



Determining Effective Dimensions of Intellectual Capital

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Abstract

The objective of this paper is to determine the effective dimensions of intellectual capital. For fulfilling this objective, the study examined 88 empirical research on the intellectual capital of the past two decades (1998–2018) in the field of intellectual capital, its dimensions and practices in different sectors of different countries. Peer-reviewed literature and journals were the key sources of data and information about the dimensions of intellectual capital. Out of 88 research papers, 75 research articles pointed to human capital, 57 research articles indicated structural capital, and 47 research articles mentioned relational capital are the most popular and important dimensions of intellectual capital. The study found that human capital is essential to establish structural capital and structural capital is required to build relational capital with the external environment. The results of this study contribute to the current understanding of determining effective dimensions of intellectual capital by analyzing 88 empirical research papers.

Keywords: Intellectual Capital; Empirical; Systematic Review

1. Introduction

Although the word “intellectual capital” was first introduced by the Economist John Kenneth Galbraith in 1969 (Hudson, 1993), the popularity of intellectual capital as a topic of evaluation is not much old. After the publication of an article named “Brain Power” written by T. A. Stewart in Fortune magazine on October 3, 1994, it begins peeking up (Mondal and Ghosh, 2014; Nguyen, 2016; Stewart, 1994; Stewart and Ruckdeschel, 1998). The term “Intellectual Capital” has started to flourish in the decade of 1990. Many concepts were raised and discussed in this concept in various literature, especially in the Journal of Intellectual Capital (Santoso, 2012), for example, intangibles, intellectual capital, intangible assets, and knowledge assets (Bontis, 2001; Kaufmann and Schneider, 2004; Kujansivu and Lonnqvist, 2007) which are closely related to each other (Santoso, 2012; Bontis et al., 2015).

It is not easy for all researchers to reach a conclusive explanation of intellectual capital (Hussi and Ahonen, 2002; Mayo, 2001; Nguyen, 2016) because there is no standard definition for intellectual capital (Aruppapal et al., 2015; Kaufmann and Schneider, 2004; Nguyen, 2016). International Accounting Standard (IAS) 38 by the IAS Board (2018) defines intellectual capital or intangible asset as, “an identifiable non-monetary asset without physical substance held for use in the production or supply of goods or services, for rental to others or administrative purposes.” Intangible assets are an integral element of assets that lack physical substance but are likely to yield future benefits (Bontis et al., 2015; Cañibano et al., 2000). To explain intellectual capital, Hall (1992) defined that “intellectual capital is a set of contemporary value drivers that productively transform resources into material assets with added value.” Nonaka (1994) mentioned that knowledge is a complex concept with complicated meaning.

Scholars offered diverse definitions for the perception of intellectual capital because they belonged to various schools of thought (Daou et al., 2014). Brooking (1996) forecasted that the accomplishment of an organization in the 21st century would be determined by their knowledge assets which should comprise appropriate training and expert workforce. According to Edvinsson (1997) intellectual capital is the possession of knowledge, applied experience, organizational technology, customer relationships, and professional skills. Intellectual capital was defined as “the knowledge and knowing abilities of a social collectivity” by Nahapiet and Ghoshal (1998) and “intellectual capital incorporates intellectual material such as knowledge, information, intellectual property, and experience that can be used for creating wealth” by Stewart and Ruckdeschel (1998) though Bontis (1998) and Seleim et al. (2007) specified that this category of knowledge “is the stock unit of organizational learning flows” and “collective brainpower of an organization.” Klein (2009) proposed “intellectual capital is knowledge, experience, expertise, and associated soft assets, rather than their hard physical and financial capital.” Intellectual capital supports enterprises in promoting competitive advantage and value because a composite of the knowledge, intelligence, creativity, entrepreneurship, and capabilities necessary to prosper in an increasingly competitive global economy where technology and knowledge lead (Bontis, 2001; Chen et al., 2006; Harrison and Sullivan, 2000; Kamaluddin and Abdul, 2009; Nasir et al., 2015; Riahi-Belkaoui, 2003; Wang and Chang, 2005).

