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A bank's intellectual capital and its importance in building competitiveness on the example of Polish listed banks

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Abstract

Motivation: Contemporary banks operating in the knowledge-based economy are constantly looking for sources of improving their competitiveness and attractiveness compared to the banking sector. Therefore, the ability to flexibly respond to changes taking place in the market environment and use the resources and experience in a creative way becomes essential. Intellectual capital is a source of the bank's intangible resources, such as knowledge, employee skills, service quality, social relations and image, and innovations. The present study focuses on the structure of intellectual capital, which has been long discussed for a long time and became a subject of numerous studies. The concept of division of the bank's intellectual capital into three subsystems was herein presented: organizational capital (KORG), innovative capital (KINN) and institutional capital (KINS). These subsystems will be included in the creation of a synthetic measure defining the bank's competitiveness.

Aim: The objective of this study is to present a method enabling the assessment of the competitiveness of listed banks in Poland with the use of multidimensional statistical methods, taking into account diagnostic variables that determine the economic and intellectual capital of banks, including its subsystems.

Results: The article systematizes the concept of the division of intellectual capital. Thanks to the aggregate measure of the bank's competitiveness, the author presented a ranking of banks, indicating the leader among the 11 banks listed on the stock exchange in Poland in 2009–2019. The proposed multidimensional analysis of the bank considers its financial and intellectual resources, which means that stakeholders can evaluate the bank's data

and its long-term development strategies. The long-term leadership position may indicate the bank's condition and its intensified activities in intellectual capital development, which may be important information for stakeholders.

Keywords: intellectual capital; competitiveness; bank
JEL: G21; O34; J24; M21

1. Introduction

On the banking services market, a similar product offer, decreasing interest income, comparable functionality of distribution channels draw the attention of managers to the bank's intangible resources, such as knowledge, employee skills, service quality, social relations and image, as well as innovations, in other words, broadly understood intellectual capital (IC). Banks, being service companies operating in the knowledge-based economy, use intellectual (non-financial) capital to the same extent as financial capital (Klimontowicz, 2018, p. 252). So far, most of the available analyses referring to building banks' competitiveness have been based on typical financial indicators (profitability indicators or performance indicators). Nevertheless, the changing conditions related to the sector's functioning in the 21st century require an evident appreciation of activities that build banks' competitiveness, based on the development of intellectual capital subsystems (Ozkan et al., 2017, p. 194). The concept of intellectual capital has long been the subject of discussion in the literature on the subject, primarily regarding the components and the principles and methods of measuring the effectiveness, mainly due to the difficult-to-measure nature of components.

The concept of intellectual capital, although more and more popular, is difficult to define unambiguously. Different approaches to the concept of intellectual capital occur primarily in the categorization of its components. The article recommends the division of intellectual capital into three equal subsystems: innovative capital, organizational capital and institutional capital. At this point, it should be highlighted that economic (financial and market) capital is still viewed as a critical element of the foundation character — the development foundation. However, the IC constitutes the basis for the improvement of the competitive position in the long term. IC comprises a specific multiplier of economic capital (Rosińska-Bukowska, 2020, p. 292). In the era of globalization, technological, social and economic changes and unlimited flow of information, modern enterprises (including banks) have to face new conditions dictated by new competitors, advanced technologies, and innovative products (Zaleska & Kondraciuk, 2019, p. 78). In today's economic reality, knowledge-based organizations, i.e. those operating on a unique method of acquiring, processing and creating knowledge deemed the entities that usually succeed. This means that success, i.e. the ability to constantly improve one's competitiveness (achieving a highly competitive position at a given moment), is identified with appropriate intellectual capital management (Herciu & Ogrean, 2019, p. 556). Empirical research concerning the competitiveness of banks in Poland is increasingly focused not only on effi-

ciency and financial indicators but more often on emphasizing the significance of the components describing the IC subsystems, which include: service quality, bank reputation, customer confidence in the financial service of a given bank and the attractiveness and comprehensiveness of its offer as significant determinants of the overall assessment of a given entity. Therefore, the article aims to discuss the concept of intellectual capital consisting of innovative, institutional and organizational capital and present an aggregate measure of a bank's competitiveness based on diagnostic indicators reflecting both its economic aspects and intellectual capital.

The author of the present study will undertake a critical analysis of the source literature, indicating the concepts of the bank's intellectual capital and the scope of research related to it. Using the multivariate statistical analysis methods, the author will form a measure of the bank's competitiveness. The objective of the quality assessment is to facilitate selecting one final result — considered optimal, in some sense the best one compared to the others. The article uses the method (Kukuła& Luty, 2015, p. 26), which uses the positions in the ranking created based on the value of the synthetic indicator (and not on the values of the synthetic indicator themselves). In the first part of the article, an overview of foreign research related to intellectual capital and the bank's competitiveness will be provided, and argumentation for selecting a given concept of division of intellectual capital. Then, the individual stages of the empirical research related to creating a synthetic indicator of the bank's competitiveness will be performed, and the grounds for selecting a given methodology. Finally, the ranking of banks and the study results will be presented, considering its possible impact on further research in this area.

