Relational Capital and Technology Brands Over Time

G. Scott Erickson[1] and Helen N. Rothberg[2]
[1]Ithaca College, Ithaca, USA
[2]Marist College, Poughkeepsie, USA
gerickson@ithaca.edu
hnrothberg@aol.com

Abstract: Study examines alternative metrics for assessing relational capital. Associated with intellectual capital, relational capital has to do with knowledge about external relationships. It is chiefly knowledge about customers, but also includes knowledge concerning all external entities such as regulators, collaborators, and others. Relational capital is not widely studied. It's not even included in some popular metrics such as VAIC but is increasingly important in a digital world dependent on customer information, customer interactions, and customer relationships. The concept of brand equity is very similar though from another discipline and not often discussed with or related to the relational capital framework. But by bringing similar disciplines closer together, we can learn things that allow a better understanding of both. Brand equity is particular important to reference because a number of consultancies offer metrics for measuring it, particularly for firms with powerful brands. As a consequence, any alternative metrics suggested will have some baseline for comparison once brand equity is included. This study explores alternative metrics for relational capital, specifically using web-scraping sentiment analysis software to examine select brands. In this case, the study replicates previous work on technology brands, looking at key indicators for the top worldwide smartphone brands. The previous study examined them over a five-week period in early 2021, and this study continues the research with similar results from early 2022. Key metrics include sentiment (positive/negative), influencers, platforms (social networks, blogs, forums), location, and volume. Brands identified as more valuable by other metrics show more interest and more stability over time though all brands do show the potential for a change in value in response to circumstances.

Keywords: Intellectual capital, relational capital, brand equity, smartphones, sentiment analysis

1. Background/Literature Review

Brand equity and relational capital are two fields focused on much the same concept but from different viewpoints. Branding is a core part of marketing, with a strong brand viewed as a key competitive asset. Brands are a communication mechanism, with a recognizable name, symbol, logo, or other device used to remind a customer of the range of personal experiences and word-of-mouth associated with it. When the personal experiences and word-of-mouth are positive, the brand brings that all back in a rush. And the customer's positive associations encourage continued purchases, often at a price premium.

1.1 Brand Equity

Branding concepts, as noted, are central to marketing and have developed a strong theoretical basis. Relational capital relates more to the intangible assets of the firm and their potential to establish unique, defensible competitive advantages. We'll discuss each in turn.

In marketing, branding discussions begin with Aaker (1991), establishing that brand value comes from consumer perceptions of higher quality. Brand value evolved into brand equity, measurable in theory but somewhat elusive in practice. Aaker (1996) proposed brand equity's components as brand awareness, brand association, and brand loyalty. The more consumers that know the brand, have positive associations, and so tend to favor the brand at purchase, the more brand equity it carries. Keller (1993) had previously shown the importance of brand awareness and brand image, also suggesting recognition followed by positive experiences would then lead to a higher brand value.

Even so, how these inputs actually determine brand equity continues to be a question. In a sense, it's up to the market and what each consumer decides the brand is worth. If possible to add all of those together, a value would be available but that approach, of course, is impossible. Seggie, et al., (2006) and Ailawadi, et al., (2003) proposed price differential as an indicator of brand value, but even that measures only what loyal customers do pay, not what they would. So individual perceptions of value are still not fully captured.

Commercial approaches also exist as brand equity is seen as important contributor to competitiveness and, by extension, firm value. These are proprietary to their creators, usually consultancies, with details not fully shared. They can also differ markedly in their valuations and often include only very large firms. But they do provide

some sense of what values might be for brand equity of exemplary firms. Interbrand and Kantar, for example, both release annual estimates of brand equity for top global firms.

The core problem from a measurement perspective is the intangibility of brand equity. It isn't a value found in regular financial reporting. Goodwill is a related concept and is found on balance sheets but only applies at the moment a firm is acquired (at a premium above its market cap, termed goodwill) and is then set in time. Further, it includes all intangible assets. Brand equity can be a big part of the total intangibles but separating its individual value out from total goodwill is problematic. And, of course, goodwill can then be outdated almost as soon as its value is settled.

