Business-to-business referral as digital coopetition strategy
Insights from an industry-wise digital business network

Ying Zhu
*Faculty of Management, University of British Columbia-Okanagan,
Kelowna, Canada*

Valerie Lynette Wang and Yong Jian Wang
*Department of Business and Public Affairs,
West Chester University of Pennsylvania, West Chester, Pennsylvania, USA, and*

Jim Nastos
Department of Computer Science, Okanagan College, Kelowna, Canada

Abstract

Purpose – Based on theories related to coopetition, the purpose of this paper is to examine the patterns of business-to-business digital referrals inscribed in businesses' digital content.

Design/methodology/approach – A complete industry-wise digital data set is formed by extracting digital referrals in all the content pages. The authors outline how digital referrals are strategically used among peer businesses in the peer-to-peer digital network and in the augmented digital network, taking into consideration geographical framing and physical distance.

Findings – The authors reveal how geographical framing and physical distance influence peer-to-peer referral patterns in the digital space. Quite counter-intuitively, businesses are more likely to give digital referrals for peers residing in the same region, as well as for peers located in closer proximity. Further, results from the augmented digital network show that peer businesses in closer proximity exhibit greater strategic similarity in their digital referring strategy.

Research limitations/implications – The findings extend the understanding of business-to-business coopetition to the digital space and suggest that geographical framing and physical distance can induce reciprocated relationships between peers by offering each other digital referrals.

Practical implications – The findings shed light on the formation of a business-to-business digital coopetition strategy using digital referral marketing.

Originality/value – This study highlights the impact of digital referrals in business-to-business relationship management, especially in the digital coopetition context.

Introduction

Business-to-business relationship has received considerable attention from both academics and practitioners as a determinant factor for a thriving firm (Bathelt and Glückler, 2003; Corsaro *et al.*, 2012; Fang *et al.*, 2016; Thornton *et al.*, 2015). For a business to be productive and successful, it cannot focus solely on a product or service but instead must be situated in a network of companies that can ensure mutually beneficial, long-lasting relationships (Ferreira *et al.*, 2013). Embedded in the inter-organizational networks, these relationships enhance each business' capability to achieve performance goals (Ansari and Stahl, 2011; Stephen and Toubia, 2010; Van den Bulte and Wuyts, 2007). Traditionally, some businesses choose to take part in the various types of geographically-based business clusters because of the need for joining business networks (Porter, 1990). These businesses tend to achieve competitive advantages by establishing connections among peer businesses that are located close to one another (Porter, 1998a; Saxenian, 1994).

At the beginning of the twenty-first century, conventional ways for building business relationships through face-to-face interactions has been gradually replaced by computer-mediated interactions such as e-mails, electronic data exchange and video conference calls (Ganesan *et al.*, 2005). Digital platforms built on digitalized business technologies has enabled businesses to communicate with suppliers, distributors, customers and partners without being constrained by physical distance (Bughin and Zeebroeck, 2017; Chakravarty *et al.*, 2014; Obal and Lancioni, 2013; Shankavaram, 2016). Aside from online communities where business can interact (De Maggio *et al.*, 2009), a variety of tools embedded in digital platforms, such as hyperlinks, can provide a direct, low-cost means for businesses to connect, interact and network with each other (Wang *et al.*, 2015; Kannan and Li, 2017).

In the digital space, digital hyperlinks inscribed in various platforms act as a fundamental driver of traffic once clicked on (Ennew *et al.*, 2005). In the domain of digital marketing, digital referral is understood as the digital marketing effort taken by a business to promote traffic going into the digital platforms of another business (Google Analytics, 2017). In a business-to-business context, digital referral actions can be taken by a business encoding digital hyperlinks into its digital content that are directed to the digital platforms of another business (Google Analytics, 2017). Referral traffic, activated by browsers clicking on a referral hyperlink, is one of the three major sources of organic traffic into a business' digital platforms, with the other two being direct traffic through browsers bookmarking the domain name and search traffic through the use of search engines (Bashara, 2018). Thus, the higher number of referral hyperlinks directed to a business can be found in the digital space, the greater the business' digital presence and the number of potential visitors tend to be. To increase referral traffic to their digital platforms, businesses are motivated to build digital connections with other businesses to increase their visibility and potential visitors to the digital domain (Elgin, 2015; Neal, 2014). As such, referral-based digital business networks are formed up (Raisi *et al.*, 2018; Ying *et al.*, 2016). Digital networks enabled by referrers' outbound hyperlinks to the inbound platforms constitute a large subset of social networks (Park, 2003; Yi and Scholz, 2016).

As an explicit indicator of social connection, digital referrals have been increasingly used by businesses, yet little is known about how businesses give digital referrals for peers, especially for

their direct competitors. Strategic decisions on displaying digital referrals for others are crucial, and such public display may also influence businesses' reputation, community membership and business relationships (Jackson, 1997; Nicolla and Teresa, 2016; Wang *et al.*, 2015). Do businesses avoid digitally promoting their nearby counterparts to deter direct competition? Instead, do they like giving digital referrals for peers located far to show a willingness to form up alliance? Despite a rich stream of research examining traditional inter-organizational connections (Becattini, 1990; Corsaro *et al.*, 2012; Harrison, 1994; Ibrahim *et al.*, 2009; Martin and Sunley, 2003; Pouder and St. John, 1996), no clear answer to these questions raised in the digital space can be directly drawn from current literature.

Thus, we attempt to examine a research question:

RQ1. How are digital referrals strategically used among peer businesses in the digital space, taken into consideration geographical framing and physical distance?

To advance the understanding of business-to-business relationship in the digital space, this research takes a holistic approach to investigate the pattern of digital business networks within an entire industry.

Extending current literature on peer-to-peer business relationships, this study helps fulfill a number of research gaps. First, recent studies applying the concept of virtual business clusters often focused on how peer businesses expand business relationships in online communities (De Maggio *et al.*, 2009), and has overlooked digital marketing as a tool for relationship building. Given that digital content marketing accounts for a large slice of business-to-business marketing activities (Wang *et al.*, 2017), our study contributes to how digital referrals can be strategically used to achieve digital content marketing objectives. Second, collaborative strategies have been intensively studied in the past to understand how to best access partners' resources (Gulati, 1998), but minimal attention is paid to how businesses use competitors' resources. Our study contributes to the peer-to-peer cooperation strategy in the digital marketplace, an area that has not been explored by previous research. Third, previous studies sought to reveal implicit relationships among businesses by interviewing managers (Nicholson *et al.*, 2013), surveying experts (Felzensztein *et al.*, 2018) or conducting case studies (Ferreira *et al.*, 2013). We extend this research stream by revealing the explicit connections among businesses through extracting the referrals inscribed in published digital content. Compared to primary data collection methods, such as surveys or interviews in which responses may appear subjective, measures used in our analysis indicate true and valid business relationships (Park, 2003). Finally, this study attempts to examine the digital network of an entire industry across multiple regions. This approach offers a holistic view and an in-depth description of business-to-business relationships than previous studies that are based on business networks in one location (De Maggio *et al.*, 2009; Geldes *et al.*, 2017; Porter, 2000; Waits, 1996).