2. Literature review

In studies on banks' competitiveness, it is noted that it is vital to shift the focus from research on economic capital to create the bank's value by developing its intellectual capital. Therefore, the operation of the bank's human resources and their innovative attitude concerning the organisational (ORG) and relational (KINS) changes, as well as those which concern the procedures of introducing product (KINN), is of crucial importance. Many bank management theories have emphasised and still emphasise the significance of knowledge, employee skills, social relations, corporate image, trademark, etc., for establishing a bank's competitiveness and building its value (Ślusarczyk & Dziura, 2017, p. 49).

In the 21st century economy, the distinguishing feature of which is the appreciation of the potential of knowledge, an organisation's true competitive strength lies primarily in the „strength" of the minds of its employees, which enables the organisation to operate in conditions of constant change. This strength has become intellectual capital, thanks to which the organisation can gain the ability to create products and services that take into account the lat-

est achievements of technical and organisational progress (Dyr & Ziółkowska, 2014, p. 49). In the modern world, an enterprise's competitiveness is more and more the result of creativity and innovation of intellectual capital (Rosińska-Bukowska, 2017, p. 155). It is necessary to use all its subsystems, although it is possible to distinguish other detailed parameters important in each of the IC subsystems for different entities. Appropriate intellectual capital management enables the company to achieve a competitive position and, above all, to maintain a long-term competitive position (Rosińska-Bukowska, 2019, p. 145).

Due to the specificity of a bank as an enterprise also operating in a global environment, it is justified to divide intellectual capital into innovative(KINN), institutional(KINS) and organisational capital (KORG). Table 1 presents the components of individual bank's IC subsystems using the proposed theoretical base. The bank emphasised a network of relationships between customers, employees and shareholders, very often dispersed internationally. Human capital is the basis of its activity, binding all its elements. In the functioning of a bank, its innovative resources can be distinguished, where modern IT systems and mobile applications are created or refined, organisational resources indicating the structure, strategy and institutional elements, such as connections and relations with contractors (Fedaseyeu et al., 2018). In each of these elements, human action, knowledge, skills, and competencies are necessary. Therefore, human capital in the network of all relations binds the remaining layers of capital and permeates them. Hence, a necessary condition for the development of a modern enterprise is the ability to arrange multi-level cooperation even with existing competitors and to distinguish the ability to effectively create value based on the diversified resources of many entities (Pedro et al., 2018, p. 407). Researchers agree on the importance of human capital as the foundation of intellectual capital, which — though being capable of integrating all interacting intangible assets — is not a sufficient element to establish it on its own. Intellectual capital is a hidden value in the relationships and the skills and knowledge of employees, partners, customers, or shareholders (Petty & Guthrie, 2000, p. 89).

The main components of the bank's institutional capital include several items — relations with recipients (e.g. borrowers), relations with suppliers (e.g. depositors), relations with partners, relations with investors, as well as reputation, image of the bank, loyalty of the bank's customers, facilitated contact customer with the bank, business cooperation. Innovative capital consists of the level of creativity of the members of the organization or the level of openness of culture, as well as shaping the organization's innovative culture, creating new solutions and products for customers. The organizational capital of a bank mainly means the degree of advancement of the systems and tools enabling the flow of knowledge within the bank and in its environment and organizational structure. It has a significant impact on creating a relational mechanism relating to the organizational sphere, innovation and contacts with the external and internal environment. The organizational, pro-innovation, and institutional

relations network is the foundation of creating socio-economic values (Pike & Roos, 2008, p. 48).

The recent tendency of researchers to focus on the bank's intangible assets does not change the fact that studies on the competitiveness of banks still mainly concern the financial condition, regulatory policy, interest rates, the credit and deposit market, or the consolidation of the banking sector (Choong, 2008, p. 56).Despite the analysis of the importance of IC in the development of modern enterprises, the preparation of research on its condition in individual entities (including banks), there is a lack of appropriate comprehensive studies taking into account the traditional ratios of profitability and ratios of efficiency of economic capital and research taking into account the current state, strength of impact and potential of intellectual capital (Dumay, 2014, p. 1258). Research on capital shows a variety of interpretations of the components of its structure. Therefore it is not comparable with the concept of the research conducted by the author of the present study. As mentioned above, the researchers, authors of the studies focus on measuring intellectual capital and assessing its level using methods that define human capital as a separate intellectual capital component. Additionally, they focus on the impact of intellectual capital on a bank's value, cost-effectiveness or profitability, and not on its competitiveness.