The theme throughout this discussion is that we have a conceptual idea of what brand equity is and how it benefits an organization. But there is no perfect metric for evaluating it. In such situations, of course, triangulating with multiple methods is a possibility, and we'll talk more of that after exploring the similar concept of relational capital.

1.2 Relational Capital

Intellectual capital (IC) came out of accounting, trying to capture the value of the intangible assets in the organization. The related field of knowledge management (KM) concerns better understanding of these intangible assets and then managing them to better effect. And for competitive advantage. Essentially, the knowledge in employees' heads has value and may be the primary unique, sustainable resource available to firms seeking enduring competitive advantage. That idea flows from the resource-based view of the firm (Barney, 1991; Wernerfelt, 1984) and its concept of competitive advantage accruing from unique resources. To the extent the workforce is the most unique resource available to any organization, if it is particularly knowledgeable, it is a competitive advantage. This knowledge-based view of the firm then supposes that the collective knowledge of that workforce can be better managed, with the idea of firmly establishing the organization's superior performance (Grant, 1999; Teece, 1998).

Part of better management comes from fully understanding the knowledge assets. Both IC and KM have a role in this, start first with KM. Knowledge management is about identifying key knowledge, defining its nature, and managing it appropriately. The key difference defining the field for almost thirty years is between explicit and tacit knowledge (Nonaka & Takeuchi, 1995). Explicit knowledge is easily defined, captured by the firm, codified, and shared between employees. Tacit knowledge is harder to express, harder to capture and codify, and shareable but generally on a person-to-person basis rather than at-scale. As might be surmised, explicit knowledge works well with formalized documents and IT systems (Matson, et al., 2003). Tacit knowledge works well with person-to-person interactions (Brown & Duguid, 1991). Both are dependent on the culture of the organization and its role in establishing trust and the motivation to share knowledge (Nahapiet & Ghoshal, 1998).

IC, as mentioned, came out of accounting and is much more focused on assessing the nature and level of knowledge assets in the firm. The basic structure is usually recognized as including human capital, structural capital, and relational capital (Bontis, 1999; Edvinsson & Malone, 1997). Human capital is individual job knowledge, structural capital is organizational systems and knowledge, while relational capital is knowledge about interacting with those outside the organization. Relational capital was often termed customer capital in early models. While other external parties are included in relational capital (Roos & Roos, 1997), the key relationships, of course, continue to be with customers.

Despite the heavy interest in brand equity, as just discussed, relational capital metrics have not been a well-researched area. Early firm-specific templates including the Balanced Scorecard (Kaplan & Norton, 1992) or Skandia Navigator (Evinsson & Malone, 1997) had a customer metric but later research hasn't looked into it consistently or in much detail. More broad-based metrics that can be used to easily compare multiple firms have also had some limitations. The original IC metric based on easily collected and analyzed annual reports, Tobin's q (Tobin & Brainerd, 1979), is a remainder after subtracting tangible assets from the firm's market capitalization. To the extent it measures IC, it only looks at the full number, not the human, structural, and relational capital components. Pulic's VAIC (Pulic, 2000) does take it a step further with estimates of human capital and structural capital but does not include relational capital (it's lumped in with structural)

Even though much of the IC community does focus on human capital, this lack of attention seems like a mistake. The massive brand equity estimates seen in some firms suggest something more is there. Moreover, customer-

related data and knowledge have been growing rapidly in recent years with the advent of Customer Relationship Management (CRM) systems able to track interactions with individual customers and provide recommendations, offers, and communications unique to each. The value from close customer relations and the attendant big data will only continue to increase in coming years.

Even without widely accepted measures, the IC community has not totally ignored relational capital and, especially, its link to brand equity. Similar to the case made with brand equity, relational capital has been shown to be enhanced by continuing positive interactions between the firm and customers (Chang & Tseng, 2005; de Castro, et al., 2004). With repeated interactions comes a better understanding in the firm of the individual customers, what they want, and how they can be satisfied. The perspective differs but some of the relationship capital literature acknowledges the customer engagement connection (Sussan, 2012; Stahle & Stahle, 2012). Although relational capital is a wider concept, including relationships with all "publics external" to the firm, IC scholars recognize its value as largely dependent on what we call brand equity in the other context (Gupta & Bhasin, 2014).