We organize the remainder of this study as follows: first, we review the current literature on business networks and cooperation, which lead to hypotheses development in the second step. Third, we introduce the method, terminologies and measurements used to conduct the data analysis. Next, we use the industry-wise digital data set to test the hypotheses. Fifth, we report the empirical results. Finally, we conclude with in-depth discussions on theoretical contributions, implications for business practice and suggestions for further research.

Theoretical background
Business network based on location
Previous research observed that companies located in a certain geographical area often form up a business cluster to gain productivity, competitive advantages and prosperity (Porter, 1990, 1998c). In a broader sense, business clusters arise among suppliers, manufacturers, service

providers, professional associations, trade groups and universities (Porter, 1998a). In a narrower sense, it is beneficial for peer businesses in the same region to enter a business cluster to improve the efficiency of the supply chain, facilitate innovation among the interdependent partners, and enhance the competitive advantage of the entire business sector of the region (Porter, 1998c).

Previous research found that a cooperative approach between competing peer businesses in a regional cluster or business network can create numerous positive results (Della Corte and Aria, 2016; Felzensztein *et al.*, 2018; Lindstrom and Polsa, 2016). This strategic approach is referred to as *coopetition*, which means:

> [. . .] creating a bigger pie to increase benefits for all players by cooperating (a focus on market growth) and dividing the pie among the players by competing (a focus on market share) (Bengtsson and Raza-Ullah, 2016, p. 26).

Despite that competition always exists among close-by peer businesses, many studies documented the positive impact of physical proximity in building strong business relationships (Green and McNaughton, 2000; Rosenfeld, 1997; Saxenian, 1994), transferring knowledge (Cantu, 2010) and facilitate learning (Asheim, 1996). Another essential benefit from close locations is to remove physical constraints to foster productivity growth (Porter, 1998b). Prior research has also shown that physical proximity promotes the sharing of information (Sternberg, 1999; Uzzi, 1997), and facilitates the spread of ideas and innovation (Breschi and Lissoni, 2001; Scheel, 2002). Peer businesses within closer proximity are less focused on direct competition (McEvily and Zaheer, 1999), and tend to adopt innovations faster from one another than from those located farther away (D'Aunno *et al.*, 2000; Rao *et al.*, 2000).

Business network based on digital referral

Digital marketing has dramatically reduced the cost of the information exchange and reshaped the way that companies manage inter-organizational communications (Hofacker *et al.*, 2016; Kannan and Li, 2017). Because of this, businesses need to maintain both traditional business contacts and virtual connections through the web (Obal and Lancioni, 2013; Park, 2003). By adding other businesses' information in own digital content, businesses can overtly exhibit their business connections (Park, 2003). As such, inter-connected businesses come together into a virtual business network (Park, 2003; Park and Thelwall, 2003).

In general, digital referrals can represent friendships, memberships and business connections that provide a "public display of connection" (Donath and Boyd, 2004). Acquiring digital referrals displayed by other businesses allows a business to exhibit business relationships regardless of geographical locale or similar limiting factors (Park, 2003). At the micro-level, prior studies described various positive outcomes for taking part in digital business networks (Vaughan, 2004; Vaughan and Wu, 2004; Vaughan and You, 2006; Ying *et al.*, 2016). For example, a strong correlation between company revenue and the number of hyperlinks the company's website attracted was exhibited in both the USA and China, although the hyperlinked network structure was significantly different across the two countries (Vaughan, 2004). More recent studies confirmed the strong association between a company's financial performance and the total number of digital referral hyperlinks on the World Wide Web and reiterated that digital referrals given to a company can ultimately contribute to its financial bottom line (Vaughan and Yang, 2013). It has become more apparent for businesses that building digital business networks can increase referral traffic, and by having a higher volume of referral traffic into their digital platforms, it is financially rewarding to these businesses.

In addition, previous research described social behaviors in the use of digital hyperlinks (Bakker and Hellsten, 2013; Elgin, 2015; Kim, 2012; Neal, 2014; Shumate and Dewitt, 2008),

especially on how digital business networks are organized to achieve strategic objectives (Ennew *et al.*, 2005; Raisi *et al.*, 2018; Vaughan, 2004; Ying *et al.*, 2016). Given the direct monetary cost of displaying digital referrals in digital content is next to zero and there is an infinite number of names that a business may choose to give a referral for, decisions on digital referrals are rather strategic than random (Jackson, 1997). The referring action could incur other potential costs. For example, digital referral displayed for another business with a negative brand image could dilute the brand image of the referrer. In addition, content browsers may drift away via the referral hyperlinks to other businesses and cause a reduction of content marketing effectiveness. Thus, the decisions on digital referrals are worth further caution. As digital referrals between peer businesses have not been closely studied, we articulate how referral-based digital business networks are presented by peer businesses across regions.

Hypotheses development

To describe a realistic scenario of the business network, we use the traditional wineries sector as the scope of our study. Based on the California winery sector, Porter (1998a) considered wineries an exemplary sector for describing a regional business cluster. Later, studies also used wineries as the scope in the study of inter-organizational coopetition (Dana *et al.*, 2013; Volschenk *et al.*, 2016). Extending this stream of research to the digital space, we use theories related to coopetition to explain digital referrals offered for other wineries (i.e. cooperation activities) while remaining the position of peer businesses in the marketplace (i.e. competition focus). Our study investigates the pattern of digital business networks constructed by referrals between wineries (*peer-to-peer digital network*), as well as those constructed between wineries and related industries (*augmented digital network*).

Stakeholder perspective of digital coopetition

Many external stakeholders encourage businesses to engage in coopetition activities (Bengtsson and Raza-Ullah, 2016). For example, Wang and Krakover (2008) found that hospitality businesses cooperate in regional destination marketing campaigns while competing in customer acquisition, showing a pattern of coopetition within the business sector. Wang and Krakover (2008) further explained that although the peer hospitality businesses have to constantly battle with each other for retaining desired market share, they must work together to market for the region to attract more visitors to the region.

The behavior can be explained by *stakeholder theory*, which states that to achieve better performance outcomes, firms tend to focus on improving the social and economic welfare of all the stakeholders (Freeman *et al.*, 2010). In Wang and Krakover's (2008) context above, the region or the business cluster act as a public stakeholder whose reputation needs to be built through the collective efforts of the hospitality businesses. Enhanced reputation of the public stakeholder perceived by other stakeholders (e.g. customers, suppliers and media) resulting from the cooperative initiatives can lead to a better financial return for the participating peer businesses in the region (Volschenk *et al.*, 2016).

This stakeholder perspective is especially important in the digital environment because online information must be trustworthy or a firm's reputation will be damaged in the eyes of various stakeholders (Shankar *et al.*, 2002). Thus, we argue that giving digital referrals for other wineries in the same region may help a winery achieve a number of strategic marketing purposes:

- demonstrating locality and authenticity associated with the region to prospects and visitors;

- exposing a reputable image to browsers, visitors, buyers and suppliers by showing well-established business relationships with peers and a connected regional business community;
- gaining trust by verifying its own content marketing information such as product categories, flavors, ingredients and prices, with similar content published by peers; and
- encouraging other wineries to return digital referrals for reciprocity, so that the reversed referrals can be used to further demonstrate its own trueness and gain trust from various stakeholders.

