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The Relationship between Intellectual Capital and Competitive Advantage: A Meta-Analysis Study

Entelektüel Sermaye ile Rekabet Avantajı Arasındaki İlişki: Bir Meta-Analiz Çalışması

Yasin KILIÇLI[1]

Abstract

Purpose: The aim of this study is to examine the results of previous studies examining the relationship between intellectual capital (IC) and competitive advantage (CA) with a meta-analytic approach.

Design/Methodology: Studies examining the relationship between IC and CA were reached by scanning a total of 14 national and international online academic databases. The Pearson correlation (r) coefficient was taken as a criterion in studies examining the relationship between IC and CA. Analyzes were performed using CMA software. A total of 15,625 samples from 71 studies were included in the meta-analysis process. In this study, the random effect model was used when interpreting the mean effect size.

Findings: As a result of the study, it was understood that the calculated average effect size was 0.490 and this value corresponded to a high effect. This suggests that a higher IC is associated with a higher CA. This result supports common hypotheses and salient findings in the literature.

Limitations: The inclusion of only Turkish and English studies published in a certain period of time in the study and the inability to reach correlation data in some studies constitute the limitations of this study.

Originality/Value: As a result of a comprehensive literature review, no studies examining the relationship between IC and CA with a meta-analytic approach were found. This study, which deals with the relationship between IC and CA with a meta-analytic approach for the first time, will provide a broader perspective on the literature in this field by calculating the average effect value between the mentioned variables over a large sample of 15.625.

Keywords: Intellectual Capital, Competitive Advantage, Meta-Analysis.

Öz

Amaç: Bu çalışmanın amacı, entelektüel sermaye (ES) ile rekabet avantajı (RA) arasındaki ilişkiyi meta-analitik bir yaklaşımla incelemektir.

Tasarım/Yöntem: ES ile RA arasındaki ilişkiyi inceleyen çalışmalara, toplam 14 ulusal ve uluslararası online akademik veri tabanı üzerinden tarama yapılarak ulaşılmıştır. ES ile RA arasındaki ilişkiyi inceleyen çalışmalarda, Pearson korelasyon (r) katsayısı ölçüt olarak alınmıştır. Analizler CMA yazılımı aracılığıyla gerçekleştirilmiştir. Meta-analiz sürecine 71 çalışmadan elde edilen toplam 15.625 örneklem sayısı dahil edildi. Bu çalışmada ortalama etki büyüklüğü yorumlanırken rastgele etki modeli kullanılmıştır.

Bulgular: Hesaplanan ortalama etki büyüklüğünün 0,490 olduğu ve bu değerin yüksek bir etkiye karşılık geldiği çalışma sonucunda anlaşılmıştır. Bu durum, yüksek bir ES, daha yüksek bir RA ile ilişkili olduğunu göstermektedir. Bu sonuç, literatürdeki yaygın olan hipotezleri ve göze çarpan bulguları desteklemektedir.

Sınırlılıklar: Araştımaya sadece belli bir zaman aralığında yayınlanmış türkçe ve ingilizce çalışmaların dahil edilmesi ve bazı çalışmalarda korelasyon verilerine uluşılamaması bu çalışmanın sınırlılıklarını oluşturmaktadır.

Özgünlük/Değer: Kapsamlı bir literatür taraması sonucunda ES ile RA arasındaki ilişkiyi meta-analitik bir yaklaşımla inceleyen çalışmalara rastlanılmamıştır. ES ile RA arasındaki ilişkiyi ilk defa meta-analitik bir yaklaşım ile ele alan bu çalışma, 15.625 gibi yüksek bir örneklem üzerinden söz konusu değişkenler arasındaki ortalama etki değerini hesaplayarak bu alandaki literatüre daha geniş bir açıdan bakmayı sağlayacaktır.

Anahtar Kelimeler: Entelektüel Sermaye, Rekabet Avantajı, Meta-Analiz.

[1] Dr, Van Yüzüncü Yıl Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, İşletme Bölümü, yasinkilicli@yyu.edu.tr, ORCID: 0000-0001-7801-3168

1. INTRODUCTION

In this age, where information-based assets are of great importance, it is possible to say that the most important resources for businesses to survive and have an institutional structure are intangible assets, namely intellectual capital resources. Intangible assets such as patents, software systems, information resources, licenses, business titles, business rights, brand names, copyrights, policies and business processes are resources of intellectual capital that constitute value to many businesses. Intellectual capital assets must be well managed and measured in order for organizations to be successful in the long term, to continue their activities and to survive. Businesses seeking competitive advantage in their industry or market are constantly developing new practices and strategies to be different from their competitors. These strategies and practices also enable businesses to produce sustainable values. In this regard, businesses see intellectual capital as a resource of competitive advantage in order to get an edge over their competitors. Intellectual capital and management of other intangible assets are resources of sustainable competitive advantage that are vital for businesses to constitute economic value. Therefore, in the global business world, the intellectual capital assets of businesses provide a competitive advantage to businesses and they are also important elements that ensure their financial strength.

In a knowledge-based economy, intellectual capital is a key element in the process of change and creativity, thus it creates a competitive advantage for organizations. In addition, a business will achieve a more efficient, more profitable and competitive position when it appropriately evaluates intellectual capital and puts it into practice in line with its objectives (Alserhan, 2017). In the current economy, intellectual assets are an important determinant of a company's competitive advantage. It also lays the foundations for future competitiveness and plays an important role in maintaining competitive advantage (Astuti et al., 2019). Intellectual capital has recently become significant for companies to gain competitive advantage in the global economy. Intellectual capital is an important resource for competition that transforms production resources into valuable assets. Barney (1991) stated that organizations that effectively use human resources and talents that are valuable to companies are more likely to achieve a competitive position (Obeidat et al., 2021). Therefore, it is possible to talk about the existence of the relationship between intellectual capital assets and competitive advantage. Owning intangible resources and capabilities increases the ability to take advantage of market opportunities. In this regard, intellectual capital, which is considered as a strategic resource, plays a key role in providing a sustainable competitive advantage (Al Khayyal et al., 2021; Damar & İraz, 2020).

It is understood from the explanations above that intellectual capital resources are an important factor in providing competitive advantage. In order to reinforce this level of importance, this study aims to examine the relationship between intellectual capital and competitive advantage in businesses with a meta-analytic approach over a large sample size. It is possible to say that there are limited number of studies examining the relationship between intellectual capital and competitive advantage, especially in the Turkish literature. This study, which aims to reveal the relationship between competitive advantage and intellectual capital, is thought to contribute to both national and international literature, especially in terms of filling the research gap in related fields. The sample of this study includes the sample numbers in studies examining the relationship between IC and CA during 2010-2021. This study will provide more consistent and more reliable results in the relationship between intellectual capital and competitive advantage through a high sample number obtained from these studies. In this study, the application of the meta-analytical method will contribute to the literature in the related field when we look at the relationship between IC and CA from a broader perspective.

2. CONCEPTUAL FRAMEWORK

2.1. Intellectual Capital (IC)

After the 1990s, researchers' interest in intellectual capital has increased and many studies have contributed to the development of this concept. Although intellectual capital came to the fore

after the 1990s, the concept was not new; it first emerged in a book published in 1836 by economist Nassau William Senior. Afterwards, in 1969, economist John Kenneth Galbraith and in 1975 Michael Kalecki reconsidered the concept of intellectual capital and they enabled it to be used in different terms (Elitok, 2019). Galbraith (1969) defined intellectual capital as the process of value creation and stock of assets (Castro and Saez, 2008). After the 1990s, researchers such as Thomas A. Stewart (1991), Edvinsson (1996), and Roos (1997) began to examine the concept of intellectual capital more comprehensively and laid the groundwork for the development of this concept (Pedro et al., 2018).

Since the concept of intellectual capital was first introduced, many definitions of this concept have been developed by different researchers. In this regard, there is no common definition in the literature on intellectual capital (Chu et al., 2011). The concept of intellectual capital has been tried to be interpreted and defined according to the perspectives of both the academic community and international organizations. For instance, the International Accounting Standards Board (IASB) defined intellectual capital as "an intangible resource that has no physical substance and is held for use in the production or supply of goods or services, for rental to others or administrative purposes". In addition, IASB sees these resources as assets created by businesses that provide economic benefits and give them competitive advantage in the future (Yinusa, 2018). The Organization for Economic Cooperation and Development (OECD), on the other hand, defines intellectual capital as "assets without physical substance that are seen as resources of economic profit in the future, often with value-creating content such as research and development, patents and trademarks" (OECD, 2008).