Several researchers indicated several attempts to measure intellectual capital, for example, according to Mouritsen et al. (2001), “intellectual capital is the aggregate sum of intangible values which comprises of human capital (knowledge, skills and capability), structural capital (everything that remains when the employees go home: databases, software, manuals, trademarks, organization structures) and customer capital (the relationship built up with the customers). On the other hand, Brooking (1996) mentioned four dimensions to evaluate intellectual capital - Human-centered assets; Infrastructure asset; Intellectual property and Market assets. After two years, with trust and culture (two supporting drivers), Bontis (1998) mentioned three elements of intellectual capital (human, structural and relational). Castro et al. (2013), Nguyen (2016), and Inkien et al. (2017) focused on technological capital. Chien and Chao (2011) focused on information capital. Chen et al. (2004), Tseng and Goo (2005), Menor et al. (2007), and Scafarto et al. (2016) focused on innovation capital. Bontis (1998, 2000), Chen et al. (2004), Bollen et al. (2005), Wu and Tsai (2005), Wu et al. (2008), Čater and Čater (2009), Maditinos et al. (2010), Kim et al. (2012), Suraj and Bontis (2012), Castro et al. (2013), and Lin et al. (2018) focused on customer capital. Bozbura (2004), Youndt and Snell (2004), Subramaniam and Youndt (2005), Tseng and Goo (2005), Reed et al. (2006), Yang and Lin (2009), Carmona-Lavado et al. (2010), Huang and Jim (2010), Chien and Chao (2011), Hsu and Sabherwal (2012), Kim et al. (2012), Grimaldi et al. (2013), Wang and Chen (2013), Maria (2014), Davletbaev (2015), and Inkien et al. (2017) focused on organizational capital. Castro et al. (2013), Nguyen (2016), and Inkien et al. (2017) highlighted on technological capital. Chien and Chao (2011) focused on information capital. Chen et al. (2004), Tseng and Goo (2005), Menor et al. (2007), and Scafarto et al. (2016) focused on innovation capital. Hence, it is high time to determine the most useful and effective dimensions of intellectual capital.

The special focus of this paper is to determine the effective dimensions of intellectual capital. For fulfilling this objective, the study needs to examine how empirical researches on intellectual capital have been developed over time by reviewing empirical literature published in peer-reviewed journals.

2. Research Approach

This paper uses a systematic review of articles on intellectual capital. The study conducted a systematic review to collect and summarize all empirical evidence from the literature that fits the context. To know previous studies, it is necessary to go through useful and more cited data from reliable sources. For collecting data, the study has gone through different sources of databases. This approach was used because it does not consider statistical data analysis and findings summarization as it is with meta-analysis (Almatrooshi et al., 2016). Peer-reviewed literature and journals were the key sources of data and information about the dimensions of intellectual capital.

The systematic review started with a literature selection process. Only papers that are utilizing survey data and quantitative methods examine the impact dimensions of intellectual capital and its application in different industries in different countries were selected for the systematic review.

For this reason, first, the study tried to go through relevant literature, written in English, using databases such as Google Scholar, JSTOR, Mendeley, Science Direct, Scopus, Social Science Citation Index, Springer Link, SSRN, and Web of Science to discover the targeted body of literature [Figures 1 and 2]. The study selected documents that discussed dimensions and the application of intellectual capital in different fields in different countries. The initial search within the database produced 6454 potentially relevant unique hits. Second, based on filtering subject category and screening the title, articles were omitted that produced 286 potentially relevant researches. Third, after investigative abstracts, articles were removed where 117 potentially relevant unique research papers have been found. Finally, publications were excluded based on the full text where 88 research papers have been found that fit all selection criteria.

Based on collected data from the popular and high ranked database, the research found 88 research papers have been found that fit all selection criteria of the past two decades (1998–2018) in the field

Figure 1: Flowchart of study selection, including the search query and inclusion criteria