Despite direct competition in the regional marketplace, giving digital referrals for peers in the same region is strategically beneficial to a winery business. These benefits cannot be easily actualized by referring to the digital content of wineries in other regions. We suggest that wineries frame their region as an important external stakeholder, and perceive digital referrals as a cooperative initiative in the competitive regional market. Therefore, we propose:

> *H1.* Businesses are more likely to give digital referrals for peers belonging to the same geographical region than for those outside the region.

Resource utilization perspective of digital coopetition
Wineries belonging to the same geographical region may spread out in different physical locations. Co-located businesses tend to engage in more collaborative activities with each other (Felzensztein *et al.*, 2018). Besides coopetition activities that can improve the image of the entire region or business cluster, businesses often seek to strengthen their own competitive position by collaborating with competitors (Ritala *et al.*, 2014). This behavior in business-to-business coopetition can be explained by *resource based view*, which argues that a firm can improve its competitive position by gaining access to competitors' resources and market, as well as engaging in collaborative activities with competitors (Bengtsson *et al.*, 2016).

By giving digital referrals for co-located peers, a winery can gain access to these peer wineries' customers, supply chain and marketing resources. It takes the following approaches:

- Displaying a close-by winery's name and unique information on a referral hyperlink will increase the likelihood that its own digital content appears in keyword-based and location-based online search results, leading to greater exposure to potential customers;
- When a better-known nearby winery's buyers and suppliers see the referral, they can easily assess new business opportunities because of distance-based supply chain optimization and the economy of scale; and
- Including a neighboring winery's destination marketing campaign in a referral, the hyperlink is essentially an action to internalize the campaign as its own, for the benefit of attracting physical traffic with little marketing cost.

Furthermore, beyond one party's resource utilization efforts, collaborated activities by co-located wineries in displaying digital referrals for each other will help them pursue joint

utilization of complementary resources, and will improve the efficiency of the supply chain and marketing campaigns for all the collaborators within close proximity.

Consequently, the resource based view leads us to think that businesses are more likely to give digital referrals for peers who are physically closer. Traditionally, businesses collaborating with peers within a short physical distance are more capable of gaining competitive advantage rapidly (Porter, 1990, 1998b). In the digital space, a business' competitive position can be strengthened by using the competitive position and resources of nearby peers, all through one-way or two-way digital referrals. For wineries close by to one another, they can tremendously benefit in market expansion and cost reduction because of referral activities' resource sharing impact. Thus, we propose that:

H2. Within a geographical region, businesses are more likely to give digital referrals for peers that are in closer proximity.

Inter-organizational learning perspective of digital coopetition

Inter-organizational learning theory maintains that firms can achieve better learning outcomes by learning from peers who produce the same product, use a similar business model and serve a common customer base (Moingeon and Edmondson, 1996). In addition, when these peer businesses encounter similar problems, it is easier for them to learn from each other because of similar context and dominant logic in problem solving (Dussauge *et al.*, 2000).

In a coopetition context, peer businesses commonly provide each other with substantial learning opportunities (Ritala and Hurmelinna-Laukkanen, 2009). A salient motive to join a peer business network is to obtain new knowledge (Fredrich *et al.*, 2019). Co-located peer businesses can easily understand and apply their competitors' knowledge and experience because their customer base, market condition, business environment and challenges are extremely similar (Fredrich *et al.*, 2019). Close proximity facilitates the spread of innovative ideas (Scheel, 2002) and promotes information sharing (Sternberg, 1999). Compared with those located in the large distance from each other, peer businesses located close-by tend to learn from each other better and faster (Dussauge *et al.*, 2000; Rao *et al.*, 2000).

Interdependent companies in the winery sector (e.g. wineries and their suppliers of grapes, barrels and labels) may use the local business network more effectively not only by obtaining useful information from it but also because of creating synchronized business operations (Pouder and St. John, 1996; Sternberg, 1999). Wineries are likely to give digital referrals for non-peer organizations (e.g. suppliers, restaurants, hotels and interest groups) in their digital content to reach the following strategic marketing objectives:

- directly supporting their wine sales such as referring to liquor stores and restaurants that stock their wines;
- indirectly supporting their sales such as referring to local accommodations, attractions and tourism agencies to facilitate wine tours;
- generating customer awareness through social networking platforms such as Youtube, Facebook, Instagram or Twitter; and
- featuring high-status members in the supply chain, such as organic grape suppliers.

At the organization level, coopetition activities are dyadic (Bengtsson and Raza-Ullah, 2016; Dorn *et al.*, 2016). In light of inter-organizational learning theory, if a winery is better off in performance or better recognized in the local community, it prompts another nearby winery

to follow the good practices (Bengtsson and Raza-Ullah, 2016; Czakon and Czernek, 2016; Mariani, 2016). Thus, digital referrals displayed by a better-off winery for all the third-party non-peer organizations and social media pages tend to be adopted by its close-by peers who aim at serving an overlapping market.

For example, a winery gives digital referrals for local liquor stores and restaurants in the hope to increase the awareness of these local businesses, promote wine sales through these outlets and attract more visitors. If another nearby winery has the same digital scheme and eventually wants to achieve the same benefits through its digital referrals, it is likely that dyadic inter-organizational learning will take place. The second winery will quickly learn to give digital referrals for the same set of local businesses when it observes the first winery's content marketing initiatives. When these two wineries largely display the same sets of referrals for local restaurants, liquor stores and accommodations in their digital content, they demonstrate an identical pattern in displaying digital referrals for third-party businesses and social media groups. If two businesses select a set of common referrals to display in their digital content, they establish strategic similarity to each other (Campbell *et al.*, 2010; Marcel *et al.*, 2011; Saxton, 1997; Villadsen, 2013). Through inter-organizational learning, digital referrals used by one winery for all the third-party organizations and social media pages tend to be spread out to all nearby wineries because of short physical distance. The closer they are located to each other, the greater such strategic similarity tends to be seen. Thus, we propose that:

H3. Within a geographical region, peer businesses in closer proximity are more likely to exhibit similar digital referring strategy.

Our theoretical reasoning in hypotheses development is summarized in Table I.

Methodology
Data collection
To empirically test our proposed hypotheses, we used a digital data set collected from the Canadian winery sector, a traditional yet growing industry. Besides the winery sector has been a recommended scope in the study of coopetition relationships in a regional business cluster setting (Porter, 1998a; Volschenk *et al.*, 2016), the data set was chosen for several other reasons. Compared to other industries such as high-tech firms, a long and stable life cycle, the substitutive nature of products, and interdependence to other local businesses make wineries a favorable industry sector suited for our research question. In addition, the modest number of existing wineries and comparable sizes of wineries to each other help to control large industry variances. To generate usable data that fit our research question, we began with a complete list of officially registered winery businesses in each Canadian province and sought their public digital content within their entire digital domain. A total of 487 Canadian wineries with functioning digital content were used to construct the digital data set for hypotheses testing.

Terminologies
To construct digital business networks based on digital referrals, we extracted referral hyperlinks in all the content pages associated with every winery's digital content. Using the extracted referral hyperlinks, we outlined two networks, namely, *peer-to-peer digital network* and *augmented digital network*.