Thomas A. Stewart was one of the people examining intellectual capital in organizations and is still considered as a pioneer of the concept "intellectual capital" (Erkuş, 2005). He brought a broad perspective to the concept of intellectual capital with his article "Brainpower" published in 1991 and later with his book "Intellectual Capital". Thomas A. Stewart (1997) defined intellectual capital as the intellectual material used by companies in the process of capital formation. Stewart (1997) defined intellectual material as information, knowledge, experience and intellectual property. Stewart (1997) also pointed out that intellectual capital was the sum of everything that provides businesses a competitive advantage (Erkuş, 2005). According to Edvinsson and Sullivan (1996), intellectual capital is a set of knowledge that can be converted into value. This definition includes broad concepts such as ideas, inventions, general information, computer programs, designs, data processes, and software systems. Accordingly, these authors noted that the concepts were not limited to forms of intellectual property protected by law such as patents, trademarks, trade secrets, or simply technological innovations (Edvinsson & Sullivan, 1996). According to Bontis (2001), intellectual capitals were assets that constitued value for businesses in the future but were not included in the balance sheet of businesses (Yinusa, 2018).

Sveiby (2001) defined intellectual capital as background values that represent wealth for businesses. These values consist of the elements that make up the internal and external structure of the business and the talents of the employees. Sveiby (2001) defined intellectual capital as values that create wealth for businesses, but these values are invisible. These values consist of the elements that make up the internal and external structure of the business. According to Sveiby (2001), elements such as trade secrets, management, copyrights, patents, software systems, research and development constitute the internal structure of the business, while elements such as brand value, institiuonal image, and customer relations constitute the external structure of the business (Sveiby, 2001). Klein and Prusak (1994) defined intellectual capital as a knowledge repository that is formed and formalized by businesses and can be used to produce higher value-added assets. This definition also contributed to the formation of a universal definition regarding the concept of intellectual capital (Maditinos et al., 2011).

Based on the explanations given above, it is possible to say that there is no universally accepted common definition of intellectual capital, and that the components of intellectual capital are not subject to a universally common classification. However, although there is no common view on the classification of these components in the literature, it is possible to divide the intellectual capital components, which are frequently used in scientific studies and generally accepted by researchers, into three groups. These are human (anthropic) capital, structural capital and relational (customer) capital

(Edvinsson & Sullivan, 1996; Petty & Guthrie, 2000). The definitions and explanations of these intellectual capital components are briefly mentioned below.

2.1.1. Human capital

Prominent researchers on intellectual capital (Bontis, 1998; Stewart, 1997; Edvinsson and Malone, 1997) considered human capital as the basic component of intellectual capital and they stated that no activity could take place in a business without human capital (Yinusa, 2018). This important component of intellectual capital is the tacit knowledge that is generally embedded in the minds of employees and that they take with them when they leave the business. This tacit knowledge is the information that is not specific to companies, and that can be rented or transferred to others only with the experience of the people. This knowledge includes employees' experience, skills, creativity and individual talents. Stewart (1997, 1999) defined human capital as the unique ability and expertise of individuals that drive companies to innovate and constitued value (Harris, 2018). Mehralian et al. (2013) defined human capital as the most important component of intellectual capital and they stated that it played an important role for companies to gain competitive advantage (Yaseen et al., 2016). According to Edvinsson and Malone (1997), human capital is the sum of the skills, experience, talents and creativity of managers or employees in businesses. Guthrie (2001) considered human capital as the institutional capacity of a company (Zerenler et al., 2008).

2.1.2. Structural capital

Structural capital is a set of databases, procedures, organizational charts, strategies, processes, routines, and internal structures that constitue high value to businesses and include all non-human sources of information for an organization to achieve its goals. In addition, structural capital is the resources that constitute the business infrastructure that performs the raw material supply, production and distribution of goods or services produced by human capital in businesses (Elitok, 2019). Structural capital is an important and specific component of intellectual capital. They are also the supporting infrastructures that enable the emergence of services or products that create added value for businesses as a result of the creative and innovative knowledge of human capital. Businesses have supporting infrastructures and these supporting infrastructures create an intellectual capital element that continues to remain in the business even if the employees leave the businesses. Structural capital, unlike human capital, includes explicit or coded information in systems, programs, databases, and business processes. Bontis (1998) defined structural capital as a system of structures and mechanisms within the organization that support the productivity and performance of employees (Yaseen et al., 2016). According to Chatzkel (2002), structural capital contributes to the development, strengthening and support of human capital. It is also the organizational capacity of businesses, including physical systems to transmit and store information materials within organizational channels.

2.1.3. Relational capital

Relational (customer) capital is similar to human capital in many ways. Businesses can not maintain their continuity without customer capital. The intellectual capital component that contributes the most to the financial performance of companies is relational capital. In addition, the ultimate goal of human and structural capital is to create relational capital (Akdağ, 2012). In many studies, researchers considered not only customers but also all other elements that interact with the business, such as society, suppliers, competitors, dealers, and the government, as relational capital (Mubarik et al., 2019). Accordingly, relational capital includes all the resources and embedded information involved in the relationship between the internal and external stakeholders of the business (investors, customers, suppliers) (Gioacasi, 2014).

According to Baah and Taiwah (2011), relational capital is the formal and informal relations between companies and their internal and external stakeholders that provide information flow. Wang (2012) defined relational capital as the initiation, maintenance, and development of relationships with a company's suppliers, customers, and other stakeholders (Soetrisno & Lina, 2014). Bontis (2002) pointed out that relational capital should not only include the relationship of companies with its customers, but also its relationships with other stakeholders or institutions. Nahapiet and Ghoshal

(1998) defined relational capital as a component of intellectual capital that includes information embedded in a company and its relations with its external environment and refers to the groups of people with which firms interact (Crupi et al., 2020).

2.2. Competetive Advantage (CA)

One of the most important features of the modern age dominated by information resources is to increase competition. Therefore, having the resources to provide competitive advantage is an important factor that determines whether a business will be successful or not. Businesses are trying to gain sustainable competitive advantages in order to survive and continue their existence in today's heavy competition conditions. Competitive advantage is the superiority of businesses over their competitors, suppliers, buyers and other people or organizations. This superiority can be interpreted as a constantly changing and developing process that aims to provide a sustainable performance to businesses (Süslü, 2019). In recent years, the concept of competitive advantage has been the subject of many scientific studies, with companies applying new methods to constitue value and rapid economic changes. Although competitive advantage in strategic management is expressed as "to provide sustainable superiority over competitors", there are many definitions of competitive advantage with different meanings. In this context, since there are many different definitions of competitive advantage in the literature, there is no a definite, clear and universal definition (Sigalas & Economou, 2013).

H. Igor Ansoff was the first to define this concept. According to Ansoff (1965), competitive advantage is a concept that enables businesses to gain a strong position in the sector and shows the superior and different aspects of businesses compared to their competitors in the market or industry in which they operate (Sigalas & Economou, 2013). According to Porter (1985), competitive advantage is the superior characteristics of businesses in all processes and supporting infrastructures that businesses benefit from the production process of the product or service they design to the distribution process (Jones & Tilley, 2003). Pitts and Lei (1996) defined competitive advantage as the activities and values that enable businesses to outperform their competitors by using their strong features while performing their own activities (Süslü, 2019). Barney (1991) expressed this concept as a value that cannot be copied or imitated by competitors. Similarly, Cravens and Piercy (2009) defined competitive advantage as a weapon that firms use to compete effectively with their competitors (Obeidat et al., 2021).

3. LITERATURE REVIEW and RESEARCH HYPOTHESIS

When the literature examining the relationship between intellectual capital and competitive advantage is examined, there are many studies in this field. Some pioneer study examples from these studies are summarized below.

Obeidat et al. (2021) examined the effect of intellectual capital and its components on the competitive advantage of organizations. These researchers, who claim that intellectual capital is an important factor for competitive advantage, found that there was a significant relationship between intellectual capital components and competitive advantage. In addition, as a result of the study, it has been observed that intellectual capital has a positive and significant effect on competitive advantage. Similarly, Astuti et al. (2019) conducted a study on 109 businesses in hotel industry in Bali, and it was found that there were positive and significant relationships between IC components and CA. In addition, it has been observed that structural capital has a statistically significant and positive effect on competitive advantage.

Assaf (2020) investigated the effect of intellectual capital components on competitive advantage in his study on Jordanian telecommunications companies. As a result of the data obtained from 245 participants, it was understood that all components had a significant effect on competitive advantage. A significant and high correlation was observed between IC and CA from the analysis results. Likewise, Kanaan et al. (2020) concluded that the components of intellectual capital on companies involved in the telecommunications sector in Jordan have a significant impact on competitive advantage. Therefore, this result also supports the result of Assaf's (2020) study.