1.3 Digital Technologies

Into this environment, new possibilities based on innovative information and communication technologies (ICTs) have arisen. As we all know, digital technologies are ubiquitous and brands are increasingly employing them for communications (including two-way) and other interactions with customers. And, as noted above, users' feelings about a brand can be discerned, in part, from activity and comments on the firm's own digital media properties.

More formally, from the literature, ICTs provide complex networks of contributors, and, vitally, those users can often be individually identified (Lechman, 2017). User interactions, including social media, are one of the applications generating considerable data through ICTs (Kaplan & Heinlein, 2010), data and information related to and capable of becoming knowledge assets (Sigala & Chaikiti, 2014; Levy, 2009).

The link between basic data and information vs. more highly developed knowledge (or intellectual capital) has been long recognized, going back to the DIKW hierarchy (data, information, knowledge, wisdom) of Ackoff (1989) and others. The hierarchy suggests growth, that basic data eventually becomes more valuable wisdom after being subject to analysis. But in our current world of big data, data and information are now often seen as valuable assets in an of themselves. Though even more valuable if analyzed for deeper insights.

This view of data, information, knowledge, and wisdom (or intelligence) as all valuable intangible assets has gained some currency with a move away from the hierarchy. Without a ranking of the intangibles, each can be seen as different but still potentially useful and valuable, as in the Cynefin framework (Kurtz & Snowden, 2006). This actually squares well with traditional KM, where tacit and explicit knowledge are both valuable but have different characteristics and different levels of sharing potential. Further refinements of the intangibles range, from data/information to explicit knowledge to tacit knowledge to insights/intelligence (Rothberg & Erickson, 2017; Simard, 2014) cement this view. Knowledge assets have value but so do data/information. And, again, ICTs generate a lot of potentially interesting and useful data/information. Can that contribute to the intangible assets of the organization, to intellectual capital? Or even more specifically, can data/information shed light on relational capital and brand equity?

One particularly intriguing use of the new capabilities of both ICTs and data/information is digital media, especially in terms of brand equity and relational capital. While not capable of measuring knowledge in and of itself, the broader view of intangible assets does specifically evaluate intangible assets. If intellectual capital can be seen to include not only knowledge but also data, information or even intelligence, by extension so can relational capital. Digital media includes customer databases and customer relationship management (CRM) systems constantly taking in data concerning individually identified customers. That deep a relationship and understanding of customers will usually add considerable value to the organization and its competitiveness. Firms can also capture customer comments, including about brands, through formal channels or through social media. In the case of social media, commenters are often brutally honest about their feelings (Liu, et al., 2017; Royai, 2002). Consequently, unfiltered perceptions come through, providing a particularly useful perspective on brand equity (Rizun & Kucharska, 2018). Further, while all organizations monitor comments on their own digital properties, current technology also allows collecting postings about brands from virtually everywhere. That capability promises rich databases with potentially deep insights about brand equity and relational capital.

2. Methodology

This study takes advantage of some of those new digital media collection capabilities to take a look at selected brands in a specific tech industry. In this case, we analyzed smartphone providers, specifically the top five global brands: Apple iPhone, Samsung Galaxy, Xiaomi, Oppo, and Vivo. An earlier study was replicated in order to observe changes over time, so results presented here were gathered over two five-week periods, July 5 to August 9, 2021 followed by February 15 to March 21, 2022. Salesforce's Social Studio was used to gather the data, collecting weekly reports on each brand. The search terms were the main brand for Xiaomi, Oppo, and Vivo and the phone brands for Apple (iPhone) and Samsung (Galaxy). Apple and Samsung, otherwise, would have returned too many non-smartphone comments, including opinions on apples as a fruit.