The *peer-to-peer digital network* (or *peer-to-peer network* for parsimonious purpose thereafter) is the digital referral chains formed up through businesses displaying digital

Hypotheses	Level of coopetition	Digital network scope	Theoretical paradigm	Theoretical explanation	Value creation by digital referral
H1	Geographical region	Peer-to-peer digital network	Stakeholder theory	Peer businesses use digital referral for each other to satisfy a broad range of public and private stakeholders	Demonstrate locality and authenticity; exhibit connected regional business community; verify content marketing information; and encourage reciprocity in referring
H2	Physical location	Peer-to-peer digital network	Resource based view	Co-located peer businesses take advantage of each other's resources to improve competitive position	Optimize keyword-based and location-based online search results; improve distance-based supply chain and economy of scale; reduce marketing campaign cost; and induce joint utilization of resources
H3	Physical location	Augmented digital network	Inter-organizational learning theory	Co-located peer businesses better learn from each other in the overlapping marketplace	Promote interdependent third-party businesses; create social media awareness; and support sales and marketing communications

Table I.
Summary of hypotheses development using theories related to coopetition

referrals for their peers. As a peer in the current study is a winery, the peer-to-peer network is the winery-to-winery digital network. A winery participates in a *peer-to-peer network* by either displaying a digital referral for another winery or having received a referral from another winery. For example, if Bella Winery gives a referral for Beaumont Winery in its Facebook content, both Bella and Beaumont appear in a *peer-to-peer* network, regardless of whether Beaumont gives referral for Bella.

The *augmented digital network* (or *augmented network* for parsimonious purpose thereafter) is the digital referral chains created through business displaying digital referrals for all other non-peer organizations. It reflects an augmented business network that includes, but is not limited to, local businesses (e.g. restaurants and accommodations), tourist agents, wine associations, social media profiles and blogs. Different from the *peer-to-peer network* that represents how wineries establish digital connections with each other, the *augmented network* represents how wineries establish digital connections with all other types of businesses in the digital space.

Measures

Six measures were used to describe digital network structures (Diestel, 2005). Digital referral, edge distance and cluster distance were used for hypotheses testing, while in-degree centrality, out-degree centrality and total-degree centrality were used for descriptive analysis only.

Digital referral: Digital referral is a binary variable (i.e. yes vs no) that indicates if there is a direct linkage from one business' digital domain to another one's, enabled by one or more activated referral hyperlinks.

Edge distance: Edge distance is the physical distance between two businesses connected by a digital referral. If a digital referral exists between wineries A and B, the edge distance between A and B is the physical distance between them.

Cluster distance: Cluster distance is the average physical distance between any two businesses located in a defined region (i.e. a Canadian province in this study). For example, if wineries A, B and C are three wineries in the province of British Columbia, the cluster distance for these three businesses is the average physical distance between A and B, between A and C and between B and C.

In-degree centrality: In-degree centrality of a business is a count of how many digital referrals it receives from other businesses. In other words, it is the number of other entities that display digital referrals for a business. In-degree centrality may reflect how influential business is in the digital network. In-degree centrality = $D_{in}(i) = \sum_{j=1}^{n} x_{ji}$ where i is the actor and $x_{ji} =$ the value of the tie from actor j to i (the value being either 0 or 1); n = total number of actors in the digital network (Prell, 2012; Wasserman and Faust, 1994).

Out-degree centrality: Out-degree centrality of a business is a count of how many digital referrals it gives for other businesses. For a winery, it is the number of other wineries that receive referrals. Out-degree centrality = $D_{out}(i) = \sum_{j=1}^{n} x_{ij}$ where i is the actor and $x_{ij} =$ the value of the tie from actor i to j (the value is either 0 or 1); n = total number of actors in the network (Prell, 2012; Wasserman and Faust, 1994).

Total degree centrality: The total degree centrality of a business is the total count of peer-to-peer referrals inbound to and outbound from a business' digital domain. Total degree centrality is a combination of how many wineries it receives a referral from (i.e. *in-degree centrality*) and how many wineries it offers referral for (i.e. *out-degree centrality*) in the digital network. As the sum of its in-degree and out-degree centrality, total degree centrality = $\sum_{j=1}^{n} x_{ji} + \sum_{j=1}^{n} x_{ij}$ (Prell, 2012; Wasserman and Faust, 1994). Thus, the total degree

centrality may reflect how active a winery is regarding its digital coopetition in the digital network.

Result
To describe the pattern of digital business networks comprising peer-to-peer referrals, we test three hypotheses using the digital data set from the Canadian winery industry. We use provinces as a proxy for geographical regions. Specifically, we use the *peer-to-peer network* to test *H1* and *H2* and the *augmented network* to test *H3*.

Descriptive statistics
Given the geographical landscape of Canada, the majority of wineries (453 out of 487; 93 per cent) are located in 3 provinces: British Columbia (192), Ontario (185) and Quebec (76), while other 7 provinces account for the remainder (total 34; 7 per cent). Wineries that either do not display a digital referral for other wineries or are not given any digital referral by other wineries are excluded from the peer-to-peer digital network. Among the 10 provinces, 4 do not present any winery participating in a *peer-to-peer network*. The 6 provinces with participants are British Columbia (BC), Ontario (ON), Quebec (QC), Nova Scotia (NS), New Brunswick (NB) and Saskatchewan (SK). British Columbia and Ontario, as 2 major players in the Canadian winery industry, have similar *peer-to-peer network* participation rate (34 and 38 per cent), whereas Quebec lags (18 per cent). In addition, Nova Scotia and New Brunswick have fewer wineries but are more digitally connected (92 and 90 per cent) in the *peer-to-peer network* than the three larger provinces. The dispersion of wineries in Canada and the peer-to-peer network characteristics are summarized in Table II.

To provide a visual illustration, we graphed the structure of the *peer-to-peer network* by province in Figure 1, with each province featured in a different color. The degree centrality measures of the peer-to-peer digital network members are summarized in Table III.

Hypotheses testing
The structure of the peer-to-peer network shows that within the 196 peer-to-peer digital referrals displayed in the digital space (Table II), only 2 of them are cross-province referrals (Figure 1). One is an Ontario winery giving a digital referral for a winery in British Columbia, and the other is a Saskatchewan winery displaying digital referral for a winery in Nova Scotia. The chi-square (χ^2) test result (2 vs 194, $\chi^2(1) = 188.08$, $p < 0.001$) indicates