Suharman and Hidayah (2021) aimed to analyze the environmental uncertainties, which are strong or weak, in order to determine the effect of intellectual capital on sustainable competitive advantage and to achieve sustainable competitive advantage in their study on 151 higher education institutions in Indonesia. As a result of the study, it was understood that there was a significant relationship between intellectual capital and competitive advantage. Contrary to this study, it was concluded that there was no significant relationship between IC and CA in the study conducted by Elda et al., (2021) on 109 participants in Indonesia.

Mubarik et al. (2019) aimed to examine the role of organizational capabilities between intellectual capital and competitive advantage, as well as the effect of intellectual capital components on competitive advantage. As a result of the study, it was determined that there was a significant relationship between intellectual capital and competitive advantage. The results of this study are similar to the results of Altarawneh (2017) study on Jordanian Pharmaceuticals industry and Arabiyat and Hasoneh (2019) study on Jordanian commercial banks.

Sadq et al. (2018) investigated whether human capital has a role on competitive advantage in their study on a private university. As a result of the study, it was determined that there was a strong positive relationship between human capital and competitive advantage. While the result of this study showed similar results with the studies of Malkawi et al. (2018), it was not similar to the study result of Crisnandani et al. (2021).

Dahash and Al-Dirawi (2018) examined the relationship between intellectual capital components and competitive advantage. As a result of this study on Iraqi hotel industry, it was determined that there were positive and strong relationship between intellectual capital components and competitive advantage. Morever, it was understood that the component showing the highest correlation with competitive advantage was human capital. Another study supporting the results of this study was conducted by Alserhan (2017) and Taie (2014). Contrary to these studies, Sadalia et al. (2018) and Yaseen et al. (2016) found that there was no relationship between human capital and competitive advantage, but there was a statistically significant relationship between structural and relational capital and competitive advantage.

Kamukama and Sulait (2017) aimed to investigate the effect of intellectual capital components on competitive advantage in their studies. As a result of the study, it was observed that the components of intellectual capital had a strong effect on competitive advantage and positive and significant relationships were found between IC elements and CA. It was understood that this result showed similar results with the study of Kamukama et al. (2011) and Srikalimah et al. (2020).

In the study conducted by Kaya (2017) on companies operating in Turkey, it was aimed to investigate the effect of knowledge management and intellectual capital on competitive advantage and innovation performance. As a result of the analysis of the data obtained from 268 participants, a positive and strong relationship was determined between intellectual capital and competitive advantage. Damar and İraz (2020) conducted a study in which the same results were observed with this study. This study, which was carried out in Turkey, was conducted out for 130 SME companies. As a result of the study, it was understood that there was a positive and statistically significant relationship between intellectual capital and competitive advantage. The results of these studies were similar to the results of the study conducted by Chahal and Bakshi (2015).

In the current economy, intellectual assets are an important determinant of competitive advantage in a company. Intellectual assets also lay the foundations for future competitiveness and play an important role in maintaining competitive advantage (Astuti et al., 2019). Barney (1991) stated that organizations that effectively use human resources and talents that are valuable to companies were more likely to achieve a competitive position (Obeidat et al., 2021). Therefore, there is a relationship between intellectual capital assets and competitive advantage. When we looked at the results of the studies conducted as a result of the literature review, there was a positive and significant relationship between intellectual capital and competitive advantage in general. In this regard, the hypothesis of this study was formed as follows;

Research hypothesis: There is a positive, strong and significant relationship between intellectual capital and competitive advantage.

4. METHOD

In this study, the relationship between intellectual capital and competitive advantage was tested with a meta-analysis method. Meta-analysis is an analysis method that summarizes the results of experimental studies in the social, behavioral and health fields and is used to apply statistical analyzes to the findings obtained from the studies (Karadağ et al., 2015; Yıldırım & Şen, 2020). Meta-analysis is a quantitative analysis method used to reduce the results of many studies to a single conclusion (Yıldırım & Şen, 2020). In addition, meta-analysis can powerfully test hypotheses that cannot be answered clearly with one or more studies, and can put an end to debates in the field. How the meta-analysis successfully clears up these debates can be understood by examining previous studies (Wampold et al., 2000). Meta-analysis is used not only to determine the relationship between two or more variables, but also to determine the impact of this relationship (Bowman, 2012). In this study, studies examining the relationship between "intellectual capital" and "competitive advantage" were included in the meta-analysis. The findings obtained as a result of the meta-analysis were reported in accordance with the criteria “PRISMA 2009 Checklist” (Göçen & Şen, 2021; Moher et al., 2009).

4.1. Search Strategy and Inclusion Criteria

Studies examining the relationship between IC and CA were reached by searching on a total of 11 international online academic databases such as “ProQuest, EBSCOHost, SCOPUS, Web of Science, Google Scholar, Elsevier Science Direct, Springer Link, JSTOR Journals, Mendeley, Emerald Insight and Wiley Online Library” (Gusenbauer & Haddaway, 2020). In addition to these databases, national databases such as "Ulakbim Discovery, National Thesis Center of the Council of Higher Education and DergiPark" were also used. Articles published in refereed and non-refereed journals, all published master's and doctoral theses, papers presented in congresses and symposiums and full texts in these databases are included in the search. Theses and full texts were included in the search in order to avoid any publication bias in the analyses. Inclusion of only statistically significant studies in meta-analysis studies will generally detract the meta-analysis from its purpose (Davis et al., 2014). In this study, not only statistically significant studies but also statistically insignificant studies were included in the search in order to avoid publication bias.

While searching the online databases, studies examining the relationship between "intellectual capital and competitive advantage" during the 12-year period between 2010 and 2021 were taken into account in order to ensure up-to-dateness. There are two different reasons for choosing this date range. First of all, although there were many studies on IC before 2010, there were a limited number of studies on IC and CA. When we examined the studies that were conducted in this field, we could say that there were more studies that strengthen the theoretical background of these concepts rather than applied studies. In order to reach the data required for meta-analysis, applied studies (quantitative data) rather than theoretical studies are needed. When the literature reviews were examined, it was understood that the concept of intellectual capital was discussed in applied studies with the concept of competitive advantage in 2010 and later. Secondly, the correlation coefficient between the variables is needed to calculate the effect size between two continuous variables (Yıldırım & Şen, 2020). The correlation coefficient (r) calculated between two continuous variables in studies is also an effect size value (Field, 2001; Law et al., 1994). Increasing applied studies on IC and CA in 2010 and later provides the opportunity to reach the correlation data and derivatives required for meta-analysis.

Articles published in refereed and non-refereed journals, all published master's and doctoral theses, papers presented in congresses and symposiums, and full texts included in the meta-analysis in line with the explanations above were determined in accordance with the inclusion criteria below. Searches were made independently of countries and regions.

1) Using the search engines of the databases above, the concepts of *"intellectual capital, competitive advantage",* the titles, abstracts and keywords of the studies were searched. As a result of the search, 13,413 studies were found.

2) While scanning, January 1st 2010 and December 31st 2021 were selected as the date range. As a result of the scans, a total of 4,561 studies were found according to title, abstract and keywords.