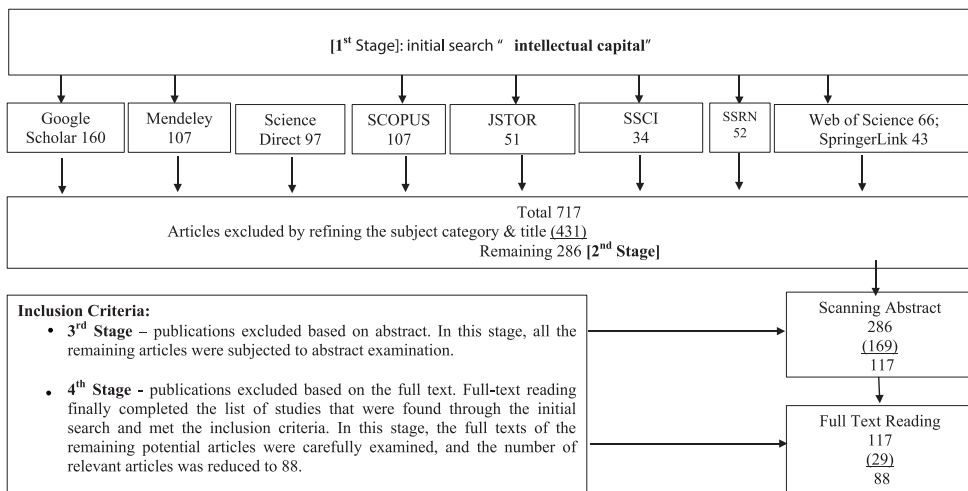
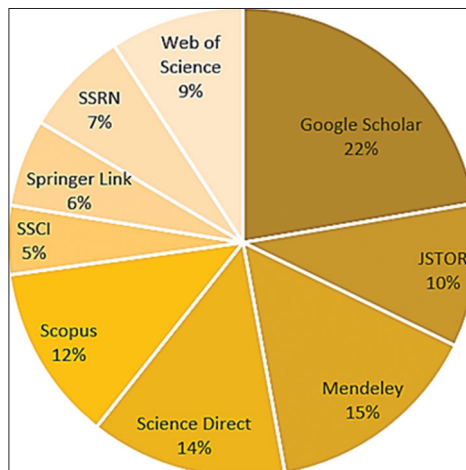


Figure 2: Number of included articles in different categories by the source digital database



of intellectual capital, its dimensions and practices in different sectors (for example, agriculture, bank, biotech, construction, electronics, engineering, financial, health care, hotel and tourism, information technology, manufacturing, pharmaceutical, and software) of different countries of the world (for example, Argentina, Australia, Austria, Bahrain, Belgium, Canada, China, Colombia, Denmark, Egypt, Finland, France, Germany, Greece, India, Indonesia, Iran, Italy, Jordan, Malaysia, Nigeria, Pakistan, Portugal, Romania, Russia, Serbia, Slovenia, South Korea, Spain, Sweden, Taiwan, Thailand, the UK, the USA, Turkey, and Uganda). To simplify further steps, a full list of all included papers, with their corresponding initial categories were compiled from the various sources into an Excel file. This was followed by the process of summarization, tabulation, and description of the main findings. Figure 3 shows the number of publications on intellectual capital per year. Figure 4 shows the studies of intellectual capital in different countries of the world.

3. Findings

Table 1a-h (in Appendix) presents the general findings of the systematic review and Figure 5 shows a graphical figure to indicate the frequency of dimensions of intellectual capital that was mentioned by numerous researchers on different sectors of different countries.

Table 1a-h and Figure 5 showcase, the majority of the reviewed studies utilized three dimensions of intellectual capital that consists of human, structural, and relational capital. Figure 5 shows that out of 88 research papers of the past two decades, 75 research articles pointed human capital, 57 research articles indicated structural capital, and 47 research articles mentioned relational capital are the most popular and important dimensions of intellectual capital.

