.761 |
| <i>Dortmund</i> | 2.887 |
| <i>Galatasaray</i> | (0.515) |
| <i>SL Benfica</i> | 7.750 |
| <i>Olympique Lyonnais</i> | 1.803 |
| <i>Celtic</i> | 2.420 |
| <i>Liverpool FC</i> | 4.981 |
| <i>FC Barcelona</i> | 11.290 |

*VAIC coefficient means total intellectual capital efficiency (ICE).

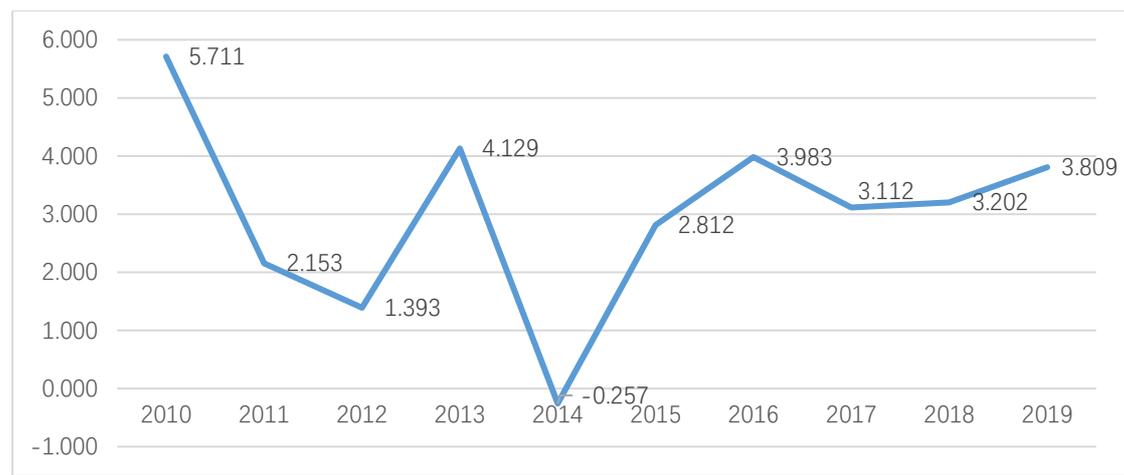
In order to make a panel data analysis between 10 clubs, the author creates figure 2 to display each component of intellectual capital efficiency for individual club. Each type of bar stands for specific intellectual capital efficiency respectively. The yellow line represents the VAIC of clubs, also meaning the total coefficient of intellectual capital efficiency (ICE). Human capital, as the core of intellectual capital, is often stable and efficient among UEFA clubs. In these orange bars, the coefficients for human capital is almost higher than 1. Compare to human capital efficiency (HCE), capital employed efficiency (CEE) in blue bars fluctuate among clubs based on their book value of enterprise. Sometimes it could be negative due to equity loss like Roman and Galatasaray club. Structural capital, as the difference between total value added and human capital, is a small proportion of intellectual capital like these grey bars. Compared to human capital, all clubs create less capital through investing in structural capital and might also be negative if human capital is larger than total value.

FIGURE 2
Intellectual Capital Efficiency of UEFA clubs in average 2010-2019



Besides, the author also focuses on average intellectual capital efficiency (ICE) of ten clubs between the period from 2010 to 2019. Each year of VAIC is calculated by the average of total intellectual capital efficiency in ten clubs. Except for 2014, intellectual capital is usually efficient in UEFA Champion League for ten years. In 2010, football clubs have the highest average intellectual capital efficiency at 5.711. After 2010, it dropped to 2.153 in 2012 and then continued to fall at 1.393 in 2013. However, for 2014, it became negative and inefficient, which is unexpected results. In recent four years, the value of average ICE has been stable between 3 to 4. It can be predicted that each club tends to use its intellectual capital efficiently to create capital and value.