The research results of Setianto & Sukmana (2016, p. 378) suggest that banks with higher efficiency of human capital tend to exhibit higher profitability levels ROA and ROE. The results of the study by Ozkan et al. (2017, p. 190) suggest that the intellectual capital of the Turkish banking sector is primarily influenced by the human capital efficiency ratio. Goh (2005, p. 285) drew similar conclusions for financial institutions in Malaysia and Australia. Other researchers used the Value Added Intellectual Coefficient (VAIC) model to analyze the intellectual capital performance of Indian banks in 2010–2016. The study results show significant differences in banks' rankings based on capital components' effectiveness and intelligent interpretation (Singh et al., 2016, p. 635). Subsequent researchers analyzed the components of intellectual capital and its impact on the Portuguese banking sector's business performance. The concept of relational capital has been extended to include „stakeholder-oriented" elements. The model development and hypothesis testing were carried out on 253 respondents from 53 organizations (Bontis, 1999, p. 433). Also, in Poland, research was conducted on the components of intellectual capital and its management (Harasim & Dziwulski, 2012, p. 153) and the impact of intellectual capital on the value of banks (Śledzik, 2013, p. 86).

It should be emphasized that the fundamental difficulty in selecting appropriate tools for researching and measuring intellectual capital results from its intangible nature. Additionally, the article adopts the concept of the bank's intellectual capital, which renounces considering human capital as a separate subsystem. This approach stands out from other studies, and therefore, it will not be possible to compare the results of the studies presented by them.

3. Methods

Research on the bank's competitiveness requires a multidimensional analysis that will consider all its financial and non-financial elements. This will allow identifying leaders in the banking market who attach importance to financial efficiency and stability and highlight innovation, service quality, employees and other intangible aspects. In the present article, the author decided to use linear ordering methods, which prioritize the elements of the analyzed set of objects (in ascending or descending order) according to the value of features or diagnostic indicators.

For the study purposes, two research hypotheses were constructed:

- H1: A bank's intellectual capital (I.C.) is based on its three subsystems' synergistic interaction: innovative capital, organizational capital, and institutional capital.
- H2: The assessment of a bank's competitiveness requires taking into account all capital components (capital stratification).

However, the foundation of the research on intellectual capital was a comprehensive characterization of the studied entities (banks). Initially, a list of as many commonly available, standardized parameters as possible, calculated according to the uniform methodology provided for publication, was prepared for all variables. The variables used were created based on the analysis of reports, rankings, and specialist industry studies.

A selected group of 11 banks (Alior Bank, BGŻ BNP Paribas, Mbank, Citi Handlowy, Idea Bank, ING Bank, Millenium Bank, PEKAO, PKO BP, Santander Bank, BOŚ Bank) provides services to over half of the commercial banking customers in Poland. This fact allows attempting to generalize the research results. All the indicated entities have a comparable offer — they are commercial banks that provide credit and deposit services and investment services for mass customers. Besides, considering this study's objective, a key factor should be that the surveyed group includes banks that received numerous awards in innovation, customer service quality, and employee attitude. These elements are the key parameters determining the strength of intellectual capital, the impact of which on banks' competitiveness is the present study's subject. All the banks mentioned above also provide comprehensive information on the electronic and mobile banking system, which is crucial in determining distribution channels' level of innovation. In Table 2 is indicated all of the indicators included in the study, according to the author affecting the competitiveness of banks.

As part of the linear ordering methods, the analyzed phenomenon is assessed from the adopted criteria, and a synthetic indicator is constructed, which is a measure of the analyzed phenomenon. The first stage of the study was the preliminary data analysis, which is aimed at assessing the properties of individual features and indicators (information value) and their appropriate

selection. In the present study, the classical coefficient of variation was used, given by the following formula:

$$v_j = \frac{s_j}{\overline{x}_j}, \tag{1}$$

where: s_j — standard deviation of the j-th feature or index, $\overline{x}_j$ — arithmetic mean of the j-th feature or index (j=1,...,m).

The next step is to carry out a correlation analysis as a starting point for the final selection of diagnostic variables. The inverse correlation matrix method, compared to the classical analysis of (multiple coefficients) of Pearson's correlation coefficient is characterized by better properties, as it uses the coefficient of multiple correlations (Pawełek et al., 2003), which provides information about the strength of the relationship between the j-th feature or the indicator (j=1,...,m), and with all other features or indicators (p=1,...,m), where $p \neq j$. First, the inverse of matrix R, namely matrix R^{-1} is determined (Malina & Zeliaś, 1997, pp. 529–530):

$$R^{-1} = \begin{bmatrix} 1 & \tilde{r}_{12} & \ldots\backslash & \tilde{r}_{1m} \\ \tilde{r}_{21} & \tilde{r}_{22} & \ldots\backslash & \tilde{r}_{2m} \\ \ldots\backslash & \ldots\backslash & \ldots\backslash & \ldots\backslash \\ \tilde{r}_{m1} & \tilde{r}_{m2} & \ldots\backslash & \tilde{r}_{mm} \end{bmatrix}, \text{ for } R = \begin{bmatrix} 1 & r_{12} & \ldots\backslash & r_{1m} \\ r_{21} & 1 & \ldots\backslash & r_{2m} \\ \ldots\backslash & \ldots\backslash & \ldots\backslash & \ldots\backslash \\ r_{m1} & r_{m2} & \ldots\backslash & 1 \end{bmatrix}, \tag{2}$$

where:

$$\tilde{r}_{jp} = \frac{(-1)^{j+p} det(R_{jp})}{det(R)}, \tag{3}$$

and $det(R)$ is the determinant of the correlation matrix, and $det(R_{jp})$ is the determinant of the matrix created by deleting j-th row and p-th column.