Social Studio returns a variety of results. The volume of comments is included, providing an idea of the level of interest in the brand. Social Studio also assesses whether posts are positive toward the brand or negative, termed sentiment analysis. Sentiment analysis is based on a proprietary rubric assessing whether key words in text surrounding the brand is generally pro or generally con. Though not a perfect metric (sarcasm is dreadfully misclassified), sentiment analysis is relatively reliable over a large sample and consistent over time.

Social Studio also tracks the platform used for the comments, including Twitter, Facebook, YouTube, blogs, forum posts and replies, reviews, and others. Once again, the level of comments are reported, and individual posts can be captured (and studied with text analysis, if desired). The influence of top posters is also included. Based on a 0-100 scale, an influencer's degree of reach is measured. As a result, a brand with top influencers with high scores will see their comments have greater impact and reach more followers than those with low scores. Finally, Social Studio tracks the country of origin, when it can be determined, and language of the user, providing some idea of the geographic or cultural source of the comments.

The brands chosen, besides being from a tech industry that we know has high levels of intellectual capital based on previous studies (Erickson & Rothberg, 2012). Further, the two most-recognized brands in the US, Apple and Samsung, have brand valuations reported on both the Interbrand and Brandz lists discussed earlier, Apple at $200.7 billion and Samsung at $62.3 billion in 2021 Interbrand lists. In addition, Xiaomi shows up on the top Chinese brands Interbrand list, with a valuation of $8.3 billion.

3. Results and Discussion

Results are presented in Table 1 (earlier period) and Table 2 (later period). As indicated, these results include the average rating of the top 10 influencers, total volume, platform, sentiment, and language. Both the averages themselves and the range of the results below them, the latter showing the variability. Only the main platforms (Twitter, YouTube, forums/forum replies) are included as these were the top three for all the brands in almost all time periods. Languages were more varied and so show more options over time rather than a consistent, more limited number across all the brands.

Table 1: Smartphone Brands, Sentiment and Related Metrics (2021)

Metric		Apple iPhone	Samsung Galaxy	Xiaomi	Vivo	Oppo
Influencers		98	98	95	84	97
Volume		164K	299K	36K	17K	18K
(Range)		52K	355K	9K	16K	29K
Platform	Twitter	46.0%	44.6%	34.0%	15.1%	32.8%
	(Range)	6.2%	16.5%	21.2%	13.0%	25.6%
	YouTube	27.4%	42.1%	37.7%	79.5%	43.1%
	(Range)	4.0%	8.8%	15.8%	13.5%	34.7%
	Forum	10.5%	8.7%	26.7%	1.2%	16.0%
	(Range)	1.8%	5.0%	7.5%	0.7%	17.5%
Sentiment	Positive	77.3%	78.5%	83.5%	87.8%	84.2%
	(Range)	2.4%	35.6%	9.4%	10.3%	11.2%
	Negative	22.7%	21.5%	16.5%	12.2%	15.8%
Language	English	57.0%	52.5%	26.9%	65.2%	45.6%
	Japanese	10.4%		14.5%		
	Spanish	6.2%	6.0%	15.0%		8.4%
	Portuguese				5.7%	
	Indonesian		6.7%			

Metric		Apple iPhone	Samsung Galaxy	Xiaomi	Vivo	Oppo
	Hindi/Bengali				6.4%	
	Chinese					8.4%

In reviewing each indicator, we'll look at both periods and then any changes across them . For the earlier period, the average rating for the top influencers at Apple (98), Samsung (98), Xiaomi (97), and Oppo (91) are all very high, indicating substantial reach for their most engaged posters, generally a positive for a brand. The average for Vivo (79) is a little lower, showing a difference, but still relatively high. For the later period, the pattern is very similar. All the brands except Vivo (84) are at least above a 95 average ranking. The brands all consistently have highly ranked top influencers, slightly higher for the most valuable brands.