Figure 3: Number of publication regarding intellectual capital per year

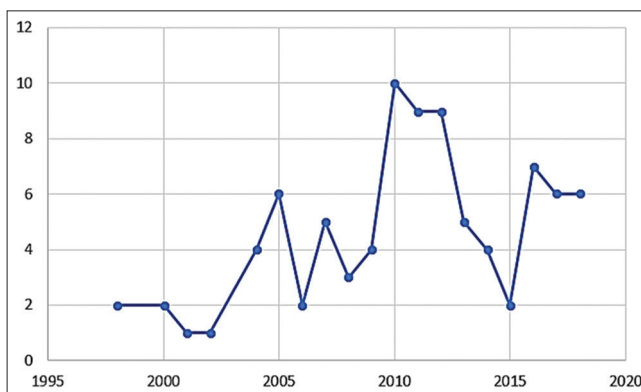


Figure 4: Studies of intellectual capital in different countries of the world

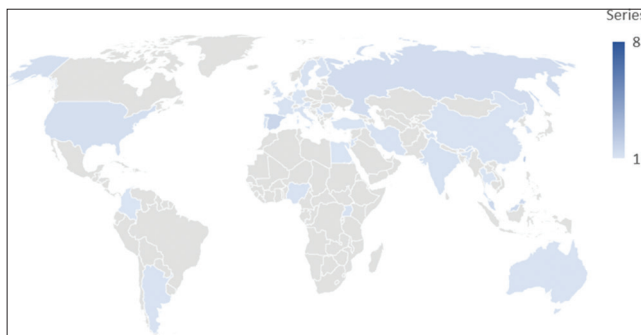
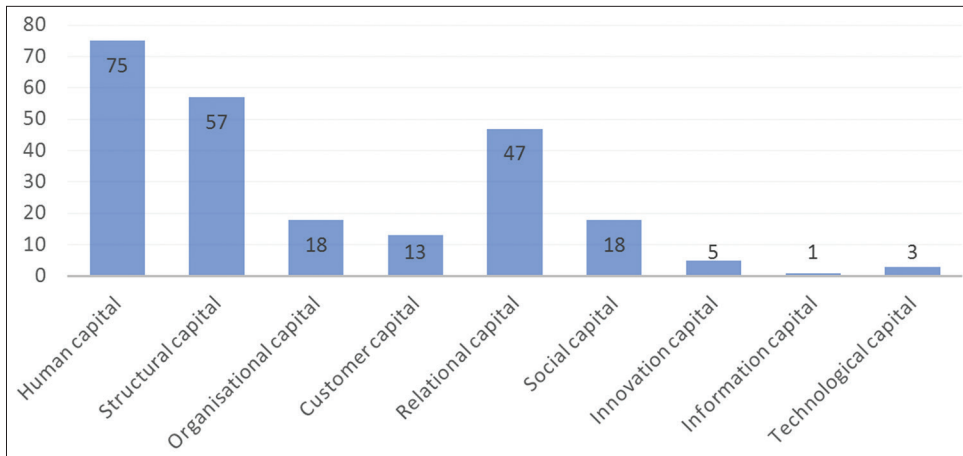