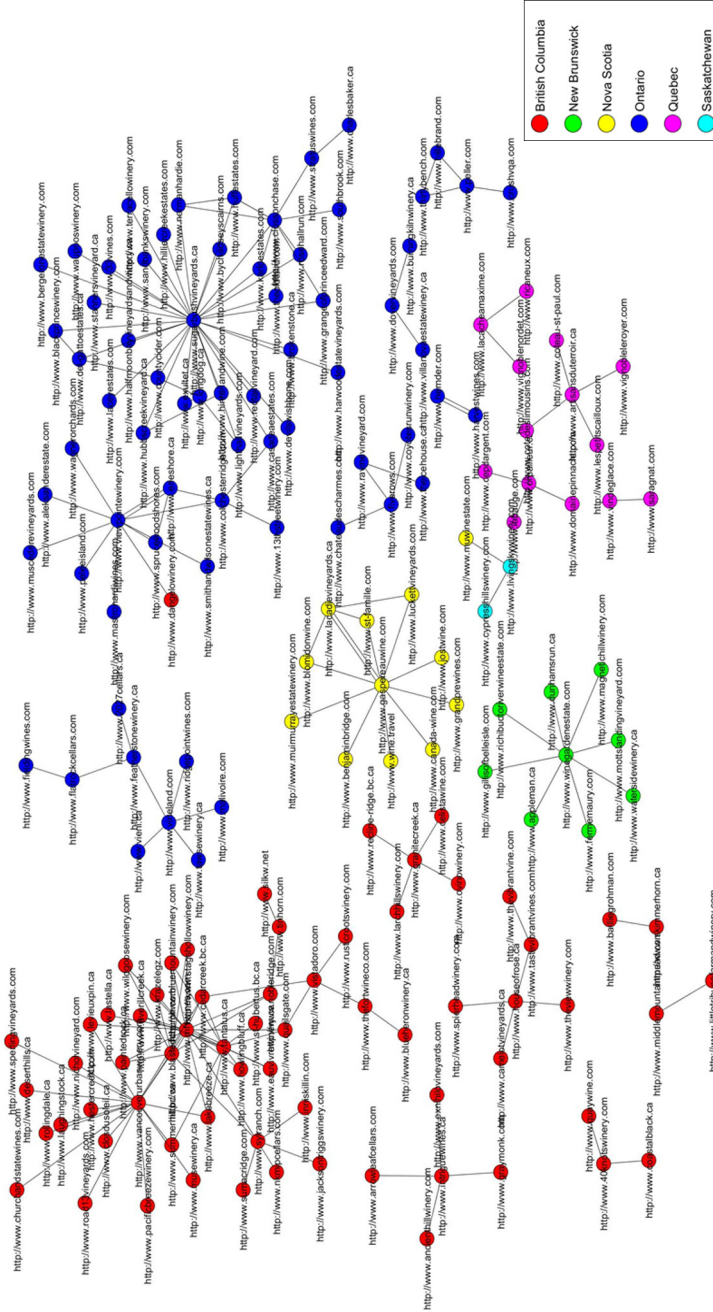| Province	Wineries	Wineries in digital network	No. of digital referrals	Digital network participation rate (%)
British Columbia	192	66	80	34
Ontario	185	70	82	38
Quebec	76	14	10	18
Nova Scotia	13	12	14	92
New Brunswick	10	9	8	90
Saskatchewan	2	2	2	100
Alberta	2	0	0	0
Manitoba	1	0	0	0
Newfoundland and Labrador	3	0	0	0
Prince Edward Island	3	0	0	0
Total	*487*	*173*	*196*	

Table II.
Peer-to-peer digital network characteristics by province

Note: Wineries with larger number of referring relationships are placed toward the center of their network

that the wineries are more likely to display digital referrals for peers in the same province than for those outside their province. The result offers support for *H1*.

A summary of peer-to-peer digital referrals in a province-by-province matrix is provided in Table IV. To verify the result, we ran additional tests for each province. For wineries located in British Columbia, it is expected by *H1* that the number of digital referrals between wineries in British Columbia is significantly higher than the number of referrals between wineries in British Columbia and wineries in other provinces. The percentage of referrals within British Columbia is significantly higher than that outside of British Columbia (98.85 per cent > 1.25 per cent, χ^2 (1) = 76.05, $p < 0.001$). Similar results were found for Ontario (97.78 per cent > 1.22 per cent, χ^2 (1) = 78.05, $p < 0.001$). Quebec and Nova Scotia wineries are only referred by wineries in the same province. The sample size of Saskatchewan and New Brunswick was too small for a meaningful statistical analysis. Analysis at the province level confirms that wineries are more likely to establish digital connections with peers in the same province. Thus, *H1* is again supported.

In *H2*, it is hypothesized that businesses within a geographical region are more likely to give digital referrals for peers that are in closer proximity. In other words, the physical distance between two wineries in a digital referring relationship is expected to be shorter compared to the average distance between all wineries. After recording the wineries' geographical locations, we transformed the latitude and longitude data for each winery in the digital data set. We then used the data to precisely measure the physical distance between the wineries. We calculated the two physical distance measures in the peer-to-peer network: *edge distance* and *cluster distance*. In each province, we compared the average distance between each pair of wineries to the average distance between each pair of wineries that are tied together with a digital referring relationship. We tested the difference between the two distance measures in the three large provinces (Table V). The number of wineries in the remaining seven provinces is too small for statistical analysis. The statistical results for the three provinces show that the distance between wineries with a referring relationship is much smaller than the average distance between wineries. Therefore, *H2* is supported.

Degree centrality	Maximum	Minimum	Mean
Out-degree centrality	30	0	1.13
In-degree centrality	4	0	1.13
Total degree centrality	30	1	2.26

Note: *n = 173

Table III.
Degree centrality measures of peer-to-peer digital network members*

Province	*Province* British Columbia	Ontario	Quebec	New Brunswick	Nova Scotia	Saskatchewan	Total
British Columbia	79 (98.85%)	1 (1.25%)					80
Ontario	1 (1.22%)	81 (97.78%)					82
Quebec			10 (100%)				10
New Brunswick				8 (100%)			8
Nova Scotia					14 (100%)		14
Saskatchewan					1 (50%)	1 (50%)	2

Table IV.
Province-by-province matrix for peer-to-peer digital referrals

The digital textual data of the augmented network was used to test *H3*. We first outlined the augmented digital network by extracting outbound referrals from all the content pages associated with every winery's digital domain. These outbound referrals are not constrained to peer wineries. They include referrals for all other non-peer organizations and groups. Out of the 487 wineries, 478 (98 per cent) display digital referrals for non-peer, third-party organizations. The total number of digital referrals extracted from the 478 wineries' digital content is 7,958. The number of digital referrals displayed in the wineries' digital content in each of the nine provinces is as follows: 3,750 in British Columbia, 3,327 in Ontario, 541 in Quebec, 125 in Nova Scotia, 90 in New Brunswick, 83 in Alberta, 20 in Newfoundland and Labrador, 14 in Saskatchewan and 8 in Prince Edward Island. The only winery in Manitoba is excluded in the augmented digital network because it does not display any referral in its digital content. To illustrate the topology of the augmented digital network, we present the augmented digital networks for British Columbia (BC), Ontario (ON) and Quebec (QC) in Figure 2.

In *H3*, it is proposed that businesses are more likely to exhibit strategic similarity in displaying digital referrals for peers who are in closer proximity. It is expected that wineries physically closer to each other are more likely to display a larger set of shared outbound referrals. To test *H3*, we first constructed network structures based on the bipartite network projection method. Bipartite network projection is a mathematical graph composed of two distinct sets of actors (Wasserman and Faust, 1994). In this study, wineries are in one set and all other types of businesses are in the other set. Having successfully modeled academic collaboration (Newman and Park, 2003), corporate elite network (Davis *et al.*, 2003), food and flavor pairings (Ahn *et al.*, 2011), actor-networks through movies (Watts and Strogatz, 1998) and political alliances (Neal, 2014), bipartite network projection method can clearly describe the augmented digital network structure in this study.

We created multiple bipartite networks based on the number of shared outbound referrals between wineries in the augmented network. We used k to represent the number of shared outbound referrals between wineries. In general, if two wineries have k number of shared outbound referrals in their digital content (i.e. have k number of identical organizations that the referrals are given for), they will both be included in the k projection graph network and an edge will be drawn between them. The larger the value of k, the more shared outbound referrals any two wineries must have to be in the k projection network.