Then the elements $\tilde{r}_{jj}$ on the main diagonal satisfying the inequality $|\tilde{r}| > r_0$, i.e. with a value greater than the set threshold value (usually r_0=10) are distinguished and gradually eliminated from the set of features and acceptable indicators, i.e. those useful for the analysis. In this way, on the basis of high values of $\tilde{r}_{jj}$ features and indicators excessively correlated with all others are eliminated, creating a set of features and indicators that are uncorrelated or poorly correlated (diagnostic). Then, the stimulation was performed, which consisted in transforming the values of features and indicators, which are destimulants and nominants, into simulants (Nan & Yang, 2014, pp. 636–638).

Four standardization transformations are used in this study: zero unitization; unitization, standardization and a modified version of standardization, given by the following formula:

$$z_{ij} = \frac{x_{ijt}^{s} - \frac{1}{nT}\sum_{i=1}^{n}\sum_{t=1}^{T} x_{ijt}^{s}}{\sqrt{\frac{1}{nT}\sum_{i=1}^{n}\sum_{t=1}^{T}\left(x_{ijt}^{s} - \frac{1}{nT}\sum_{i=1}^{n}\sum_{t=1}^{T} x_{ijt}^{s}\right)^{2}}}, \quad (j=1,\ldots,m). \tag{4}$$

Synthetic indicator with μ_i values for i-th object (i=1,…,n), where z_{ij} are normalized data values, a αj (j=1,…,m) are weights for features and indicators $\alpha_j \in (0;m)$, for which, in particular $\sum_{j=1}^{m}\alpha_j = 1$, can be expressed as follows:

$$\mu_i = \sum_{j=1}^{m}\left(z_{ij}\alpha_j\right), \tag{5}$$

$$\mu_i = \frac{1}{m}\sum_{j=1}^{m}\left(z_{ij}\alpha_j\right). \tag{6}$$

The purpose of the quality assessment is to enable selecting the specific outcome — considered optimal, in some sense the best result compared to the others. This study uses the method (Kukuła & Luty, 2015, pp. 2019–231), which is based on the positions in the ranking created based on the value of the synthetic indicator (and not on the values of the synthetic indicator themselves). So if we have ν different ranking results (for n objects), then the number of possible comparisons between these rankings is:

$$a = \frac{\nu(\nu-1)}{2}. \tag{7}$$

By comparing the results of the rankings, we understand here the estimation of the measure of the similarity of the rankings m_{rs} according to the formula:

$$m_{rs} = 1 - \frac{2\sum_{i=1}^{n}\left|c_{ir} - c_{is}\right|}{n^2 - z}, \quad r, s = 1,\ldots,\nu, \tag{8}$$

where: c_{ir} — position of the i-th object in the ranking with number r, c_{is} — position of the i-th object in the ranking with the number s, while $z = \begin{cases} 0, n \in P \\ 1, n \in P \end{cases}$,

where P — a set of even natural numbers. The results of the comparisons „between rankings" can be presented in the form of a symmetrical matrix M with dimensions ν x ν, where the rankings with the same numbers are compared on the main diagonal, for which m_{rs}=1, for r=s, while outside the main diagonal m_{rs}=m_{sr}, for $r \neq s$.

In order to determine the degree of similarity in the ranking as a result of the *r*-th method of linear ordering of objects in relation to the other rankings, the sum of the elements of the *r*-th row (or column) of the matrix *M* minus 1 should be calculated, according to the formula:

$$\overline{u}_r = \frac{1}{\nu - 1} \sum_{\substack{s=1 \\ r \neq q}}^{\nu} m_{rs}, \; r, s = 1, \ldots, \nu, \tag{9}$$

Finally, it is recommended to choose the method of linear ordering (and the associated ranking) for which $\overline{u}_r = \max_r \overline{u}_r$. This result can be considered optimal (best) in the sense that it will be the most comparable (similar, correlated) to all other ranking results — in other words, it will be the least different from all other ranking results.

4. Results

The study of the impact of intellectual capital on the competitiveness of banks in Poland was conducted based on the results of 11 commercial banks for the years 2009–2019. The database consisted of 27 acceptable indicators, which are presented in Table 1. In the first stage of the study, a preliminary data analysis was performed — the measures of descriptive statistics were calculated: mean, standard deviation, asymmetry (skewness), range, minimum and maximum result, and also the variability index was calculated for each acceptable indicator.