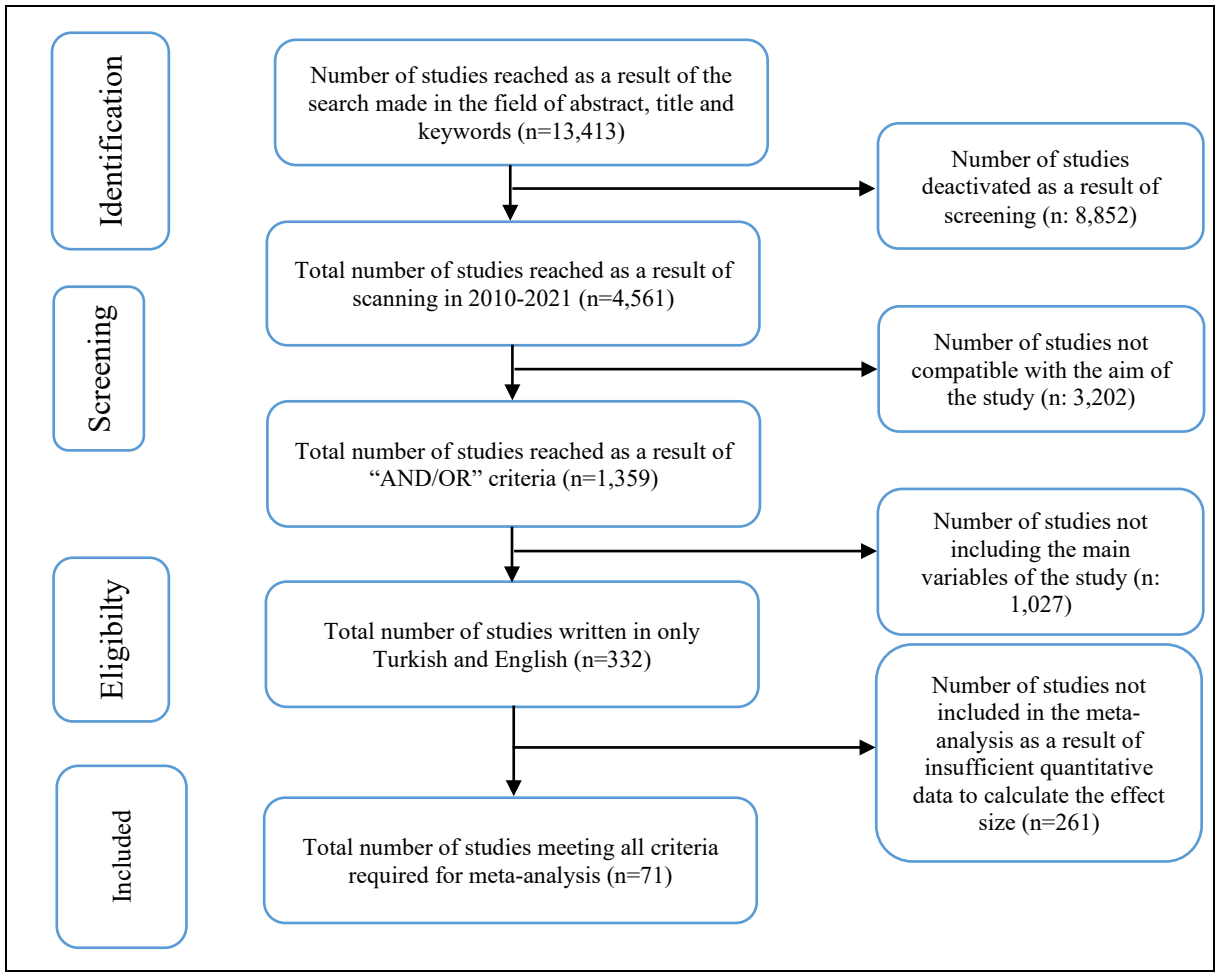
3) Such combinations as “intellectual capital AND competitive advantage”, “human capital AND competitive advantage”, “structural capital AND competitive advantage”, “relational capital AND competitive advantage”, “intellectual capital OR competitive advantage”, “human capital OR competitive advantage”, “structural capital OR competitive advantage”, “customer capital OR competitive advantage” were written to the search engines and scanned. As a result of the search, 1,359 studies were found.

4) The studies reached as a result of the search were limited to be written in only Turkish and English languages. As a result of the limitation, 332 studies were reached.

5) Correlation data are needed to calculate the effect size between two continuous variables in the meta-analysis (Field, 2001; Yıldırım & Şen, 2020). Accordingly, after the contents of the remaining studies were examined in depth, a total of 71 studies were reached, including the correlation data and the numerical data used in the calculation of the correlation data (number of samples, t-test value and standardized regression (β) coefficient).

As a result of the search criteria above, a total of 71 studies were included in the research sample. Subsequent analyzes were carried out in line with the data provided by these studies. In the international literature, researchers recommend using the work flow chart of PRISMA (2009) guidelines in meta-analysis studies (Bonazza et al., 2017; Eser, 2022). The purpose of the PRISMA guidelines is to assist researchers in improving the presentation and reporting of systematic review and meta-analysis studies (Moher et al., 2009). As a result of the search criteria, in order to better understand how the studies in the scope of the sample were reached, a work flow chart in accordance with the PRISMA (2009) guidelines was created in Figure 1 below.

Figure 1: PRISMA Workflow Chart for Data Collection



In this study, studies that examined the relationship between intellectual capital and competitive advantage in 2010 and 2021 were included. As a result of the search criteria (See Figure 1), a total of 71 studies were found that provided the quantitative data which is valid for the meta-analysis. Information on the type of publication and sample size of the studies included in this study were presented in Table 1.

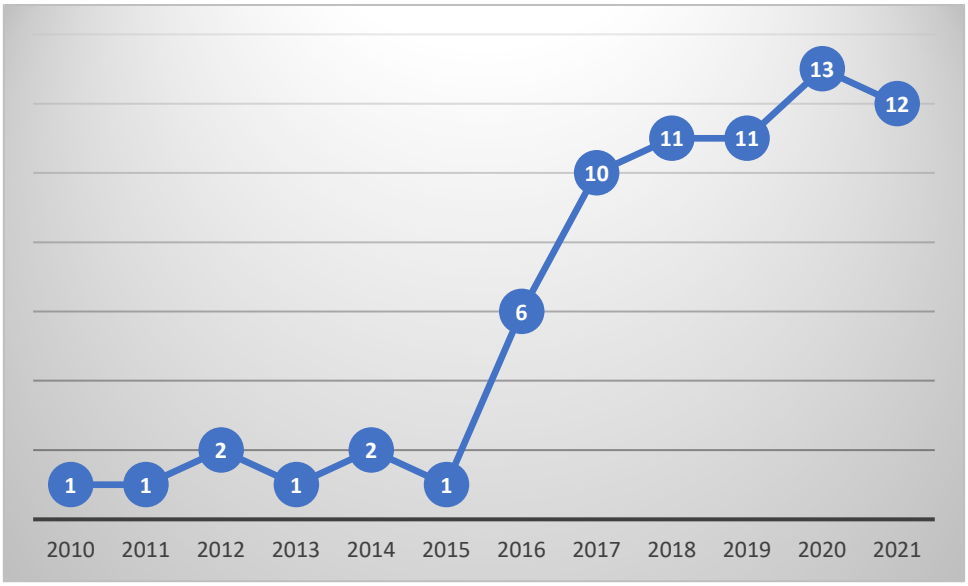
Table 1: Descriptive Information on Studies

Variable		f
Publication Type	Article	60
	Master Thesis	2
	Doctoral Thesis	2
	Conference Paper	7
	Total	71
Number of Samples	Article	13.739
	Master Thesis	42.1
	Doctoral Thesis	54.9
	Conference Paper	91.6
	Total	15.625

When Table 1 was examined, a total of 71 studies, including 60 articles, 2 master's theses, 2 doctoral theses and 7 conference papers, were included in the meta-analysis. In addition, it was understood from Table 1 that the total number of samples included in the meta-analysis in this study was 15.625.

The variation of the studies included in the meta-analysis to examine the relationship between IC and CA according to years was given in Figure 2 below.

Figure 2: Change of Studies Included in Meta-Analysis According to Years



When Figure 2 was examined, it was seen that most of the studies were conducted in 2020 (13 studies). In addition, it has been understood that studies examining the relationship between intellectual capital and competitive advantage have increased rapidly after 2015 in Figure 2.

4.2. Coding Procedure

The coding process is basically a data extraction process and it is extracting clearer and more appropriate data for the studies from the complex information (Çoğaltay, 2014). After the studies included in the meta-analysis as a result of the research criteria were examined in detail, an accurate and understandable coding form was developed. This coding form provides an overview of the studies included in the meta-analysis and the concepts used in these studies. The coding forms used in the previous meta-analysis studies were reviewed while creating the coding form (Eser, 2022; Schyns & Schilling, 2013). The coding form developed in this study consists of two sections: First section: it is the section where the studies are listed chronologically from 2010 to 2021. This section includes the year of the study, the name of the author and the type of publication. Second section: it is about the data of the study. This section provides information about the number of samples and correlation values of studies examining the relationship between intellectual capital and competitive advantage.

4.3. Reliability and Validity

According to Card (2012), ensuring the reliability of the coding also affects the reliability of the meta-analysis studies to be conducted (Ateş & Ünal, 2021). In this study, inter-interpretive reliability was used to determine the reliability of the coding form. The most commonly used method to test inter-interpretive reliability is the Cohen's Kappa statistic. The Cohen's Kappa statistic takes values between -1 and +1 like the correlation value (McHugh, 2012; Stockings et al., 2015). The data coding form of this study was sent to two experts in the field of social sciences who were independent of this study. Since the first part of the data coding form contains objective data, it is not included in the reliability. The Cohen's Kappa value calculated as a result of inter-interpretive reliability was found to be 0.83. A Cohen's Kappa value between 0.80 and 0.90 indicates a strong reliability (McHugh, 2012). Therefore, according to Cohen's Kappa value, the data coding form used in this study is reliable.

The validity of meta-analysis studies depends on the ability of data collection tools to measure what was intended in the studies included in the sample. Petitti (2000) stated that the validity of the mean effect size obtained as a result of the meta-analysis was directly proportional to the validity level

of the studies included in the analysis (Ateş & Ünal, 2021). In this study, the validity of the calculated mean effect size value (Apendix-A) shows whether the data collection tools are valid.

4.4. Meta-Analysis Process and Data Analysis

In this study, the essential statistical analyzes were carried out in line with the meta-analysis process using the "Comprehensive Meta-Analysis (CMA-V3)" program. “SPSS 26.0” statistical package program was used for descriptive data analysis of the studies, and “Microsoft Excel 2016” program was used for data coding form.