Volume of digital media activity, of course, is a very important indicator of engagement with a brand. In the earlier period, posting volume shows the clearest difference between the brands, ranging from very high at Samsung (259K per week, on average) down to 15K per week at Vivo and 7K at Oppo. Of considerable interest and replicating previous research using this methodology, the variability of these results also varies sharply. Apple and Samsung both have a ranges only a fraction of average volume while the others have ranges close to their average values (and so are much more variable/less consistent on a relative basis). For the later period, both Apple and Samsung are even higher, Samsung reaching an average of almost 300K per week. Xiaomi is noticeably lower. Once again, range is also noticeably different with Apple and Xiaomi varying only a fraction of their average value. Samsung changed quite a lot in its volume and, especially, in the range but much of that was due to a single week when volume hit 550K. Otherwise, volume was more tightly bunched, as in the previous period. The outlier demonstrates an important capability of the methodology, to spot one-off readings and to be able to explore in more detail (e.g. new product launch, promotional event, adverse publicity?). The comments the software also gathers could be studied in more detail to determine what circumstances are impacting the brand's metrics, particularly given evidence of a dramatic shift.

Table 2: Smartphone Brands, Sentiment and Related Results (2022)

Metric		Apple iPhone	Samsung Galaxy	Xiaomi	Vivo	Oppo
Influencers		98	98	97	79	91
Volume		259 K	259K	90K	15K	6.9K
(Range)		151K	119K	71K	15K	5.1K
Source	Twitter	65.0%	55.6%	47.3%	19.0%	41.6%
	(Range)	5.9%	28.3%	21.7%	27.9%	27.2%
	YouTube	21.8%	33.3%	28.1%	67.5%	26.4%
	(Range)	4.6%	22.2%	13.9%	21.7%	7.9%
	Forum	6.9%	5.0%	19.6%	1.1%	16.1%
	(Range)	1.2%	3.0%	8.2%	.8%	9.7%
Sentiment	Positive	77.1%	88.9%	81.4%	87.3%	88.1%
	(Range)	12.6%	7.7%	15.1%	16.3%	12.5%
	Negative	22.9%	11.1%	18.6%	12.7%	11.9%
Language	English	40.3%	57.9%	24.1%	72.2%	32.0%
	Japanese	16.2%		14.8%		36.9%
	Spanish			10.9%		3.7%
	Portuguese		3.6%		4.2%	
	Indonesian		5.3%			
	Hindi/Bengali				8.0%	
	Arabic	16.1%				

The social media platform metrics include Twitter (social chatter), YouTube (video), and forums (more engaged discussion). In the earlier period, the dominant platform is Twitter, with a plurality of activity for all the brands except Vivo. For Vivo, YouTube is substantially more active. Xiaomi and Oppo show uniquely higher results in the forums. The later metrics are generally similar though Twitter's influence declines except for Apple and Samsung while YouTube is more prominent for all the brands except Apple. Xiaomi and Oppo again have noticeably higher use of forums. What does this mean? On the surface, the high-value brands with devoted fans (Apple vs. Samsung) continue to have spirited debates on Twitter. Given the nature of Twitter, those probably aren't conducted with any real depth to the discussion though that could be explored. The YouTube activity is likely to have more to do with videos, making videos, what product is used for making videos, and so forth, in some ways a more use-oriented exchange ("shot on iPhone 13"). And the forums offer opportunities

for more in-depth discussions, beyond the simplest aspects of brand image. The patterns are again largely stable over time, and the methodology would allow deeper looks into the exact exchanges on these platforms, both their nature and their depth.

Sentiment might be the key indicator in terms of brand value. As noted above, the software assesses the context and language of the posting, rating it positive or negative regarding the language surrounding the search term. So when the tweet, for example, mentions the Apple iPhone, is it a positive comment or a negative one? The early results are quite interesting as all of the brands have positive ratings in the 80% range, often the high end of the range, except for Apple—the most valuable brand in the world. Apple comes in noticeably lower than the others. The later ratings confirm the general theme but with the addition of Samsung as a second major brand with relatively lower positivity. Even more interesting are the ranges. While Apple has lower positives, it also has a much more stable sentiment in the early period (as does Samsung, but not to the same degree). The latter period shows relatively similar and stable sentiments for all of the brands, again with the important exception of Samsung. But, as already established, there is a blip in the metrics for Samsung in the later period which may also impact the sentiment results. Beyond the blip, the higher rated brands tend to be noticeably more stable in the sentiment ratings, in a given measure and over time.