FIGURE 3
Average Intellectual Capital Efficiency of UEFA clubs in 2010-2019



Relationship Between Human Capital and Structural Capital

This study also investigates the relationship between human capital and structural capital in intellectual capital dimensions. According to Edvinsson and Malone (1998), the concept of IC consists of three components including human capital, structural capital, and relational capital. Among three types of intellectual capital, human capital is the core capital to play a great role in financial performance. For the structural capital, it could be organization's database or infrastructure to function human capital. Therefore, correlation between human capital and structural capital ought to exist and be positive. Namvar (2012) explores the effect of human capital on structural capital in e-business industry in Iran. They adopted regression model to analyze. Finally, they provided adequate evidence that three components of intellectual capital are correlated. It could show human capital has a great relationship with structural capital.

In order to explore the relationship between human capital and structural capital, this study adopts regression analysis. The regression equation is as follows:

$$SC_i = \beta_0 + \beta_1 HC_i + \beta_2 SCI_i + \beta_3 GDP + \beta_4 AGE + e_i$$

Dependent variable

In this study, one of aim is to demonstrate the hypothesis that human capital (HC) has positive impact on structural capital (SC) in football industry. In regression model, the author regards structural capital as dependent variable, which is affected by the change of human capital and certain control variables. When calculating intellectual capital efficiency (ICE) through VAIC model, the structural capital is also calculated as the difference between total value added and human capital.

Independent variable

Similarly, the author also calculates human capital with total salary and wage costs. In the main results, the value of human capital would stand out from all types of intellectual capital, which indicates human capital is the center of intellectual capital. Therefore, in the relationship between human capital and structural capital, human capital, as the independent variable, controls the hypothesis (H_1) by changing its value to test structural capital efficiency. Meanwhile, another independent variable is social capital index (SCI). Social capital involves the relationship between employees and companies and creates value and competitive advantage (Hitt & Duane, 2002). Therefore, it can also be the factor that affects structural capital. Social capital is measured by social capital index (Lee et al., 2011).

Control variable

In this regression model, there are two control variables including GDP of each country and years for company publicly traded (AGE). GDP of each country from 2010 to 2018 is collected on Trading Economic website. The AGE index is the natural logarithm of one plus the number of years a firm goes public. The author collected data on Bloomberg Terminal. These control variables strongly influence regression results, although they are not the primary interest for relationship between SC and HC.

The study collects each variable for regression model with 50 samples of publicly traded clubs. The Table 6 summarizes these variables efficiently. Structural Capital, as the dependent variable, has great standard deviation among observed objects, which is consistent to human capital. However, the mean of structural capital is close to 60, which is much smaller than that of human capital. For the SCI, it indicates that the sample from different countries with the similar score of social capital. In control variables, GDP has the mean at 15.88 and AGE has the mean at 2141.464 respectively. Among these clubs, Manchester United went public at the latest with seven years.

TABLE 6

Summary of Variables in Regression Model

| Variable | Obs | Mean | Std.Dev. | Min | Max |
|----------|-----|----------|----------|--------|---------|
| SC | 50 | 59.6252 | 44.66376 | 0.49 | 217.82 |
| HC | 50 | 230.8774 | 72.74196 | 0.38 | 295.94 |
| SCI | 50 | 6.115 | 0.962141 | 3.97 | 7.05 |
| GDP | 50 | 2141.464 | 1160.161 | 199.42 | 3996.76 |
| AGE | 50 | 15.88 | 4.547437 | 7 | 21 |

In the Table 7, it presents the correlation analysis among dependent and independent variables. For the main investigation between human capital and structural capital, the value “0.6964” demonstrates that structural capital and human capital are correlated tightly and positively. For SCI, it has the value of 0.1241 with structural capital, which shows little relevance to structural capital. However, it has a great positive correlation with GDP.

TABLE 7

Correlation Analysis

| | SC | HC | SCI | GDP | AGE |
|-----|---------|--------|---------|--------|-----|
| SC | 1.0000 | | | | |
| HC | 0.6964* | 1.0000 | | | |
| SCI | 0.1241 | 0.3020 | 1.0000 | | |
| GDP | 0.0704 | 0.3244 | 0.8947* | 1.0000 | |

| | | | | | |
|-----|-----------|-----------|--------|--------|--------|
| AGE | -0.4620** | -0.2985** | 0.1532 | 0.3110 | 1.0000 |
|-----|-----------|-----------|--------|--------|--------|

*The value between 0.5 and 1.0 means great positive correlation between each other.