The effect size obtained in meta-analyzes is a standard value used to determine the direction and strength of the relationship between the variables within the scope of the study (Karadağ et al., 2015). There are many different values that can be used to measure effect size in the relationship between variables. Values such as Pearson correlation coefficient (r), effect size index (d), odds ratios, regression coefficient, Cohen's d and risk ratios are a few of them (Field, 2001; Nakagawa & Cuthill, 2007). In this study, Pearson correlation data were used to calculate the effect size.

When more than one correlation values are given between the same structural categories in correlational meta-analysis studies, there are two different approaches regarding which of them can be used in meta-analysis (Schyns & Schilling, 2013; Çoğaltay, 2014). The first one is: if the correlations are independent, all relevant correlations are included in the analysis and are considered independent studies. The other one is: if the correlations are dependent, the correlations are averaged. Although there are different methods for correcting these mean correlations, most of these methods tend to lead to high correlation estimates (Schyns & Schilling, 2013). Therefore, conservative estimate was preferred in this study since using the mean correlation produces a conservative estimate of the overall correlation.

In this study, the Pearson correlation coefficient (r) value could not be reached in some studies included in the meta-analysis. Therefore, β (standardized regression coefficient) and t-values were used to calculate the r value in the relationship between the variables. Peterson and Brown (2005) stated that if β weights vary between -0.5 and 0.5, standardized β weights can be converted to r (Lenhard and Lenhard, 2016). Then, the r value found was converted to Fisher's Z value and analyzes were made over Fisher's Z value. The Fisher's Z value found as a result of the analyzes was interpreted by converting it to the correlation coefficient (r) (Xu et al., 2020). In all effect size calculations, 0.05 significance level and 95% confidence interval were taken as basis. The 95% confidence interval should not contain (0). Otherwise, the mean effect size reached as a result of the meta-analysis will not be significant at the 0.05 level (Duval & Tweedie, 2000). According to Nakagawa and Cuthill (2007), reporting the significance (p) level and the confidence interval (CI) value in the meta-analysis results encourages not only practical thinking but also effective thinking in the interpretation of meta-analysis results. The use of effect sizes and their confidence intervals in meta-analytical reports provides a better understanding of the results and enables effective statistical inferences from the data (Nakagawa & Cuthill, 2007).

Cochran's Q test and I^2 statistics, which are frequently used in the literature, were used to determine the heterogeneity among the studies included in the meta-analysis. In meta-analysis studies, researchers must choose whether to report results according to a fixed effects model or a random effects model. Andy P. Field (2001) suggested that it was generally more appropriate to use the random effects model in meta-analysis studies in the social sciences. In addition, many researchers stated that the random effects model produced more realistic results than the fixed effects model (Ades et al., 2005). In line with the explanations made, the random effects model was used in the meta-analysis process in this study.

In meta-analysis studies in which correlation values are used, the value corresponding to the correlation should be used while interpreting the effect size. Cohen (1988) stated that in cases where the correlation is taken as the effect size, a value corresponding to 0.10 indicated a small effect, a value corresponding to 0.30 indicates a medium effect, and a value corresponding to 0.50 indicates a large effect (Yıldırım & Şen, 2020). Similarly, (Lipsey & Wilson, 2001) evaluated that the effect size corresponding to the correlation corresponds to 0.10 as a small effect, 0.25 as a medium effect and 0.40 as a large effect.

5. FINDINGS

5.1. Publication Bias

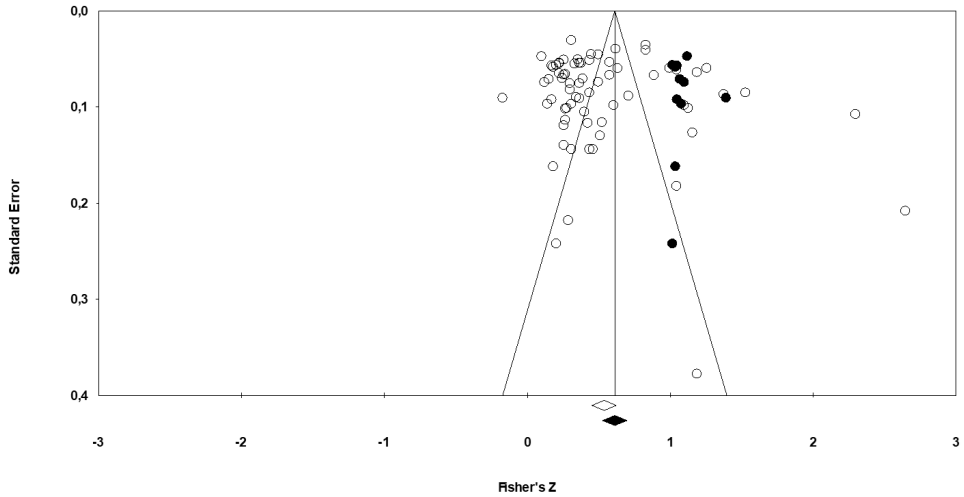
Publication bias poses a significant threat to meta-analyzes and literature review. Therefore, the first problem which researchers need to solve before moving on to meta-analysis is publication bias (Xu et al., 2020). According to Petitti (2000), publication bias is a term generally used for reporting and publishing statistically significant results (Yıldırım & Şen, 2020). In this study, non-statistical studies were also included along with statistically significant studies to avoid publication bias. In meta-analysis studies, there are a number of graphic and many numerical methods in detecting publication bias. Funnel plot is the most important of these methods.

The funnel plot is the most widely used primary visual tool for detecting publication bias in meta-analysis studies (Duval & Tweedie, 2000; Dinçer, 2021; Rothstein, 2008). All of the studies included in the meta-analysis should be within the funnel lines and be symmetrical to avoid publication bias. Otherwise, it should be kept in mind that studies that are not in the funnel and that are not symmetrical will cause publication bias (Dinçer, 2021). However, in cases where the symmetry is not very clear, researchers can sometimes approach subjectively in the evaluation of the funnel plot (Duval & Tweedie, 2000). This is a criticized aspect of the funnel plot (Yıldırım & Şen, 2020). Therefore, when evaluating the publication bias of the meta-analysis result, using Duval and Tweedie's (2005) trim and fill method together with the funnel plot will make the meta-analysis results more reliable and valid. In addition to these methods, using different methods in the literature in meta-analysis studies will lead to more objective results.

In this study, in addition to the funnel plot in detecting publication bias, Duval and Tweedie's (2005) trim and fill method, Begg and Mazumdar's (1994) rank correlation, Orwin's (1983) safe N in addition to Rosenthal's (1979) safe N, and Egger et al.'s (1997) regression test were used. These methods can be calculated with the CMA program.

The funnel plot regarding the publication bias of the studies included in the meta-analysis and the findings of Duval and Tweedie's (2005) trim and fill method were given in Figure 3 below.

Figure 3: Funnel Plot Regarding Publication Bias



The white dots in Figure 3 show the studies included in the meta-analysis. While the circular white dots represent individual studies, the diamond-shaped white dot represents the overall effect. The vertical line in the funnel plot shows the effect sizes of the studies included in the meta-analysis. Looking at the white dots in the funnel plot, it was seen that it was denser on the left side of the vertical line. Therefore, the studies are not distributed symmetrically around the funnel plot lines and this situation causes publication bias. However, since the funnel plot does not contain statistical

information, it is not possible to talk about publication bias in this study. Hence, it is necessary to apply other statistical methods to determine whether there is publication bias.

The black dots in Figure 3 show the studies added as a result of Duval and Tweedie's trim and fill method. While the circular black dots indicate individual studies, diamond-shaped black dots represent the mean effect achieved as a result of the trim and fill method. While Duval and Tweedie's trim and fill method helps detect publication bias, it also helps to correct it. This method produces artificial studies that make the asymmetric funnel plot symmetrical (Yıldırım & Şen, 2020). This method indicates that there are missing studies on the right side of the funnel plot in Figure 3. Therefore, with this method, artificial studies were added to the right side of the funnel plot, helping to correct the publication bias. Thus, the asymmetrical funnel plot became symmetrical with the trim and fill method of Duval and Tweedie (Figure 3).

The new funnel plot (Figure 3) obtained as a result of Duval and Tweedie's trim and fill method reports the corrected value for the mean effect size of the meta-analysis. Table 2 includes both the adjustted and unadjusted values according to Duval and Tweedie's trim and fill method.