In the next stage, correlation coefficients and inverse correlation matrix were determined separately for individual groups of indicators 2009–2019. In this procedure, the diagonal elements of the obtained inverse matrix were analyzed, assuming that those indicators for which the values on the main diagonal are greater than 10 (D) are excluded from the set of acceptable indicators. A summary list of diagnostic indicators (uncorrelated or poorly correlated) for the years 2009–2019 was prepared based on the conducted analyses. The results of the selection of diagnostic indicators for the analysis for individual years differed. Therefore, only those indicators that occurred at least 6 times during the period under study were selected for further analysis. Finally, 15 indicators were included in the analysis, 13 of which were designated as stimulants, and 2 as destimulants, as shown in Table 3. In the next stage, the stimulation of indicators X4 and X18 (conversion of destimulant values into stimulants) was performed using the synthetic variable procedure, using the formula (4). In terms of weighing diagnostic indicators, two solutions were adopted in the analysis — the system of equal weighting and the system of differential weighting.

Taking into account the number of diagnostic indicators within the intellectual capital subsystems, i.e. innovative (2), institutional (3) and organizational (5) capital, as well as economic capital (5), the weights for the indicators in these subgroups were respectively 0.50 ; 0.33; 0.20 and 0.20; and the weights

equal for the subgroups (for particular types of capital) were 0.25 each. With the second method of weighing the diagnostic indicators — proposed by the author — under the innovative, institutional, economic and organizational capital, the weights for indicators in these subgroups were 0.50 each; 0.33; 0.20 and 0.20; while the weights for the subgroups (for particular types of capital) were respectively 0.20; 0.20; 0.40 and 0.20. The exact method of weighting the indicators/types of capital is presented in Table 4.

At the proper stage of the linear ordering of banks — normalization of diagnostic indicators, aggregation and quality assessment — as a result of the application of 4 normalization formulas, i.e. 2 methods of unitarization and 2 methods of standardization; in combination with 2 weight systems (equal weighting, differential weighting), the final result was 8 variants of results (rankings) for each analyzed year (2009–2019). Table 5 summarizes the above analysis methods, and the results of an exemplary linear ordering of banks (rankings) using the system of differential weighting and standardization are presented in Table 6. In the construction of the synthetic indicator of the competitive advantage of banks (KB) for the *i*-th bank, the classic formula of aggregation of diagnostic features was used, based on the arithmetic mean (inside individual types of capital) and based on the sum (for individual types of capital) according to the following formula:

$$KB_i = \sum_{j=1}^{k} \left(\frac{1}{m} \sum_{j=1}^{m} \left(z_{ij} \alpha_j \right) \right) \beta_j . \tag{10}$$

For example, according to variant 7 of calculations (ranking 7), the formula of the synthetic measure was as follows:

$$\begin{aligned} KB_i = {} & (0.5*X7+0.5*X14)+(0.33*X12a+0.33*X22+0.33*X23)+ \\ & +(0.2*X1+0.2*X3+0.2*X4+0.2*X5+0.2*X16)+ \\ & +(0.2*X9+0.2*X13+0.2*X15+0.2*X15a+0.2*X18), \end{aligned} \tag{11}$$

and the individual parts of the formula are partial measures for each type of capital, respectively innovative, institutional, economic and organizational capital.

Because both rankings 1, 2 and 7 were equally often selected as the best ones, an analysis of the correlation between the values of the synthetic indicator was performed for these linear ordering methods. The analysis showed a strong positive correlation between the values of the measures in both variants of calculation (ranking 1 and 7 and ranking 2 and 7), which is presented in Table 7.

Based on the analyzes carried out, it was decided to choose ranking seven as the optimal solution. According to the ranking established based on a synthetic indicator created based on the differential weighting and standardization system, the highest position in the ranking was occupied by PKO BP bank (Chart 1). PKO BP — only in 2012 and 2016 it was in second place. In the analysis, PKO BP stood out in terms of the size of assets, the volume of loans and deposits, and the number of customers, branches, employees and users of mobile and elec-

tronic banking. Another bank that was usually second or third (and sometimes even further) in the ranking over the analyzed period was Santander Bank. Only once, in 2016, it was in first place, while in 2018, it dropped significantly to ninth place in the ranking. The third most competitive was ING Bank, which in 2013, 2018–2019 was second in the ranking, and in the remaining years, it was ranked third (2009, 2017) to sixth (2011). Based on the analysis of basic numerical characteristics and performance indicators, the bank stood out from other entities by ensuring ROE, CIR and NIM (KE) indicators exceeding the market standard (banking sector).

The least competitive banks include Alior Bank, BGŻ BNP Paribas and BOŚ. Alior Bank (average position in the ranking 8.55) twice — in 2009 and 2016, it took the last, i.e. eleventh position in the ranking. The highest, sixth position in the ranking of the bank as mentioned above had in 2017. On the other hand, BGŻ BNP Paribas (average position in the ranking of 8.64) in 2010 occupied the lowest, i.e. eleventh position in the ranking. For most of the analyzed period (2011–2014 and 2017) it was in the tenth position. Unexpectedly, in 2018, the bank was ranked third — it was the highest-placed place in the ranking, and in 2019 it was placed sixth in the ranking. The last bank — BOŚ (average position in the ranking 10.64) in the years 2009–2010 and 2016 was ninth or tenth, and in 2011–2015 and 2017–2019 the last one, i.e. 11th place in the ranking.