As an example for Canadian wineries in our research context, as both Creek Side Winery and 13th Street Winery link to a Facebook profile, both wineries are included in a $k = 1$ projection network. In this network, an edge is drawn between Creek Side Winery and 13-th Street Winery. In addition, these two wineries also link to the Niagara wine festival website. When they share two common externals, they are both included in a $k = 2$ projection network. In total, Creek Side Winery and 13th Street Winery share 8 common referrals, and thus, they are both included in $k = 1$-8 projection networks.

	Province	# of wineries in the province	# of referrals within the province	Average distance in km Between any two wineries in the province	Between any two wineries with digital referring relationship	t-test
Table V. Comparison of average cluster distance and edge distance	British Columbia	66	79	167.10	81.74	$t = 6.77\ p < 0.001$
	Ontario	70	81	197.74	41.65	$t = 12.76\ p < 0.001$
	Quebec	14	10	100.39	24.67	$t = 6.80\ p < 0.001$
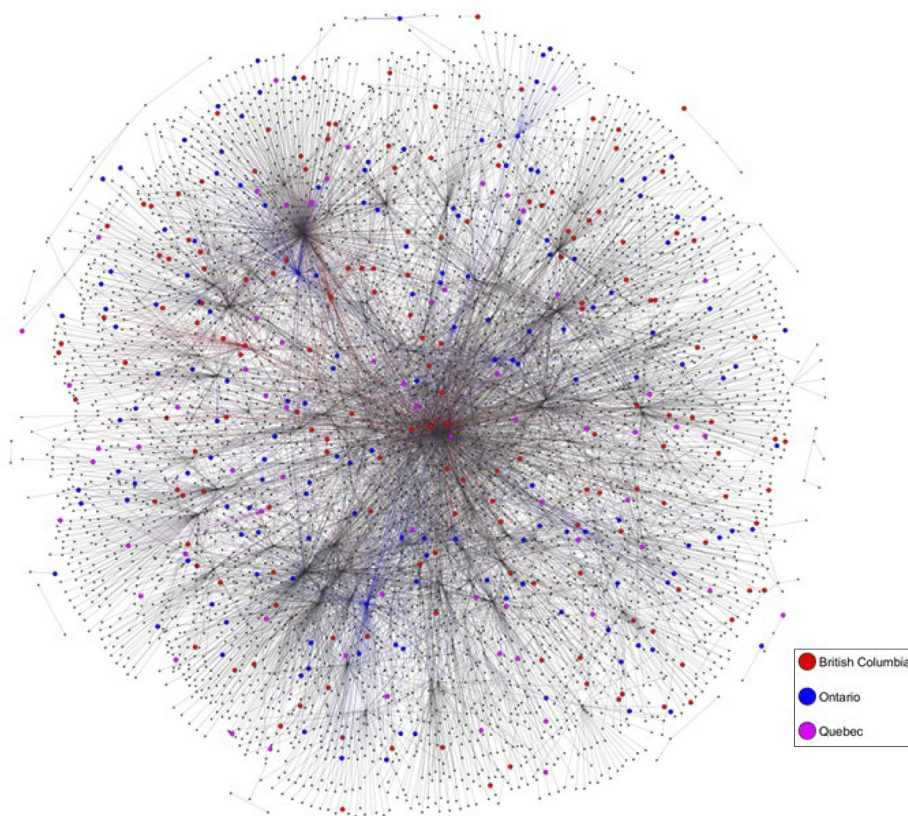
Notes: The colored nodes are wineries in the three provinces. The black nodes are non-winery
domain names. Wineries displaying larger number of referrals are placed toward the center of
the graph

Figure 2.
Augmented digital
network in three
provinces

Using the bipartite network projection method, we analyzed 20 different bipartite networks
where k takes the value from 1 to 20. In other words, based on the number of shared
outbound referrals (i.e. k-value), wineries are grouped into 20 bipartite networks. In
Table VI, when the number of shared outbound referrals increases, the physical distance
among the wineries decreases. For example, the average distance between any two wineries
sharing 1 common outbound referrals is 1,836.58 km, while the distance drops to 9 km if
they share 20 common outbound referrals.

   A linear regression is performed using *edge distance* in kilometers as a dependent
variable and the number of shared outbound referrals (i.e. k-value) between any two
wineries in bipartite projection networks as an independent variable. In Table VII, a
significant negative relationship is found between the number of shared outbound referrals
and their edge distance. In support of *H3*, the significant negative coefficient shows that
when two wineries are physically closer to each other, they demonstrate greater strategic
similarity by displaying a larger set of shared outbound referrals.

Discussion

As the use of digital platforms becomes pervasive for managing and maintaining business-to-business relationships, digital marketing has been widely implemented by businesses as a powerful tool for interacting with suppliers, customers and partners. Digital business networks built around peer businesses are also growing at a fast pace (Raisi *et al.*, 2018; Vaughan, 2004; Ying *et al.*, 2016), but this rapid growth has not been matched by previous research. The current research is among early attempts in examining business-to-business digital referrals and analyzing the patterns of digital business networks. Based on theories related to coopetition, we revealed how digital referrals are strategically used among peer businesses in the digital space, taking into consideration the geographical position and physical proximity.

The results from the *peer-to-peer digital network* indicate that businesses tend to use digital referrals to pursue digital coopetition with their peers in the same geographical region, more so than with outside members. It implies that peer businesses residing in a traditional, geographically-based business cluster tend to connect in the digital space by giving referrals to each other. Businesses within a geographical region can benefit from forming up regional alliances in the digital space, verifying the importance of geographical framing emphasized by stakeholder theory. The bond developed by referring each other in the digital space mirrors the traditional coopetition relationship in business clusters (Della Corte and Aria, 2016; Felzensztein *et al.*, 2018). Our findings further demonstrate that close proximity between two peer businesses can tremendously induce additional perceived benefits of a reciprocated relationship because of better resource utilization (Table I). In turn, such perception cultivates the formation of actual business relationships through digital referrals. Specifically, businesses (e.g. wineries) located close by to each other are more likely

No. of shared outbound referrals (k-value)	Average edge distance	No. of shared outbound referrals (k-value)	Average edge distance
1	1,836.58	11	234.65
2	1,859.98	12	188.29
3	1,765.86	13	104.50
4	1,514.26	14	444.36
5	1,141.88	15	92.00
6	810.06	16	81.57
7	750.32	17	4.80
8	407.57	18	44.50
9	335.33	19	325.00
10	544.40	20	9.00

Table VI.
Number of shared outbound referrals and average edge distance

Independent variable	Coefficients	Std. error	t	Sig
Constant	1,023.980	165.424	6.190	0.000
Number of shared outbound referrals	−29.198	7.780	−3.753	0.001
Note: Dependent variable is edge distance measured in km				

Table VII.
Linear regression results

to include other competing business' links in their own digital content, ultimately creating a location-centered digital business network.

Our findings on the *augmented digital network* inform us that closer physical distance between peer businesses induces similar digital referring strategies as reflected by similar patterns of digital referrals. Based on inter-organizational learning theory, we reveal that when two peer businesses are closer to each other, they are more likely to encode a similar set of referrals in their digital content. Our findings imply that the physical location of a business influences not only the connections in its business network but also the formation of its digital marketing strategy for coopetition reasons. Through learning from co-located peers, businesses tend to benefit from using similar digital referring strategy. Their digital content tends to display referrals for a common set of players, including suppliers, distributors, retailers, complementers and the various social media profiles. Allowing each other to collaborate on promoting a common set of interdependent organizations can eventually lead to positive outcomes for all in the digital space.