Figure 5: Publication frequency on different dimensions of intellectual capital

The field of empirical research on the dimensions of intellectual capital has grown in terms of the number of publications per year and the geographical spread of the field. Bontis (1998; 2000), Harris (2000), Bozbura (2004), Chen et al. (2004), Youndt and Snell (2004), Boedker et al. (2005), Bollen et al. (2005), Mavridis and Kyrmizoglou (2005), Tseng and Goo (2005), Wu and Tsai (2005), Chen et al. (2006), Reed et al. (2006), Seleim et al. (2007), Huang and Hsueh (2007), Menor et al. (2007), Tovstiga Tulugurova (2007), Wu et al. (2007), Bayburina and Golovko (2008), Hsu and Fang (2009), Calisir et al. (2010), Cabello-Medina et al. (2011), González-Loureiro and Figueroa-Dorrego (2012), Castro et al. (2013), Celenza and Rossi, (2014), Bontis et al. (2015), Dženopoljac et al. (2016), Inkien et al. (2017), and Cricelli et al. (2018) focused on human capital as the major dimension of intellectual capital. Bontis (1998; 2000), Chen et al. (2004), Bollen et al. (2005), Wu and Tsai (2005), Chen et al. (2006), Huang and Hsueh (2007), Bayburina and Golovko (2008), F-Jardón and Susana (2009), Calisir et al. (2010), Garanina (2010), Aramburu and Sáenz (2011), González-Loureiro and Figueroa-Dorrego (2012), Ling (2013), Celenza and Rossi, (2014), Bontis et al. (2015), Kehelwalatenna (2016), Andreeva and Garanina, (2017), and Asiaei et al. (2018) emphasized on structural capital. Bontis (1998; 2000), Chen et al. (2004), Bollen et al. (2005), Wu and Tsai (2005), Wu et al. (2008), Čater and Čater (2009), Maditinos et al. (2010), Kim et al. (2012), Suraj and Bontis (2012), Castro et al. (2013), and Lin et al. (2018) focused on customer capital. Bozbura (2004), Youndt and Snell (2004), Subramaniam and Youndt (2005), Tseng and Goo (2005), Reed et al. (2006), Yang and Lin (2009), Carmona-Lavado et al. (2010), Huang and Jim (2010), Chien and Chao (2011), Hsu and Sabherwal (2012), Kim et al. (2012), Grimaldi et al. (2013), Wang and Chen (2013), Maria (2014), Davletbaev (2015), and Inkien et al. (2017) focused on organizational capital. Castro et al. (2013), Nguyen (2016), and Inkien et al. (2017) focused on technological capital. Chien and Chao (2011) focused on information capital. Chen et al. (2004), Tseng and Goo (2005), Menor et al. (2007), and Scafarto et al. (2016) focused on innovation capital. Bontis (1998; 2000), Chen et al. (2004), Bollen et al. (2005), Wu and Tsai (2005), Wu et al. (2008), Čater and Čater (2009), Maditinos et al. (2010), Kim et al. (2012), Suraj and Bontis (2012), Castro et al. (2013), and Lin et al. (2018) focused on customer capital. Bozbura (2004), Youndt and Snell (2004), Subramaniam and Youndt (2005), Tseng and Goo (2005), Reed et al. (2006), Yang and Lin (2009), Carmona-Lavado et al. (2010), Huang and Jim (2010), Chien and Chao (2011), Hsu and Sabherwal (2012), Kim et al. (2012), Grimaldi et al. (2013), Wang and Chen (2013), Maria (2014), Davletbaev (2015), and Inkien et al. (2017) focused on organizational capital. Castro et al. (2013), Nguyen (2016), and Inkien et al. (2017) highlighted technological capital. Chien and Chao (2011) focused on information capital. Chen et al. (2004), Tseng and Goo (2005), Menor et al. (2007), and Scafarto et al. (2016) focused on innovation capital. Out of these dimensions, human capital, structural capital, and relational capital are the most used and cited dimensions of intellectual capital.

Human capital includes individual's attributes as formal education (Kamukama et al., 2010; Marr, 2008; Bontis, 1998; Bueno et al., 2003; Chen et al., 2004; Wang and Chang, 2005), experience (Akpınar and Akdemir, 1999; Kamukama et al., 2010; Marr, 2008; Paoloni et al., 2010; Smuts, 2008; Vodak, 2010;), knowledge (Pienaar et al., 2009; Paoloni et al., 2010; Franco et al., 2010; Akpınar and Akdemir, 1999; Chen, 2009; Marr, 2008), expertise (Akpınar and Akdemir, 1999; Chen, 2009; Felício et al., 2014; Franco et al., 2010; Kamukama et al., 2010; Lafuente and Rabetino, 2011; Lazear, 2009; Marr, 2008; Paoloni et al., 2010; Pienaar et al., 2009; Smuts, 2008; Stewart and Ruckdeschel, 1998; Sullivan, 1998; Vodak, 2010; Bueno et al., 2003; Leiponen, 2005; Hayton, 2005; Sharabati et al., 2010), and innovation and creation (Pienaar et al., 2009; Paoloni et al., 2010; Kamukama et al., 2010; Marr, 2008) which ensures business success (Honig, 2001; Pena, 2004) and broader range of opportunities (Davidsson Honig, 2003; Gimeno et al., 1997). Stewart and Ruckdeschel (1998) emphasized on the importance of analytical thinking, systems integration and experiment.

Structural capital includes infrastructure, systems and knowledge databases (Sánchez et al., 2001; Cañibano et al., 2002; Bueno et al., 2003; Gallego and Rodríguez, 2005; Bontis, 1998; Bontis, 1999; Bontis et al., 2000; Chen et al., 2004; Roos et al., 1997; Sharabati et al., 2010), research and product innovations (Bueno et al., 2003; Chen et al., 2004; Halim, 2010; Sharabati et al., 2010), and intellectual property rights (Díez et al., 2010; Chen, 2009; Marr, 2008; Paoloni et al., 2010; Yau et al., 2009).