Based on the obtained results, it can be concluded that the value of the competitiveness measure — allowing banks to maintain a high position in the ranking — is the result of high values of its components, among which the most significant impact was, in turn, economic capital (KE), institutional capital (INS), innovative (INN) and organizational capital (ORG). This order was established on the basis of the number of high correlation coefficients of individual capital layers with the value of the synthetic measure. Undeniably, the basis for achieving a high position in the ranking was economic capital (determined in the study by ROA, NIM, CIR, loans/credits sector and solvency ratio). Therefore, in order to achieve the position of a leader, the bank had to focus primarily on rational asset management, cost optimization and taking care of financial security. In addition, it is distinguished by the attention to the implementation of activities in the field of corporate social responsibility and numerous prestigious awards, both national and international. It was also essential to provide innovative solutions to clients and convince them to use electronic banking. The organization of work and employment conditions were of minor importance in the assessment of competitiveness.

The conducted research allowed for positive verification of the hypothesis that assessing a bank's competitiveness requires taking into account all capital components (stratification of capital). By including all capital components, the researcher can create a ranking indicating a leader who develops in terms of profitability and financial efficiency and appropriately manages intellectual capital. The ranking may contribute to the fact that the leaders controlling a sig-

nificant part of the market (e.g. credits, deposits, assets) will not be in the leading positions in the comprehensive assessment. The research conducted cannot be compared with similar research carried out by other researchers because no similar research on the financial sector — banks — has been identified. The assessment of competitiveness in the analyzes of most researchers focuses on a specific parameter — stability, market share, profitability, or the quality of service or the level of innovation. To assess a bank in terms of the amount of intellectual capital, researchers often use parametric methods that distinguish human capital as a separate element, which is contrary to the assumptions adopted in this article.

5. Conclusion

In today's economic reality, knowledge-based organizations, i.e. those based on a unique method of acquiring, processing and creating knowledge, are considered successful entities. Bank managers are increasingly focusing not only on the efficiency and financial indicators but precisely on taking into account the parameters describing the IC subsystems, including service quality, bank reputation, the level of customer trust and the attractiveness and comprehensiveness of its offer as significant determinants for the assessment of a given entity. The challenge for every modern bank is to understand the importance of intellectual capital, define its elements, and set measures that enable it to be effectively managed, which leads to improving and maintaining its strong competitive position. The present study aimed to present the assessment of the bank's competitiveness, which considers the subsystems of intellectual capital. Proprietary diagnostic indicators were used, created based on the analysis of specialized bank reports. It can be concluded that such a multidimensional assessment has identified a banking leader who, while effectively managing economic capital and ensuring the stability of the financial system, also focuses on the development of intellectual capital. This issue requires further research and the elaboration of diagnostic variables so that it would be possible to develop a comprehensive measure of the bank's competitiveness. This may be the beginning of a discussion in this regard, as the structure of intellectual capital is also defined differently by various authors in the literature on the subject. Research should also be extended with other banks operating in the banking sector. It should also be noted that providing the uniformity and availability of data will also constitute a challenging task.

The division of intellectual capital adopted in the article emphasizes the essence of human capital, which permeates all other structures, constituting their integrating element, which cannot be eliminated. However, it should be noted that many researchers consider human capital as a separate component of intellectual capital. Different ways of defining and dividing intellectual capital proposed by the researchers result in the lack of clear recommendations as

to the changes that should be introduced to enterprise management models to improve its competitiveness, using intellectual capital as a critical factor.

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Appendix

Table 1.
The concept of the structure of intellectual capital in a bank

Innovation capital	Institutional capital	Organizational capital
– the ability of employees to solve tasks efficiently and innovatively; – a modern computer system, technical infrastructure; – employee creativity (internal study on the Creative Attitude of Employees — CAE, number of implemented innovative projects per employee, share of bank employees submitting new ideas in the total number of employees); – digitization level (number of banking products sold via internet or mobile banking); – customers using innovative distribution channels (share of the number of customers using internet banking services in the total number of customers and the number of customers using the mobile application in relation to the total number of customers); – investments in human resources development (value of training/employee benefits, number of training hours); the number of financial innovations introduced, including: Blik mobile payment system, biometric login to mobile applications, contactless payments with watches, voice control for the mobile applications, disk for storing documents in online banking, money transfer to the telephone number, customer video verification service; cooperation with FinTech.	– the bank's reputation (the bank's position according to the survey on the level of „Social trust in bank institutions" by the Polish Bank Association, TRI*M* methodology); – the bank's image (position in the Newsweek ranking, position according to the „Bank appreciated by customers" survey by ARC Rynek i Opinia, position in the „Złoty Bankier" ranking, NPS); – customer loyalty (Customer Loyalty Index — CLI, customer attrition rate — the share of customers resigning from services in relation to the total number of customers, the level of customer productization — the number of the bank's products per customer, customer retention rate — the share of the number of customers remaining in relationship with the bank over 1 year in relation to total number of customers; – the number of awards granted in international and domestic competitions compared to other banks; – relations with external stakeholders: contractors – (cooperation with external companies), non-profit institutions (including educational institutions); – volunteering (number of hours of volunteering per employee); socially responsible activities: number of CSR best practices compared to competitors, specificity of CSR activities of a given bank.	– service quality (Mystery Shopper study);employee competences (seniority, employee education, promotion opportunities) – programs of improving employee engagement – (incentive pay programs, remuneration) – accessibility and ease of use of the banking system by customers; – rules for the development of the bank's organizational structures: the value of mergers and acquisitions, number of transactions made — compared to the average number of transactions carried out by direct competitors; – principles of building the bank's brand value: brand strategy, methods of rebranding of the acquired entities; – speed of handling complaints and inquiries (response time to the complaint); – the level of security in using the services; – increase in the customer base (increase in the number of new customers in relation to the increase in the number of new customers of commercial banks); – customer availability (number of branches of a given bank/total number of commercial bank branches, number of ATMs of a given bank/total number of ATMs) – employee identification with the bank's mission — relationship architecture