One important aspect of sentiment is its connection to volume. While Apple's positive sentiment percentage is lower than the other brands (as is Samsung's in the later period), that is a percentage of a much large volume. So Apple's 77% of 259K posts equates to almost 200K positive comments in the more recent data. Compare that to Vivo. Vivo had 87.8% positive sentiment, but that comes from a volume of only 17K, roughly 15K positive comments. So even with the lower percentage, Apple's positive sentiment numbers actually dwarf the smaller brand's (200K vs. 15K).

Finally, the language results provide some sense of where the brands have resonance. The Social Studio software also tracks location, but that metric has quite a number of incomplete readings. Language is the fuller data set and location can often be inferred (Portuguese and Brazil, English and the US/UK/more widely, etc.). In the earlier period, English is dominant for Apple, Samsung, and Vivo. English is also prominent for Xiaomi and Oppo but their language results are far more variable and represent considerably more languages/locations. These patterns are also reflected in the later period results though Apple's English percentage is lower and Chinese noticeably higher. The later period also shows considerable change in Oppo's geographic areas of strength as the Japanese numbers fall off sharply while the Chinese are higher. There are some consistencies for both periods in pockets of data for some of the brands (Vivo in India and Brazil, Samsung in Indonesia, Apple in the Middle East). Add it all together and an interesting picture emerges of brands aimed at the US and European markets against those with much wider targets. As with some of the earlier metrics, noticeably different results (e.g. a steep rise in Indonesian postings) could be easily explored for details on what might be driving the outcomes.

4. Conclusions

The objective of this study was to explore how alternative metrics can shed light on knowledge asset values, particularly assets like relational capital lacking widely accepted existing methods. Once we identify, through multiple studies, what results and patterns we associate with high-equity brands, we can more reliably start to apply such relational capital metrics.

Here, the brands known to have really high (Apple, Samsung), high (Xiaomi), and lower (Vivo, Oppo) brand equity can be compared and contrasted. Brand equity appears to correlated with consistently high volume on digital platforms over time. Surprisingly, higher brand equity is not associated with positive sentiment percentages (though raw numbers are high simply because of the massive volume) but do tend to be much more stable over time. The less highly rated brands are considerably more variable over time in terms of volume, sentiment, and, sometimes, platforms. Language and location can also vary but a consistent pattern is less obvious.

The methodology also allows deeper, more qualitative analysis of the comments behind the volume, sentiments, and overall discussion. Consequently, when blips do appear in the relatively consistent brand metrics over time, they can be investigated, allowing ever deeper understanding of what really influences brand value and relational capital. If so, relational capital can not only be more readily measured but the influences on relational capital, what makes it change, can also be better understood.

References

Aaker, D. A. (1996). *Building strong brands*. The Free Press.

Aaker, D. A. (1991). *Managing brand equity.* New York.

Ackoff, R. (1989). From data to wisdom. *Journal of Applied Systems Analysis, 16*, 3–9.

Ailawadi, K.L., Lehmann, D.R. & Neslin, S.A. (October 2003). "Revenue premium as an outcome measure of brand equity". *Journal of Marketing*. *67*(4), 1–17.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99-120.

Bontis, N. (1999). Managing organizational knowledge by diagnosing intellectual capital: Framing and advancing the state of the field. *International Journal of Technology Management, 18*(5-8), 433-462.

Brown, J.S. & Duguid, P. (1991). Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation. *Organizational Science*, *2*(1), 40-57.

Chang, A. & Tseng, C-N. (2005). Building customer capital through relationship marketing activities: The case of Taiwanese multilevel marketing companies. *Journal of Intellectual Capital, 6*(2), 253-266.

de Castro, G.M., Saez, P.L. & Lopez, J.E.N. (2004). The role of corporate reputation in developing relational capital. *Journal of Intellectual Capital*, *5*(4), 575-585.

Edvinsson, L. & Malone, M. (1997). *Intellectual capital*, Harper Business.

Erickson, G.S. & Rothberg, H.N. (2017). Digital media and relational capital. *Proceedings of the 18th European Conference on Knowledge Management*, Barcelona, Spain, 303-309.