**The value under 0 means negative correlation between each other.

This Table 8 shows the regression results in the STATA. It is noticeable that p-value of human capital is 0.000, showing very significant. The coefficient for human capital is 0.3974751, which captures the relationship between human capital and structural capital. It indicates that the higher value of human capital impact structural capital positively. On the contrary, the control variable, AGE, has negative coefficients at -2.284088. It demonstrates that the higher level of AGE impact structural capital negatively. However, the p-value of social capital is 0.602 which is higher than 0.1, suggesting insignificance. Compared to control variables, the significance of human capital and social capital is much more important. The F-value with “0.0000” also presents that the regression analysis is significant.

TABLE 8
Regression Analysis

| Source | SS | df | MS | Number of obs | 50 | |
|----------|------------|-----------|----------|---------------|-----------|-----------|
| Model | 54836.4113 | 4 | 13709.10 | F (4,45) | 14.38 | |
| Residual | 42911.2934 | 45 | 953.58 | Prob > F | 0.000 | |
| Total | 97747.7046 | 49 | 1994.85 | R-squared | 0.561 | |
| | | | | Adj R-squared | 0.522 | |
| | | | | Root MSE | 30.88 | |
| SC | Coef. | Std. Err. | t | P > t | [95%Conf. | Interval] |
| HC | 0.397451 | 0.0721 | 5.51 | 0.000 | 0.25229 | 0.543 |
| SCI | 5.689592 | 10.8208 | 0.53 | 0.602 | -16.10465 | 27.484 |
| GDP | -0.0068121 | 0.0098 | -0.70 | 0.489 | -0.02649 | 0.013 |
| AGE | -2.284088 | 1.2005 | -1.90 | 0.064 | -4.70202 | 0.134 |
| _cons | 27.64669 | 58.3731 | 0.47 | 0.638 | -89.92280 | 145.216 |

*If $p < 0.1$, it shows the results with significance in regression model.

If coefficient is positive, it shows positive relationship, otherwise negative.

V. DISCUSSION

With VAIC model, it can be concluded that almost all clubs have efficient intellectual capital except for Roman and Galatasary. These clubs achieve great ability to create value by intellectual resources. In addition, the highest intellectual capital efficiency belongs to Barcelona club. Among three component of intellectual capital, human capital usually takes a stable proportion with great efficiency but not for structural capital and relational capital. The latter two are easier to be affected by operating profit and book value. Another hand, based on regression results, the findings can demonstrate that human capital affects structural capital positively.

In table 4, the total intellectual capital efficiency (ICE) of each club is partly significant. The negative value of both Roma and Galatasary is unexpected. Roma's negative ICE is attribute to equity loss, which leads to negative capital employed

efficiency. Roma club was most likely to suffer from large accumulated loss and large dividend payments during ten years. Like Roma, Galatasary faced equity loss but also operating loss. It influences the calculation of total value added with negative value, therefore resulting in negative structural capital. Similarly, in graph 2, the average VAIC in 2014 was different at -0.257. The average value of ten clubs might also be affected by some club's both operating loss and equity loss. It suggests UEFA football clubs in 2014 could not create value more efficiently through investing in intellectual capital than those in any other years. In regression analysis, there is also an insignificant result of social capital's p-value at 0.602. The measurement of social capital is based on social capital index (SCI) developed by Lee et al. (2011). It might not be updated to the latest index in 2019 by countries.