Relational capital includes strategic alliances, license, and agreements (Sánchez et al., 2001; Cañibano et al., 2002; Bueno et al., 2003; F-Jardón and Susana, 2009; Sveiby and Simons, 2002; Adam Urquhart, 2009; Sharabati et al., 2010; Halim, 2010), customers relations (Kaplan and Norton, 1992; Sánchez et al., 2001; Cañibano et al., 2002; Bueno et al., 2003; F-Jardón and Susana, 2009; Halim, 2010), and customers knowledge (Saint-Onge, 1996; Petrash, 1996; Edvinsson et al., 1997; Stewart and Ruckdeschel, 1998; Bontis, 1998; Sánchez et al., 2001; Cañibano et al., 2002; Bueno et al., 2003; Mouritsen, 2006; F-Jardón and Susana, 2009; Santos and Figueroa, 2010; Kaplan and Norton, 1992; Halim, 2010). To develop strong, sustainable and efficient relational capital, an organization should focus on strategic alliances, license and agreements, customers relations, and customers knowledge (Cabrita and Bontis, 2008; Karimi, 2014; Sharabati et al., 2010).

Former researchers of the past decade proved that intellectual capital is vital for the existence of the organization and competitive success as there is a significant link between the most effective dimensions of intellectual capital (human capital, structural capital, and relational capital) and firm performance. Highly cited researches of the past decade indicated that competitive success of an organization depends on the strategic management of intellectual capital rather than strategic allocation of physical and financial resources (Andreeva and Garanina, 2016; Asiaei et al., 2018; González-Loureiro and Figueroa-Dorrego, 2012; Hormiga et al., 2011; Kalkan et al., 2014; Khaliq and Bontis, 2015; Mention and Bontis, 2013; Sharabati et al., 2010; Vargas and Lloria, 2017).

4. Conclusions

This study highlights the most effective dimensions of intellectual capital. Hence, the study reviewed the articles systematically of the past two decades (1998–2018) in the field of intellectual capital, its dimensions and practices in different sectors of different countries. The results of this study contribute to the current understanding of determining effective dimensions of intellectual capital by analyzing 88 empirical research papers. The study found that human capital is essential to establish structural capital and structural capital is required to build relational capital with the external environment. The study also found that employees' knowledge turns into organizational knowledge and that organizations which have solid human and structural capital have a higher probability of having relational capital. Although the study has a significant contribution to the body of literature, it has some limitations. The literature selection has been development based on personal preferences, and only survey data and statistical methods of analysis were applied within the scope of this study. Different cases and research-based figures from the balance sheet were omitted. Based on this study, there is a wider scope of future studies. As the study pointed on the effective dimensions of intellectual capital of different sectors or industries of different countries, it will be easier to analyze the gap. Moreover, there is a scope to find

out the impact of the most effective dimensions of intellectual capital on organizational performance and the firm's competitive advantages on the basis of developing and developed countries.

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Appendix

Table 1a: Dimensions of intellectual capital by several studies of the past two decades

Author year	Country	Industry	Citation	Human capital	Structural capital	Organizational capital	Customer capital	Relational capital	Social capital	Innovation capital	Information capital	Technological capital
Bontis (1998)	Canada	Multi-industry	3327	✓	✓		✓					
Nahapiet and Ghoshal (1998)	The UK	Multi-industry	17441						✓			
Bontis et al. (2000)	Malaysia	Multi-industry	2037	✓	✓		✓					
Harris (2000)	Global	Multi-industry	43	✓			✓					
Yli-Renko et al. (2001)	The UK	High-tech	2937						✓			
Yli-Renko et al. (2002)	Finland	Electronics	686						✓			
Bozbura (2004)	Turkey	Multi-industry	217	✓		✓		✓				
Chen et al. (2004)	China	High-tech	877	✓	✓		✓			✓		
Youndt and Snell (2004)	The USA	Multi-industry	729	✓		✓			✓			
Boedker et al. (2005)	Australia	Multi-industry	107	✓	✓			✓				
Bollen et al. (2005)	Germany	Pharmaceutical	291	✓	✓		✓					