Erickson, G.S. & Rothberg, H.N. (2012), *Intelligence in action: Strategically managing knowledge assets*, Palgrave Macmillan.

Grant, R.M. (1996). Toward a knowledge-based theory of the firm *Strategic Management Journal*, *17*(Winter), 109-122.

Gupta, M. & Bhasin, J. (2014). The relationship between intellectual capital and brand equity. *Management and Labour Studies, 39*(3), 329-339.

Interbrand (2021). https://www.interbrand.com/best-global-brands/, accessed 7/1/2021.

Kantar (2021), https://www.kantar.com/campaigns/brandz/global, accessed 7/1/2021.

Kaplan, R.S. & Norton, P.D. (1992). The balanced scorecard—Measures that drive performance. *Harvard Business Review, 70*(1), 71-79.

Keller, K.L. (1993). Conceptualizing, measuring, and managing customer-based brand equity. *Journal of Marketing*, *57*(1), 1-22.

Kurtz, C.F. & Snowden, D.J. (2003). The new dynamics of strategy: Sensemaking in a complex-complicated world. *IBM Systems Journal*, *42*(3), 462-483.

Lechman, E. (2017). *The diffusion of information and communication technologies*. Routledge.

Levy, M. (2009). Web 2.0 implications on knowledge management'. *Journal of Knowledge Management*, *13*(1), 120-134.

Liu, X., Magjuka, R. J., Bonk, C. J., & Seung-Jee, L. (2007). Does sense of community matter? An examination of participants' perceptions of building learning communities in online courses. *Quarterly Review of Distance Education, 8*(1), 9–24.

Matson, E, Patiath, P. & Shavers, T. (2003). Stimulating knowledge sharing: Strengthening your organizations' internal knowledge market. *Organizational Dynamics*, *32*(3), 275-285.

Nahapiet, J. & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *The Academy of Management Review*, *23*(2), 242-266.

Nonaka, I. & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation.* Oxford University Press.

Pulic, A. (2000). VAIC—An accounting tool for IC management. *International Journal of Technology Management*, *20*(5-7), 702-714.

Rizun, N. & Kucharska, W. (2018). Text mining algorithms for extracting brand knowledge: The fashion industry case. *Proceedings of the 31st International Business Information Management Association Conference.*

Roos, J. & Roos, G. (1997). Measuring your company's intellectual performance. Long Range Planning, *30*(3), 45-62.

Rothberg, H.N. & Erickson, G.S. (2017) Big data systems: Knowledge transfer or intelligence insights. *Journal of Knowledge Management*, *21*(1), 92-112.

Seggie, S.H., Kim, D., & Cavusgil, S.T. (2006). Do supply chain IT alignment and supply chain interfirm system integration impact upon brand equity and firm performance? *Journal of Business Research*, *59*(8), 887–895.

Sigala, M. & Chalkiti, K. (2014). Investigating the exploitation of web 2.0 for knowledge management in the Greek tourism industry: A utilisation-importance analysis. *Computers in Human Behavior*, *30*, 800-812.

Simard, A. (2014). Analytics in context: Modeling in a regulatory environment. *Proceedings of the International Conference on Analytics Driven Solutions*, 82-92.

Stahle, S. & Stahle, P. (2013). Towards measures of national intellectual capital: an analysis of the CHS model. *Journal of Intellectual Capital*, *13*(2), 164-177.

Sussan, F. (2012). Consumer interaction as intellectual capital. *Journal of Intellectual Capital*, *13*(1), 81-105.

Teece, D.J. (1998). Capturing value from knowledge assets: The new economy, markets for know-how, and intangible assets. *California Management Review*, *40*(3), 55-79.

Tobin, J. & Brainard, W.C. (1977). Asset markets and the cost of capital. In Fellner, W., Balassa, B.A. & Nelson, R.R., Eds., *Economic progress, private values and public policy, Essays in honor of William Fellner*, North-Holland Publishing Company, 235-262.

Wernerfelt, B. (1984). The resource-based view of the firm. *Strategic Management Journal*, *5*(2), 171-180.