Digital marketing managers usually aim to stand out from their peers by differentiating the digital content. However, our findings clearly show that businesses tend to adopt similar digital referring strategies to their close-by peers'. When crafting their differentiation strategy, digital marketing managers should understand how similar digital referring strategy enables the creation of exceptional value in the marketplace, and carefully consider learning from nearby peers. A differentiated referral strategy may not help a business to set itself apart from nearby peer businesses. This is a compelling reason for why secluded digital content and the decisions to isolate itself from peer' digital campaigns would be divisive. Business-to-business relationship outcomes through digital marketing rest firmly with a business' ability to hyperlink its own digital content with that of peers.

Information dissemination through digital marketing increases the organic traffic for peer businesses in a digital business network, and thus, can advance the competitive advantage of the business network. Benevolent referring behavior can promote peer businesses to return the favor of referring. This mutually beneficial digital marketing practice extends the previous paradigms of Porter's (1990, 1998b) cluster theory and competitive advantage theory to the digital space. Revealing the pattern of digital business networks built on digital referrals can also help businesses better understand a new level of business-to-business coopetition. Thoroughly understanding this practice helps a business build their digital connectedness with its peers, and extend strategic alliances into the digital space.

Our findings not only offer rich and broad managerial knowledge for business practitioners but also provide pertinent insights for policymakers and economic development officers. This study presents a holistic map of digital business networks. Policymakers and economic development officers can easily identify weak links in the digital network and offer support to those businesses most in need of digitalization. Furthermore, this study offers a forward-thinking category of business relationships in the digital space beyond geographically-based patterns in the past. By observing a digital business network and the interactions from within business consultants and economists are able to better identify the trends in digital coopetition among the businesses, and thus, provide clear guidance for growth and development initiatives.

Limitation and future research recommendations
As with all research, our study is not without limitations. Although this study reveals a holistic pattern of digital business networks, we have not yet provided behavioral reasons for offering digital referrals for peers. We encourage future research to take a behavioral approach in investigating the underlying motives for a business to include or exclude peer

businesses in digital referring and other digital marketing efforts. Although we observed that businesses located closer to each other are more likely to form up digital connections, we cannot rule out the possibility that two businesses seek connections first in the digital space, then later realize they are located near each other. We recommend that further research consider this possibility and investigate the digital relationship formation using appropriate research methods such as time series.

This study only takes into consideration geographical framing and physical proximity in the understanding of how digital referrals are used by peer businesses. Although these factors make a strong impact, future research may incorporate non-spatial dimensions of proximity, such as social, institutional, cognitive and organizational proximities (Geldes *et al.*, 2017), to investigate if they influence the formation of digital business relationships by peer businesses.

Likewise, although digital referral is used as an indicator of business relationships, it neither signifies all other types of digital communications nor represents all the relationship touchpoints between businesses (Yi and Scholz, 2016). For example, whether peer businesses are more likely to "like" one another's Facebook pages, follow their Twitter accounts, and tag their posts would be an interesting field for future research efforts in digital marketing.

Although our industry-wise digital data set is advantageous in mapping the locations and connections of businesses, it does not contain any non-digital information of the wineries such as shareholder information or financial performance data. To further study what factors affect the position of a business in its digital business network, it is important to obtain additional data associated with their digital marketing practices such as marketing expenditure, marketing experience, learning capability and so on. Future research can also use additional data to identify what type of businesses is more likely to give out digital referrals and what type of businesses is more likely to receive digital referrals. With additional survey data or secondary data combined with the digital data used in this study, future research can better describe the antecedents, moderators and non-linear relationships in the examination of digital referring behavior.

This study focuses on the Canadian winery sector. Although the analysis of the industry-wise digital business network has yielded rich findings, the findings may not be directly applicable to certain industries, such as high-tech industries. The high-tech industries are distinctive from the traditional winery sector in many ways, including lower interdependence with the local community, stronger innovation focus and larger size and product variations, all of which mark a clear difference in the peer-to-peer business relationship. Thus, future research should examine the patterns of digital referrals in other industries, and possibly in other countries, to draw a complete conclusion.

As businesses continue to embrace new conducts of relationship building and expand relationships into new domains, knowledge about how business-to-business relationships are transformed into digital platforms will continue to expand. The demand for a clear understanding of the intertwining of traditional and digital business relationships motivates this study, and this research provides an initial stepping stone for future research.

References

Ahn, Y.Y., Ahnert, S.E., Bagrow, J.P. and Barabasi, A.L. (2011), "Flavor networks and the principles of food pairing", *Scientific Reports*, Vol. 1, p. 196.

Ansari, A., Koenigsberg, O. and Stahl, F. (2011), "Modeling multiple relationships in social networks", *Journal of Marketing Research*, Vol. 48, pp. 713-728.

Asheim, B. (1996), "Industrial districts as 'learning regions': a condition for prosperity", *European Planning Studies*, Vol. 4 No. 4, pp. 379-400.

Bakker, F.G.A. and Hellsten, I. (2013), "Capturing online presence: hyperlinks and semantic networks in activist group websites on corporate social responsibility", *Journal of Business Ethics*, Vol. 118 No. 4, pp. 807-823.

Bashara, R. (2018), "What is referral traffic in Google analytics?", Houston Chronicle, available at: https://smallbusiness.chron.com/referral-traffic-google-analytics-53168.html (accessed July 2018).

Bathelt, H. and Glückler, J. (2003), "Toward a relational economic geography", *Journal of Economic Geography*, Vol. 3 No. 2, pp. 117-144.

Becattini, G. (1990), "The Marshallian industrial district as a socio-economic notion", in Pyke, F. Becattini, G. and Sengenberger, W. (Eds), *Industrial Districts and Inter-Firm Co-Operation in Italy*, International Institute for Labour Studies, Geneva, pp. 37-51.

Bengtsson, M., Kock, S., Lundgren-Henriksson, E. and Nasholm, M.H. (2016), "Coopetition research in theory and practice: growing new theoretical, empirical, and methodological domains", *Industrial Marketing Management*, Vol. 57, pp. 4-11.

Bengtsson, M. and Raza-Ullah, T. (2016), "A systematic review of research on coopetition: toward a multilevel understanding", *Industrial Marketing Management*, Vol. 57, pp. 23-39.

Breschi, S. and Lissoni, F. (2001), "Knowledge spillovers and local innovation system: a critical survey", *Industrial and Corporate Change*, Vol. 10 No. 4, pp. 975-1005.

Bughin, J. and Zeebroeck, N.V. (2017), "New evidence for the power of digital platforms", McKinsey Quarterly, available at: www.mckinsey.com/business-functions/digital-mckinsey/our-insights/new-evidence-for-the-power-of-digital-platforms (accessed August 2017).

Campbell, C., Papania, L., Parent, M. and Cyr, D. (2010), "An exploratory study into brand alignment in B2B relationships", *Industrial Marketing Management*, Vol. 39 No. 5, pp. 712-720.