Table 2: Findings Relgarding Duval and Tweedie's Trim and Fill Method

		Random Effect			Q Value
	Studies Filled	Point Estimate	Lower Limit	Upper Limit	
Observed Values		0.49	0.423	0.552	1926.92
Adjusted Values	11	0.54	0.545	0.482	2581.75

Looking at Table 2, it was understood that the number of missing studies in the relationship between IC and CA was 11 according to the random effects model. Therefore, the missing studies were included in the meta-analysis using Duval and Tweedie's trim and fill method and the overall effect model was recalculated. The mean effect size before adding the missing study was 0.49. However, when missing studies are added, this effect value increases to 0.54 (95% CI= [0.545; 0.482]). The number of missing studies constitutes approximately 15% (15/71) of the number of studies included in the meta-analysis. In this case, publication bias is not a concern in this study in general.

In this study, apart from the funnel plot and Duval and Tweedie's (2005) trim and fill method, Begg and Mazumdar's (1994) rank correlation, Orwin's (1983) safe N in addition to Rosenthal's (1979) safe N, and Egger et al.'s (1997) regression test were used in detecting publication bias. These methods can be calculated with the CMA program.

Table 3: Other Findings Regarding Publication Bias

Publication Bias Method		Results
Rosenthal's Fail-Safe N	z-value for observed studies	58.62206
	p-value for observed studies	0.00000
	Alpha	0.05000
	Tails	2.00000
	z for Alpha	1.95996
	Number of observed studies	71.00000
	Fail-Safe N	3446.00000
Orwin's Fail-Safe N	Correlation in observed studies	0.46048
	Criterion for a "trivial" correlation	0.00100
	Mean correlation in missing studies	0.00000
	Number missing studies needed to bring correlation under 0,001	5282.00
Begg and Mazumdar Rank Correlation	Tau	0.16459
	for z-value for Tau	2.03012
	p-value (1 tailed)	0.02117
	p-value (2 tailed)	0.04234
Egger's Linear Regression	Intercept	1.34064
	Standard Error	1.59633
	t-value	0.83982
	95% lower limit (2 tailed)	-1.84396
	95% upper limit (2 tailed)	4.52524
	df	69.00000

p-value (1 tailed)	0.20195
p-value (2 tailed)	0.40391

Rosenthal's safe N number gives the number of unpublished studies required to make the effect size value of studies within the statistically significant sample to be statistically insignificant. As this number increases, publication bias decreases (Kansızoğlu, 2017). Rosenthal states that publication bias will be at a minimum level if NR > 5k+10 (k=number of studies included in meta-analysis) (Yıldırım & Şen, 2020). When the values in Table 3 are put into their places in the formula, it was seen that the Safe N value (3446>365) was quite high. Thus, there was no publication bias in this meta-analysis study examining the relationship between IC and CA according to Rosenthal's safe N.

Another method used to detect publication bias in Table 3 is Orwin's Safe N. This value corresponds to Rosenthal's safe N. Orwin's safe N method gives the number of unpublished studies required to reduce the mean effect size found as a result of the meta-analysis to a certain value (Orwin, 1983). We can say that as this number increases, publication bias decreases. Thus, it was seen in Table 3 that the number of studies that can bring the effect size value in this study to 0.001 according to Orwin's safe N method is 5282. It was understood that this result was quite high. This result was a separate indicator of the absence of publication bias in this study.

Another publication bias method used in this study is the regression test of Egger et al. If the p value obtained as a result of this test is higher than the alpha level (0.05), it indicates that there is no publication bias. There are two p values in this test. Rothstein (2008) stated that the two-tailed p (2-tailed) value should be reported in meta-analysis results (Rothstein, 2008). In Table 3, it was understood that the two-tailed (2-tailed) p value was 0.40391 (CI= -1.84396; 4.52524) according to the results of Egger et al.'s (1997) regression test. Hence, there is no publication bias in this study according to the results of Egger et al.'s (1997) regression test.

Another publication bias method used in Table 3 is Begg and Mazumdar's rank correlation method. According to this method, it is possible to talk about publication bias if the p value is less than 0.05. Otherwise, we can say that there is no publication bias. The p value to be considered here is the two-tailed value (Yıldırım & Şen, 2020). In Table 3, this p (2-tailed) value was found to be 0.04234. Therefore, according to Begg and Mazumdar's rank correlation method, we can say that there is publication bias in this study.

When we looked at the publication bias statistics of this study (Figure 3, Table 2, Table 3), it was possible to say that there was no publication bias in general except for Begg and Mazumdar's rank correlation method.

5.2. The Effect Value Size

Effect size constitutes the nature of the meta-analysis. Effect size is a value that reveals whether the independent variable affects the dependent variable positively or negatively in a study. Effect size is a value calculated for individual studies. However, the effect size used in meta-analysis studies expresses the overall effect value of all studies included in the study, not the result of an individual study (Dinçer, 2021). That is, the effect size used in meta-analysis studies helps us to see the whole picture, not just a part of it.

Another purpose of the meta-analysis is to calculate the heterogeneity of the effect size. In this study, Cochran's Q test and I^2 statistics were used as stated above (Section 4.4) to calculate heterogeneity. The Q test is the value corresponding to the degrees of freedom (df) in the chi-square (χ^2) table. If the Q value obtained as a result of the heterogeneity test is greater than the Q value in the χ^2 table, it can be said that the study is heterogeneous (Dinçer, 2021; Pilatin, 2022). The I^2 statistic, unlike Q, is an intuitive measure of heterogeneity that does not depend on the effect size. If the I2 statistic exceeds the 75% limit value, it is possible to talk about a high level of heterogeneity (Ateş & Ünal, 2021).

The meta-analysis results regarding the effect size and heterogeneity tests were given in Table 4 below.

Table 4: Effect Size (Pearson r) and Heterogeneity Test Results

		Effect Size and 95% İnterval			Test of Null (Two-Tail)		Heterogeneity			
Model	N	Effect size	Lower limit	Upper limit	Z-value	*p*	Q	df (Q)	*p*	I^2
Fixed	7	0.498	0.482	0.514	61.814	0.000	1926.920	70	0.00	96.367
Random	7	0.536	0.451	0.621	12.378	0.000				

In Table 4, when the data were subjected to the heterogeneity test, the Q (df=70) statistic value was calculated to be 1926.920 (p<0.001). The fact that the obtained Q statistic value exceeds the 70 degrees of freedom and 95% confidence interval found from the chi-square (χ2) table (df=70, $\chi^2(0.95)$ =90.531) indicates that the data are heterogeneously distributed. In addition, it was seen that the I^2 value calculated from the data was 96.367. Therefore, the value of I^2 (96.367) exceeds the 75% limit value, indicating a high level of heterogeneity. It is possible to conclude that the distribution is heterogeneous by looking at the Q statistics and I^2 values. When Table 4 was examined, it was understood that, according to the data of the studies included in the meta-analysis, the effect size in terms of Fisher's z value was 0.498 according to the fixed effects model and 0.536 according to the random-effects model. In meta-analysis studies in which correlation values are used, the value corresponding to the correlation should be used when interpreting the effect size. When the Fisher z value was converted to the correlation (Pearson r) value, the correlation (r) value was 0.460 according to the fixed effects model and 0.490 according to the random effects model. According to the results of the random effects model analysis, it was seen that the confidence interval was between 0.451 and 0.621 and was significant at the level of 0.05 (*p=0.00*). According to Lipsey and Wilson (2001) the mean effect size value in this study showed that it had a positive and large effect. Based on this, it is possible to talk about the existence of a positive, significant and strong relationship between intellectual capital and competitive advantage (*r = 0.49, p = 0.00*). The forest graph showing the distribution of the effect size values of the studies within the scope of the study according to the random effects model was given in Appendix-A.

6. Discussion and Conclusion

When we look at the literature, we see that the relationship between IC and CA has been studied with different methods and models. Especially after 2015, the number of studies examining the relationship between IC and CA has gained intensity (Figure 2). However, when we look back, no meta-analysis study has been conducted that reveals the general effect on the relationship between IC and CA. Therefore, this study aims to contribute to the literature in the field of IC and CA by calculating the mean effect value of the relationship between IC and CA. In order to calculate the mean effect value in the meta-analysis, 71 studies and Pearson correlation data between IC and CA from these studies were used (Appendix-A).

As a result of the meta-analysis in this study, there is a positive, significant and strong relationship between IC and CA according to the random effects model (r = 0.49; p = 0.00). In the effect size calculations, 0.05 significance level and 95% confidence interval were taken as basis. The fact that the 95% confidence interval does not contain (0) is a separate indicator of a significant relationship between IC and CA (95% CI = [0.451; 0.621]). The use of confidence intervals in meta-analytical reports allows for meaningful statistical inferences and encourages researchers to think effectively (Nakagawa & Cuthill, 2007). In line with the explanations made, it is possible to say that the research hypothesis of "There is a positive, strong and significant relationship between intellectual capital and competitive advantage" has been confirmed. This positive and significant relationship between IC and CA supports the results of many studies such as Dahash and Al-Dirawi (2018), Taie (2014), Kamukama and Sulait (2017), Astuti et al (2019) and Assaf (2020). However, this significant relationship contradicts the research results of Elda et al (2021) and Crisnandani et al (2021). In addition, the insignificant relationship between the human capital dimension and competitive advantage supports this contradiction Sadalia et al. (2018) and Yaseen et al. (2016). In conclusion, the

positive and significant mean effect size obtained as a result of this study indicates that companies that use or direct their IC assets correctly will be effective in gaining sustainable competitive advantage.