Notes:

* TRI*M — measurement technique developed in 2011 by the global research agency TNS (today Kantar). The TRI * M reputation measurement methodology is based on the main indicators related to: general assessment, assessment of the quality of products and services, sympathy (customer's emotional attachment), perception of success and declared trust. Answers to questions in each area are given using a five-point scale, and on this basis, a synthetic indicator that enables to measure the reputation of a given bank is established.

Source: Own preparation based on reports on the activities of PKO BP, ING, IDEA, BNP Paribas, mBank, Pekao, Santander, Citi Handlowy, BOŚ, Millenium, Alior from the period 2009–2019.

Table 2.
Acceptable indicators included in the study

Capital	Symbol	Name	Type
KE	X1	ROA	S
KE	X2	ROE	S
KE	X3	NIM	S
KE	X4	CIR	D
KE	X5	credits/credits sector (L/SL)	S
KE	X6	deposits/deposits sector (D/SD)	S
INN	X7	number of clients actively using internet banking services/number of clients (EB/C)	S
INN	X8	number of clients actively using mobile apps/number of clients (MB/C)	S
ORG	X9	employee benefits/number of employees (C/E)	S
KE	X10	profit/number of employees (P/E)	S
KE	X11	sales revenues/assets (S/A)	S
INS	X12	'Bankier' Ranking — ranking position	D
INS	X12_a	'Bankier' Ranking — overall ranking results (N/C)	S
ORG	X13	increase in the number of customers compared to commercial banks (N/C)	S
INN	X14	value of trainings/employee benefits (T/C)	S
ORG	X15	number of branches/number of branches sector (B/SB)	S
ORG	X15_a	number of branches/number of clients (B/C)	S
KE	X16	capital adequacy ratio	S
KE	X17	ROS	S
ORG	X18	number of customers/number of employees (C/E)	D
INN	X19	trainings value/number of employees (T/E)	S
KE	X20	credits/deposits (L/D)	N
KE	X21	assets/assets sector (A/SA)	S
INS	X22	number of prizes awarded (INC)	S
INS	X22_a	number of awards granted/total number of awards	S
INS	X23	CSR good practices (GP)	S
INS	X23_a	CSR good practices/good practices commercial banks	S

Notes:

S — stimulant; D — destimulant.

Source: Own preparation.

Table 3.
Diagnostic indicators included in the study and their types

Capital	Symbol	Name	Type
KE	X1	ROA	S
KE	X3	NIM	S
KE	X4	CIR	D
KE	X5	credits/credits sector (L/SL)	S
INN	X7	number of clients actively using internet banking services/number of clients (EB/C)	S
ORG	X9	employee benefits/number of employees (C/E)	S
INS	X12	‚Bankier' Ranking — ranking position	S
ORG	X13	increase in the number of customers compared to commercial banks (N/C)	S
INN	X14	value of trainings/employee benefits (T/C)	S
ORG	X15	number of branches/number of branches sector (B/SB)	S
ORG	X15a	number of branches/number of clients (B/C)	S
KE	X16	capital adequacy ratio	S
ORG	X18	number of customers/number of employees (C/E)	D
INS	X22	number of prizes awarded (INC)	S
INS	X23	CSR good practices (GP)	S

Notes:
S — stimulant; D — destimulant.
Source: Own preparation.

Table 4.
The weighting system adopted in the analysis

Specification	INN	INS	KE	ORG
equal weighting (for indicators)	0.50	0.33	0.20	0.20
equal weighting (for subgroups)	0.25	0.25	0.25	0.25
differential weighting (for indicators)	0.50	0.33	0.20	0.20
differential weighting (for subgroups)	0.20	0.20	0.40	0.20

Source: Own preparation.