This study also has some limitations. Compared to other information industry, sports industry especially for football has less organizations to be publicly traded. Therefore, when selecting sample in UEFA Champion League, some popular and prevalent clubs are unable to collect data like Real Madrid. In the process of calculating total value added (VA), components might not be added correctly like write-downs (D). The component "D" should be calculated by write-downs of both current and long-term assets but there's not one account representing write-downs in balance sheet. Some of accounts lacked information when searching in Bloomberg Terminal. Therefore, calculation errors from these components exist when analyzing VAIC of each club. Meanwhile, VAIC model remains some shortcomings and drawbacks. Since Pulic (2000) was the first to put forward the method, many researchers have applied the model into regional and national analysis of individual company's performance on intellectual capital. However, it still cannot be a formal and conceptual method for measuring intellectual capital efficiency. For the human capital, VAIC model defined it as total salary and wage costs simply but human capital is more complex and variable at labor costs, which probably underestimates the value. Another hand, if a company discloses a negative book value or negative profit, VAIC will be negative and cannot perform correctly on measuring intellectual capital as a whole (Fijałkowska, 2014).

Reliability and Validity

For the reliability of research, this study follows previous research undertaken by Gürel et al. (2013) who examined the intellectual capital through VAIC model. This model has been acknowledged by many previous researchers (Pulic, 2000; Pirjo et al., 2011; Ricci et al., 2015). For the additional test, the author adopts regression model to investigate the relationship between human capital and structural capital according to Namvar et al. (2011) who figure out correlation between internal intellectual capital dimension. These reliable analysis techniques are adopted by this study to measure IC of European football clubs with similar findings. For the validity of research, the sample of this study is top and prevalent football clubs in large-scale European league. Although Liverpool and Barcelona are not publicly traded, the influence and publicity are also admitted by people around the world in football industry. The ten-year average data from 2010 to 2019 is also significant and valid for regression and VAIC analysis.

Theoretical Contribution

Followed by Gürel et al. (2013), the study adopts VAIC method into the calculation of intellectual capital efficiency of football clubs from various countries in UEFA Champion League. What's more, the calculation of total value added of enterprise is also based on Gürel and her partners' equation (Gürel et al., 2013). Turkey, one country in Europe, merely occupies a small proportion of football industry. Except for Turkey,

the author also investigates the football industry in six other countries in Europe like Spain, England, and so on. In the finding and analysis part, we also create related line chart to compare each intellectual capital efficiency of clubs in different countries. It is significant to look through the impact of IC on the whole European football industry base on a prevalent European league. On the other hand, we initiate the research on the internal relationship between human capital and structural capital. It can help future study to focus on the promotion of structural capital from human capital in an enterprise.

VI. CONCLUSION

Due to the increasing importance of intellectual capital in sports industry, this study makes its objective to measure intellectual capital of each football club in UEFA Champion League and to demonstrate whether human capital has positive impact on structural capital or not. The author determined 10 top clubs from 7 various countries in UEFA Champion League as the sample of this study. For the methodology, the author adopts VAIC model to measure efficiency of intellectual capital in ten clubs. With panel data analysis, the author finds that 8 of football clubs used intellectual capital efficiently especially for Barcelona and Benfica club. Among intellectual capital, human capital usually obtains stable and great efficiency coefficient but not for structural capital and relational capital. What's more, the author undertakes an additional analysis with regression model. Through the regression results, it has affirmed that human capital influence structural capital positively.

With VAIC model to measure intellectual capital, previous researchers have focused on national analysis for the overall efficiency of companies. Gürel et al. (2013) has determined whether using intellectual capital can seek profit for sports enterprises through analyzing two Turkish football clubs. This study expands the sample in different countries from Europe area. However, sample cannot contain some top clubs which not publicly traded because they lack detailed and adequate financial information. What's more, the application of VAIC model is unable to perform on clubs with negative operating profit and negative equity.

Football industry is one kind of sports industry. For the development of sports enterprise, this study could continue to be undertaken for other sports industry such as basketball. It is significant for researchers to make a great comparison between different sports industry. Similarly, future study for other industries could also adopt regional analysis in one continent with various countries. Besides, using more than two methods for measuring intellectual capital can decrease calculation error efficiently. One major suggestion is combining VAIC model with market-to-book ratio. Meanwhile, relationships between intellectual capital dimensions could also be researched specifically such as the effect of human capital on components of relational capital.

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