Although there are few studies revealing an insignificant relationship between IC and CA, the findings obtained from many studies in the literature emphasize that companies that use and direct their intellectual capital assets effectively outclass others in creating competitive advantage. Therefore, intellectual capital assets, which have an important role in creating competitive advantage in companies, should not be overlooked. When the ever-increasing role of IC in acquiring CA is investigated, it becomes clear how important this relationship is. IC is intangible assets that are vital to the survival of organizations. The more a corporation / an organization invests in its IC, the more successful it will be in earning CA in the market or industry.

Classical notions that businesses can grow by investing in traditional assets are becoming less and less important in today's global economy. Everything has gained a dynamic structure in today's world. In order to keep up with the ever-changing economic conditions in a dynamic environment, businesses need intangible resources that can gain competitive advantage and increase their financial performance (Kamukama, 2013). On the other hand, considering the competitive and technological advances in the twenty-first century, it is possible to say that the importance of intellectual assets has become inevitable. Especially during the COVID-19 pandemic, which has affected the whole world for about two years, the sales of businesses on knowledge-based systems (structural capital) and the great dedication of employees (human capital) once again emphasize the importance and position of intellectual capital in the future. Businesses that do not have information systems, competent personnel and a strong customer relationship have disappeared during this pandemic (COVID-19). Therefore, business owners and managers need to understand the value of intangible assets and constantly focus on practices that will improve or develop these assets.

The mechanism that provides the greatest return on the quality of the products and services of the businesses is relational (customer) capital. The products or services most preferred by the customers in the market are the products or services of the businesses that give importance to customer satisfaction and services. This allows businesses to gain competitiveness against their competitors. Therefore, customer capital, as well as human and structural capital, is intellectual assets of vital importance for businesses. These inferences show evidence of the strong relationship between the IC and CA variables that emerged in this study. As a result, IC assets belonging to businesses are non-business-specific assets that cannot be imitated by their competitors, are valuable and above all, provide sustainable competitive advantage.

This study also contributes theoretically to the relationship between IC and CA as well as contributing to the studies to be conducted in the field of meta-analysis. The theoretical contributions in this study clarify the relationship between IC and CA in general, based on the existing studies. This study integrates the concept of IC and CA, revealing the existence of a positive relationship between them. Thus, this study will pave the way for further studies on how IC and CA variables affect each other. For example, researchers who want to conduct research with a meta-analytic method in the future will examine institutions in the same sector and culture, which will provide a more consistent and more reliable understanding of the relationship between IC and CA. Further research in the field of IC and CA will allow the link between IC and CA to expand. In addition, future studies examining the relationship between IC and CA can be collected and analyzed in terms of participant characteristics (gender, education, age, geographical region, etc.) and subgroup analyzes (ANOVA) can be made. The average effect sizes of the studies divided into groups in terms of these characteristics can be calculated and the difference can be reported. In addition to these, meta-regression analyzes can be performed using different categorical or continuous variables to reveal the extent to which the dependent variable affects the mean effect size.

The meta-analysis applied in this study has some limitations due to its inherent shortcomings, as noted by Rosenthal and DiMatteo (2001). First of all, the Pearson correlation (r) coefficient was determined as the criterion for calculating the effect size of the studies included in the meta-analysis process. Accordingly, some studies were not included in the meta-analysis process as correlation data

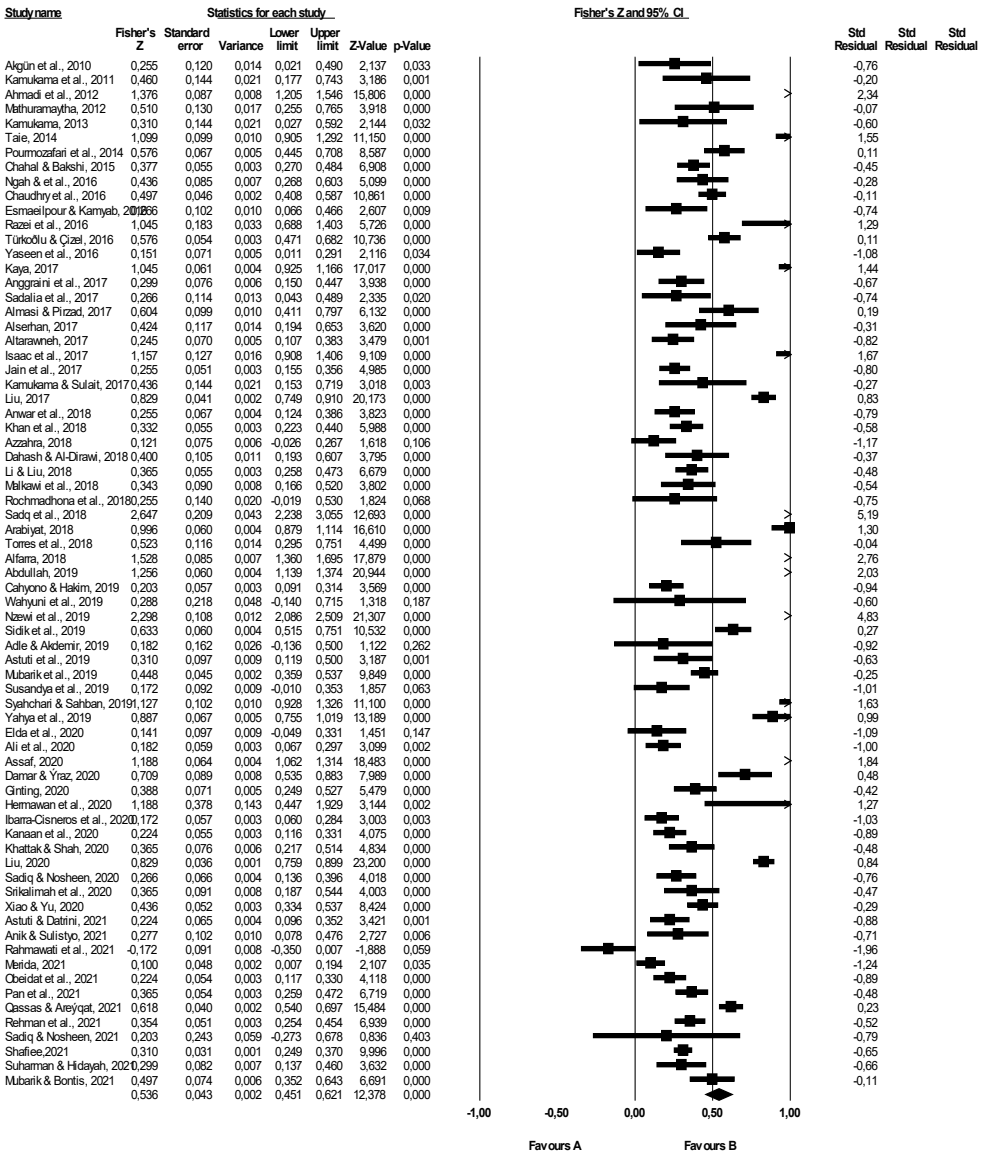
and derivatives could not be reached. Although a comprehensive search was performed in this study, the inclusion of only studies written in only English and Turkish in the analysis is another reason for limitation. The inclusion of studies conducted between 2010 and 2021 in this study is another limitation criterion. Expanding the research criteria and thus increasing the number of studies included in the analysis will provide much more reliable results by looking at the relationship in question from a broader perspective.

This study investigated the relationship between IC and CA based on the results from public or private institutions from different sectors. The competitive conditions faced by businesses operating in separate sectors or industries differ. Therefore, using data obtained from businesses in the same sector or industry will allow a clearer understanding of the relationship between IC and CA. Hence, researchers', who want to conduct study with a meta-analytical method in the future, examining institutions or organizations in the same sector and culture, will provide a consistent and reliable understanding of the relationship between IC and CA. Further studies in the field of IC and CA will allow the relationship between IC and CA to expand. In addition, future studies examining the relationship between IC and CA can be collected and analyzed in terms of participant characteristics (gender, education, age, marital status, geographical region, etc.) and sub-group analyzes (ANOVA) can be made. The difference emerging can be reported by calculating the mean effect sizes of the studies divided into groups in terms of these characteristics on the IC and CA. In addition to these, meta-regression analyzes can be performed using different categorical or continuous variables to reveal the extent to which this affects the dependent variable, which is the mean effect size.