Table 1b: Dimensions of intellectual capital by several studies

Author year	Country	Industry	Citation	Human capital	Structural capital	Organisational capital	Customer capital	Relational capital	Social capital	Innovation capital	Information capital	Technological capital
Mavridis and Kymizoglou (2005)	Greek	Bank	164	✓								
Subramaniam and Youndt (2005)	The USA	Multi-industry	2631	✓		✓			✓			
Tseng and Goo (2005)	Taiwan	Manufacturing	463	✓		✓		✓		✓		
Wu Tsai (2005)	Taiwan	Multi-industry	71	✓	✓		✓		✓			
Chen et al. (2006)	Taiwan	Manufacturing	160	✓	✓			✓				
Reed et al., (2006)	The USA	Financial	458	✓		✓			✓			
Seleim et al. (2007)	Egypt	Software	174	✓								
Huang and Hsueh (2007)	Taiwan	Engineering consulting	109	✓	✓			✓				
Menor et al. (2007)	The USA	Manufacturing	114	✓	✓					✓		
Tovstiga and Tulugurova (2007).	Russia	Multi-industry	119	✓	✓							
Wu et al. (2007)	Taiwan	Information technology	111	✓	✓			✓				
Bayburina and Golovko (2008)	Russia	Multi-industry	4	✓	✓							

Table 1c: Dimensions of intellectual capital by several studies

Author year	Country	Industry	Citation	Human capital	Structural capital	Organisational capital	Customer capital	Relational capital	Social capital	Innovation capital	Information capital	Technological capital
Cabrita Bontis (2008)	Portugal	Financial	318	✓	✓			✓				
Wu et al. (2008)	Taiwan	Multi-industry	280	✓	✓		✓		✓			
Čater and Čater (2009)	Slovenia	Multi-industry	67	✓	✓		✓					
F-Jardón and Susana (2009)	Argentina	Wood manufacturing	80	✓	✓			✓				
Hsu and Fang (2009)	Taiwan	Information tech	402	✓	✓			✓				
Yang and Lin (2009)	Taiwan	Healthcare	209	✓		✓		✓				
Calisir et al. (2010)	Australia	Multi-industry	34	✓	✓			✓				
Carmona-Lavado et al. (2010)	Spain	Industrial	145			✓			✓			
Garinina (2010).	Russia	Multi-industry	2	✓	✓							
Huang and Jim (2010)	Taiwan	Pharmaceutical	105	✓		✓				✓		
Kamukama et al. (2010)	Uganda	Financial	103	✓	✓			✓				
Kianto and Waajakoski (2010)	Finland	Multi-industry	51						✓			

Table 1d: Dimensions of intellectual capital by several studies

Author year	Country	Industry	Citation	Human capital	Structural capital	Organizational capital	Customer capital	Relational capital	Social capital	Innovation capital	Information capital	Technological capital
Maditinos et al. (2010)	Greece	Multi-industry	39	✓	✓		✓			✓		
Namvar et al. (2010)	Iran	Computers and electronics	52	✓	✓			✓				
Sharabati et al. (2010)	Jordan	Pharmaceutical	357	✓	✓			✓				
Steinfeld et al. (2010)	Denmark	Biotech	48						✓			
Aramburu and Sáenz (2011)	Spain	Manufacturing	50		✓							
Cabello-Medina et al. (2011)	Spain	Multi-industry	143	✓					✓			
Chien and Chao (2011)	Taiwan	Financial	18	✓		✓					✓	
Delgado-Verde et al. (2011a)	Spain	Manufacturing	100			✓						
Delgado-Verde et al. (2011b)	Spain	High-tech and medium tech	38					✓				
Hormiga et al. (2011a)	Spain	Start-ups	109					✓				
Hormiga et al. (2011b)	Spain	New ventures	131	✓	✓			✓				
Kamukama et al. (2011)	Uganda	Financial	143	✓	✓			✓				