Table 5.
Ranking depending on the weighting system and standardization method

Ranking	System of weighting	Normalization method
ranking 1	equal	zero unitization
ranking 2	equal	unitization
ranking 3	equal	standardization
ranking 4	equal	standardization (over time)
ranking 5	differential	zero unitization
ranking 6	differential	unitization
ranking 7	differential	standardization
ranking 8	differential	standardization (over time)

Source: Own preparation.

Table 6.
Synthetic indicator and ranking of banks with the use of the differential weighting and standardization

Bank	2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
	V	R	V	R	V	R	V	R	V	R	V	R	V	R	V	R	V	R	V	R	V	R
Alior Bank	1.2766	11	1.7221	9	1.9766	7	2.1317	7	1.8485	9	2.5436	9	2.7252	8	2.0423	11	2.9756	6	1.9800	8	1.8662	9
BGŻ BNP Paribas	1.5476	7	1.3146	11	1.6096	10	1.6979	10	1.6351	10	2.4129	10	2.5524	9	2.0864	9	2.6563	10	2.2871	3	2.1841	6
BOŚ	1.4746	9	1.3194	10	1.5712	11	1.5576	11	1.2241	11	1.7693	11	2.0110	11	2.0570	10	2.2325	11	1.5216	11	1.6114	11
Citi Handlowy	1.9408	4	1.9055	7	2.5023	2	2.4153	4	2.3076	5	2.8091	5	2.7854	7	2.1182	8	2.7552	8	2.1025	6	2.0586	8
IDEA Bank	1.4919	8	2.3094	2	2.3569	5	2.1175	8	2.3249	4	2.5541	8	2.5250	10	2.1441	7	2.7527	9	1.6843	10	1.6144	10
ING Bank	2.0306	3	2.0757	5	2.1171	6	2.2872	5	2.5146	2	2.9109	4	3.0829	4	2.3416	5	3.2032	3	2.3631	2	2.4432	2
Mbank	1.5542	6	2.0827	4	1.9165	8	2.1087	9	2.2342	7	2.7117	6	2.8378	6	2.3643	4	3.0128	5	2.2088	4	2.1130	7
Millenium Bank	1.3576	10	1.7878	8	1.8674	9	2.1993	6	2.0734	8	2.6735	7	2.9574	5	2.3073	6	2.8850	7	2.1697	5	2.3702	3
PEKAO Bank	2.1888	2	2.0680	6	2.4518	4	2.7354	1	2.2627	6	3.0340	3	3.2386	3	2.4639	3	3.0652	4	2.0420	7	2.1851	5
PKO BP	2.3578	1	2.4101	1	2.6412	1	2.6701	2	2.6094	1	3.3689	1	3.6016	1	2.7385	2	3.5943	1	2.6270	1	2.6762	1
Santander Bank	1.6563	5	2.1903	3	2.4710	3	2.4911	3	2.4851	3	3.2751	2	3.3175	2	2.7777	1	3.2290	2	1.9318	9	2.2415	4

Notes:

V — value of a synthetic indicator; R — ranking.

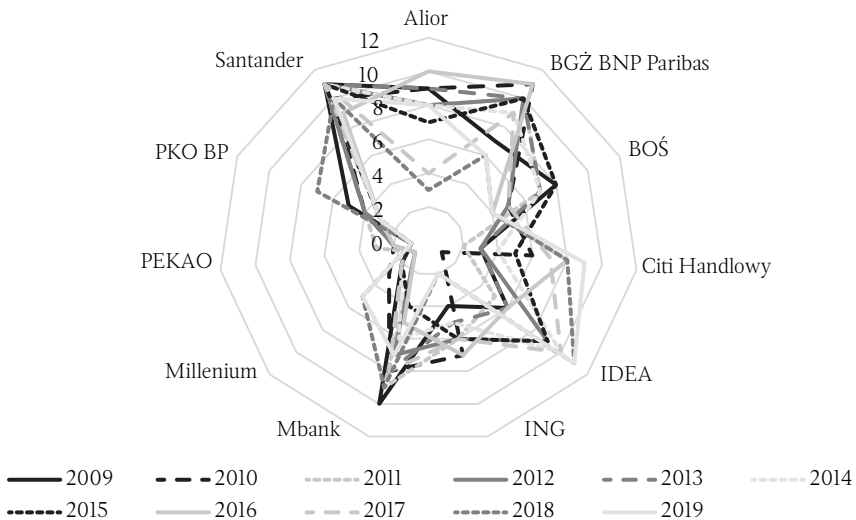
Source: Own preparation.

Table 7.
Pearson's linear correlations of the values of synthetic indicators for variants 1 and 7 as well as 2 and 7

Year	Correlation (rankings 1 and 7)	Correlation (rankings 2 and 7)
2009	0.984	0.997
2010	0.956	0.997
2011	0.988	0.996
2012	0.967	0.991
2013	0.983	0.997
2014	0.969	0.997
2015	0.984	0.999
2016	0.947	0.998
2017	0.957	0.999
2018	0.961	0.994
2019	0.979	0.993

Source: Own preparation.

Chart 1.
Static ranking of banks for a development measure based on differential weighting and standardization



Source: Own preparation.