Ethics Statement: *In this study, no method requiring the permission of the "Ethics Committee" was used.*

Etik Beyan: *Bu çalışmada "Etik Kurul" izni alınmasını gerektiren bir yöntem kullanılmamıştır.*

Appendıx-A: Forest Plot of Studies Included in Meta-Analysis



Study name	Fisher's Z	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	Std Residual	Std Residual	Std Residual
Akgün et al., 2010	0,255	0,120	0,014	0,021	0,490	2,137	0,033	-0,76		
Kamukama et al., 2011	0,460	0,144	0,021	0,177	0,743	3,186	0,001	-0,20		
Ahmadi et al., 2012	1,376	0,087	0,008	1,205	1,546	15,806	0,000	2,34		
Mathuramaytha, 2012	0,510	0,130	0,017	0,255	0,765	3,918	0,000	-0,07		
Kamukama, 2013	0,310	0,144	0,021	0,027	0,592	2,144	0,032	-0,60		
Taie, 2014	1,099	0,099	0,010	0,905	1,292	11,150	0,000	1,55		
Pourmozafari et al., 2014	0,576	0,067	0,005	0,445	0,708	8,587	0,000	0,11		
Chahal & Bakshi, 2015	0,377	0,055	0,003	0,270	0,484	6,908	0,000	-0,45		
Ngah & et al., 2016	0,436	0,085	0,007	0,268	0,603	5,099	0,000	-0,28		
Chaudhry et al., 2016	0,497	0,046	0,002	0,408	0,587	10,861	0,000	-0,11		
Esmaeilpour & Kamyab, 2016	0,266	0,102	0,010	0,066	0,466	2,607	0,009	-0,74		
Razei et al., 2016	1,045	0,183	0,033	0,688	1,403	5,726	0,000	1,29		
Türkoğlu & Çizel, 2016	0,576	0,054	0,003	0,471	0,682	10,736	0,000	0,11		
Yaseen et al., 2016	0,151	0,071	0,005	0,011	0,291	2,116	0,034	-1,08		
Kaya, 2017	1,045	0,061	0,004	0,925	1,166	17,017	0,000	1,44		
Anggraini et al., 2017	0,299	0,076	0,006	0,150	0,447	3,938	0,000	-0,67		
Sadalia et al., 2017	0,266	0,114	0,013	0,043	0,489	2,335	0,020	-0,74		
Almasi & Pirzad, 2017	0,604	0,099	0,010	0,411	0,797	6,132	0,000	0,19		
Alserhan, 2017	0,424	0,117	0,014	0,194	0,653	3,620	0,000	-0,31		
Altarawneh, 2017	0,245	0,070	0,005	0,107	0,383	3,479	0,001	-0,82		
Isaac et al., 2017	1,157	0,127	0,016	0,908	1,406	9,109	0,000	1,67		
Jain et al., 2017	0,255	0,051	0,003	0,155	0,356	4,985	0,000	-0,80		
Kamukama & Sulait, 2017	0,436	0,144	0,021	0,153	0,719	3,018	0,003	-0,27		
Liu, 2017	0,829	0,041	0,002	0,749	0,910	20,173	0,000	0,83		
Anwar et al., 2018	0,255	0,067	0,004	0,124	0,386	3,823	0,000	-0,79		
Khan et al., 2018	0,332	0,055	0,003	0,223	0,440	5,988	0,000	-0,58		
Azzahra, 2018	0,121	0,075	0,006	-0,026	0,267	1,618	0,106	-1,17		
Dahash & Al-Dirawi, 2018	0,400	0,105	0,011	0,193	0,607	3,795	0,000	-0,37		
Li & Liu, 2018	0,365	0,055	0,003	0,258	0,473	6,679	0,000	-0,48		
Malkawi et al., 2018	0,343	0,090	0,008	0,166	0,520	3,802	0,000	-0,54		
Rochmadhona et al., 2018	0,255	0,140	0,020	-0,019	0,530	1,824	0,068	-0,75		
Sadq et al., 2018	2,647	0,209	0,043	2,238	3,055	12,693	0,000	5,19		
Arabiyat, 2018	0,996	0,060	0,004	0,879	1,114	16,610	0,000	1,30		
Torres et al., 2018	0,523	0,116	0,014	0,295	0,751	4,499	0,000	-0,04		
Alfarra, 2018	1,528	0,085	0,007	1,360	1,695	17,879	0,000	2,76		
Abdullah, 2019	1,256	0,060	0,004	1,139	1,374	20,944	0,000	2,03		
Cahyono & Hakim, 2019	0,203	0,057	0,003	0,091	0,314	3,569	0,000	-0,94		
Wahyuni et al., 2019	0,288	0,218	0,048	-0,140	0,715	1,318	0,187	-0,60		
Nzewi et al., 2019	2,298	0,108	0,012	2,086	2,509	21,307	0,000	4,83		
Sidik et al., 2019	0,633	0,060	0,004	0,515	0,751	10,532	0,000	0,27		
Adle & Akdemir, 2019	0,182	0,162	0,026	-0,136	0,500	1,122	0,262	-0,92		
Astuti et al., 2019	0,310	0,097	0,009	0,119	0,500	3,187	0,001	-0,63		
Mubarik et al., 2019	0,448	0,045	0,002	0,359	0,537	9,849	0,000	-0,25		
Susandya et al., 2019	0,172	0,092	0,009	-0,010	0,353	1,857	0,063	-1,01		
Syahchari & Sahban, 2019	1,127	0,102	0,010	0,928	1,326	11,100	0,000	1,63		
Yahya et al., 2019	0,887	0,067	0,005	0,755	1,019	13,189	0,000	0,99		
Elda et al., 2020	0,141	0,097	0,009	-0,049	0,331	1,451	0,147	-1,09		
Ali et al., 2020	0,182	0,059	0,003	0,067	0,297	3,099	0,002	-1,00		
Assaf, 2020	1,188	0,064	0,004	1,062	1,314	18,483	0,000	1,84		
Damar & Yraz, 2020	0,709	0,089	0,008	0,535	0,883	7,989	0,000	0,48		
Ginting, 2020	0,388	0,071	0,005	0,249	0,527	5,479	0,000	-0,42		
Hermawan et al., 2020	1,188	0,378	0,143	0,447	1,929	3,144	0,002	1,27		
Ibarra-Cisneros et al., 2020	0,172	0,057	0,003	0,060	0,284	3,003	0,003	-1,03		
Kanaan et al., 2020	0,224	0,055	0,003	0,116	0,331	4,075	0,000	-0,89		
Khattak & Shah, 2020	0,365	0,076	0,006	0,217	0,514	4,834	0,000	-0,48		
Liu, 2020	0,829	0,036	0,001	0,759	0,899	23,200	0,000	0,84		
Sadiq & Nosheen, 2020	0,266	0,066	0,004	0,136	0,396	4,018	0,000	-0,76		
Srikalimah et al., 2020	0,365	0,091	0,008	0,187	0,544	4,003	0,000	-0,47		
Xiao & Yu, 2020	0,436	0,052	0,003	0,334	0,537	8,424	0,000	-0,29		
Astuti & Datrini, 2021	0,224	0,065	0,004	0,096	0,352	3,421	0,001	-0,88		
Anik & Sulistyo, 2021	0,277	0,102	0,010	0,078	0,476	2,727	0,006	-0,71		
Rahmawati et al., 2021	-0,172	0,091	0,008	-0,350	0,007	-1,888	0,059	-1,96		
Merida, 2021	0,100	0,048	0,002	0,007	0,194	2,107	0,035	-1,24		
Obeidat et al., 2021	0,224	0,054	0,003	0,117	0,330	4,118	0,000	-0,89		
Pan et al., 2021	0,365	0,054	0,003	0,259	0,472	6,719	0,000	-0,48		
Qassas & Areýqat, 2021	0,618	0,040	0,002	0,540	0,697	15,484	0,000	0,23		
Rehman et al., 2021	0,354	0,051	0,003	0,254	0,454	6,939	0,000	-0,52		
Sadiq & Nosheen, 2021	0,203	0,243	0,059	-0,273	0,678	0,836	0,403	-0,79		
Shafiee,2021	0,310	0,031	0,001	0,249	0,370	9,996	0,000	-0,65		
Suharman & Hidayah, 2021	0,299	0,082	0,007	0,137	0,460	3,632	0,000	-0,66		
Mubarik & Bontis, 2021	0,497	0,074	0,006	0,352	0,643	6,691	0,000	-0,11		
	0,536	0,043	0,002	0,451	0,621	12,378	0,000			

Meta Analysis

Note: Studies included in the meta-analysis are marked with a "*" in the bibliography.

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