Table 1c: Dimensions of intellectual capital by several studies

Author (year)	Country	Industry	Citation	Human capital	Structural capital	Organizational capital	Customer capital	Relational capital	Social capital	Innovation capital	Information capital	Technological capital
Leitner (2011)	Austria	Manufacturing	56	✓	✓							
González-Loureiro and Dorrego (2012)	Spain	Innovative SMEs	39	✓	✓			✓				
Hsu and Sabherwal (2012)	Taiwan	Multi-industry	140	✓		✓			✓			
Jardon and Susana (2012)	Argentina	Wood Manufacturing	96	✓	✓			✓				
Kim et al. (2012)	South Korea	Hotels	44	✓		✓	✓					
Ling (2012)	Taiwan	Multi-industry	4	✓	✓			✓				
Mathuramaytha (2012)	Thailand	Industrial	7	✓	✓			✓				
Mehdivand et al. (2012)	Iran	Nano-businesses	18	✓	✓			✓				
Molodchik and Nursubina (2012)	Russia	Multi-industry	1	✓	✓			✓				
Suraj and Bontis (2012)	Nigeria	Telecom	51	✓	✓		✓					
Castro et al. (2013)	Spain	Technology	33	✓			✓					✓
Grimaldi et al. (2013)	Italy	Tech. Public Service	10	✓		✓		✓				

Table 1f: Dimensions of intellectual capital by several studies

Author year	Country	Industry	Citation	Human capital	Structural capital	Organizational capital	Customer capital	Relational capital	Social capital	Innovation capital	Information capital	Technological capital
Ling (2013)	Taiwan	Multi-industry	81	✓	✓			✓				
Mention and Bontis (2013)	Belgium Luxembourg	Finance	94	✓	✓			✓				
Wang and Chen (2013)	China	Multi-industry	52	✓		✓			✓			
Celenza and Rossi, (2014)	Italy	Multi-industry	28	✓	✓			✓				
Maria (2014)	Romania	Multi-industry	29	✓	✓	✓						
Osman (2014)	Malaysia	ICT	1	✓	✓							
Vishnu and Kumar (2014)	India	Pharmaceutics	57	✓	✓			✓				
Bontis et al. (2015)	Russia (Serbia)	Hotel	30	✓	✓			✓				
Davlebaev (2015)	Russia	IT Sector		✓				✓				
Dženopoljac et al. (2016)	Russia (Serbia)	ICT	24	✓	✓	✓						
Kehelwalatenna (2016)	The USA	Banking	6	✓	✓			✓				
Martini et al. (2016)	Germany, France, the UK Italy	Multi-industry	9					✓				

Table 1g: Dimensions of intellectual capital by several studies

Author year	Country	Industry	Citation	Human capital	Structural capital	Organizational capital	Customer capital	Relational capital	Social capital	Innovation capital	Information capital	Technological capital
Nguyen (2016)	The US	Public Sector	1	✓	✓			✓				✓
Pirozzi and Ferulano (2016)	Italy and the UK	Health care	8	✓	✓			✓				
Scafarto et al. (2016)	Multi-national	Agribusiness	13	✓				✓		✓		
Zahedi et al. (2016)	Iran	Auto-industry	1	✓	✓			✓				
Andreeva and Garanina, (2017).	Russia	Manufacture	1	✓	✓			✓				
Inkinen et al. (2017)	Serbia	Multi-industry	7	✓	✓	✓			✓			✓
Sardo and Serrasqueiro (2017)	European Union	Multi-industry	1	✓	✓			✓				
Secundo et al. (2017)	Multi-national	Multi-industry	8	✓	✓			✓				
Sharma and Dharni (2017).	India	Manufacture and Service	1	✓	✓			✓				
Vargas and Lloria (2017)	Spain	Bio-technology	4	✓	✓			✓				
Cricelli et al. (2018)	Columbia	Public Universities	2	✓	✓			✓				
Asiaei et al. (2018)	Iran	Public companies	-	✓	✓			✓	✓			

Table 1h: Dimensions of intellectual capital by several studies

Author year	Country	Industry	Citation	Human capital	Structural capital	Organizational capital	Customer capital	Relational capital	Social capital	Innovation capital	Information capital	Technological capital
Eid (2018)	Bahrain	Multi-Industries	-	✓	✓			✓				
Khalique et al. (2018)	Malaysia	SME	-	✓	✓			✓				
Hussinki et al. (2018)	Finland	Multi-Industries	-	✓	✓			✓				
Lin et al. (2018)	Taiwan	Construction	1	✓	✓		✓					