Cantu, C. (2010), "Exploring the role of spatial relationships to transform knowledge in a business idea: beyond a geographical proximity", *Industrial Marketing Management*, Vol. 39 No. 6, pp. 887-897.

Chakravarty, A., Kumar, A. and Grewal, R. (2014), "Customer orientation structure for internet-based business-to-business platform firms", *Journal of Marketing*, Vol. 78 No. 5, pp. 1-23.

Corsaro, D., Cantu, C. and Tunisini, A. (2012), "Actors' heterogeneity in innovation networks", *Industrial Marketing Management*, Vol. 41 No. 5, pp. 780-789.

Czakon, W. and Czernek, K. (2016), "The role of trust-building mechanisms in entering into network coopetition: the case of tourism networks in Poland", *Industrial Marketing Management*, Vol. 57, pp. 64-74.

D'Aunno, T., Succi, M. and Alexander, J.A. (2000), "The role of institutional and market forces in divergent organizational change", *Administrative Science Quarterly*, Vol. 45 No. 4, pp. 679-703.

Dana, L.P., Granata, J., Lasch, F. and Carnaby, A. (2013), "The evolution of co-opetition in the Waipara wine cluster of New Zealand", *Wine Economics and Policy*, Vol. 2 No. 1, pp. 42-49.

Davis, G.F., Yoo, M. and Baker, W.E. (2003), "The small world of the American corporate elite", *Strategic Organization*, Vol. 1 No. 3, pp. 301-326.

De Maggio, M., Gloor, P.A. and Passiante, G. (2009), "Collaborative innovation networks, virtual communities and geographical clustering", *International Journal of Innovation and Regional Development*, Vol. 1 No. 4, pp. 387-404.

Della Corte, V. and Aria, M. (2016), "Coopetition and sustainable competitive advantage: the case of tourist destinations", *Tourism Management*, Vol. 54, pp. 524-540.

Diestel, R. (2005), *Graph Theory*, Springer-Verlag, New York, NY.

Donath, J. and Boyd, D. (2004), "Public displays of connection", *BT Technology Journal*, Vol. 22 No. 4, pp. 71-82.

Dorn, S., Schweiger, B. and Albers, S. (2016), "Levels, phases and themes of coopetition: a systematic literature review and research agenda", *European Management Journal*, Vol. 34 No. 5, pp. 484-500.

Dussauge, P., Garrette, B. and Mitchell, W. (2000), "Learning from competing partners: outcomes and durations of scale and link alliances in Europe, North America and Asia", *Strategic Management Journal*, Vol. 21 No. 2, pp. 99-126.

Elgin, D.J. (2015), "Utilizing hyperlink network analysis to examine climate change supporters and opponents", *Review of Policy Research*, Vol. 32 No. 2, pp. 226-245.

Ennew, C., Lockett, A., Blackman, I. and Holland, C.P. (2005), "Competition in internet retail markets: the impact of links on web site traffic", *Long Range Planning*, Vol. 38 No. 4, pp. 359-372.

Fang, E., Lee, J., Palmatier, R. and Han, S. (2016), "If it takes a village to foster innovation, success depends on the neighbors: the effects of global and ego networks on new product launches", *Journal of Marketing Research*, Vol. 53 No. 3, pp. 319-337.

Felzensztein, C., Gimmon, E. and Deans, K.R. (2018), "Coopetition in regional clusters: keep calm and expect unexpected changes", *Industrial Marketing Management*, Vol. 69, pp. 116-124.

Ferreira, F.N., Proenca, J.F., Spencer, R. and Cova, B. (2013), "The transition from products to solutions: external business model fit and dynamics", *Industrial Marketing Management*, Vol. 42 No. 7, pp. 1093-1101.

Fredrich, V., Bouncken, R.B. and Kraus, S. (2019), "The race is on: configurations of absorptive capacity, interdependence and slack resources for interorganizational learning in coopetition alliances", *Journal of Business Research*, Vol. 101, pp. 862-868.

Freeman, R.E., Harrison, J.S., Wicks, A.C., Parmar, B.L. and De Colle, S. (2010), *Stakeholder Theory: The State of the Art*, Cambridge University Press, Cambridge.

Ganesan, S., Malter, A.J. and Rindfleisch, A. (2005), "Does distance still matter? Geographic proximity and new product development", *Journal of Marketing*, Vol. 69 No. 4, pp. 44-60.

Geldes, C., Heredia, J., Felzensztein, C. and Mora, M. (2017), "Proximity as determinant of business cooperation for technological and non-technological innovations: a study of an agribusiness cluster", *Journal of Business and Industrial Marketing*, Vol. 32 No. 1, pp. 167-178.

Google Analytics (2017), "Google analytics user guide", available at: www.google.com/grants/education/Google_Analytics_Training.pdf

Green, M.B. and McNaughton, R.B. (2000), *Industrial Networks and Proximity*, Ashgate, Aldershot.

Gulati, R. (1998), "Alliances and networks", *Strategic Management Journal*, Vol. 19 No. 4, pp. 293-317.

Harrison, B. (1994), *Lean and Mean: The Changing Landscape of Corporate Power in the Age of Flexibility*, Basic Books, New York, NY.

Hofacker, C.F., Ruyter, K., Lurie, N., Manchanda, P. and Donaldson, J. (2016), "Gamification and mobile marketing effectiveness", *Journal of Interactive Marketing*, Vol. 34 No. 1, pp. 25-36.

Ibrahim, S.E., Fallah, M.H. and Reilly, R.R. (2009), "Localized sources of knowledge and the effect of knowledge spillovers: an empirical study of inventors in the telecommunications industry", *Journal of Economic Geography*, Vol. 9 No. 3, pp. 405-431.

Jackson, M.H. (1997), "Assessing the structure of communication on the world wide web", *Journal of Computer-Mediated Communication*, Vol. 3 No. 1, p. 1.

Kannan, P.K. and Li, H.A. (2017), "Digital marketing: a framework, review and research agenda", *International Journal of Research in Marketing*, Vol. 34 No. 1, pp. 22-45.

Kim, J.H. (2012), "A hyperlink and semantic network analysis of the triple helix (university-government-industry): the interorganizational communication structure of nanotechnology", *Journal of Computer-Mediated Communication*, Vol. 17 No. 2, pp. 152-170.

Lindstrom, T. and Polsa, P. (2016), "Coopetition close to the customer – a case study of a small business network", *Industrial Marketing Management*, Vol. 53, pp. 207-215.

McEvily, B. and Zaheer, A. (1999), "Bridging ties: a source of firm heterogeneity in competitive capabilities", *Strategic Management Journal*, Vol. 20 No. 12, pp. 1133-1156.

Marcel, J.J., Barr, P.S. and Duhaime, I.M. (2011), "The influence of executive cognition on competitive dynamics", *Strategic Management Journal*, Vol. 32 No. 2, pp. 115-138.

Mariani, M.M. (2016), "Coordination in inter-network co-opetition: evidence from the tourism sector", *Industrial Marketing Management*, Vol. 53, pp. 103-123.

Martin, R. and Sunley, P. (2003), "Deconstructing clusters: chaotic concept or policy panacea?", *Journal of Economic Geography*, Vol. 3 No. 1, pp. 5-35.

Moingeon, B. and Edmondson, A. (1996), *Organizational Learning and Competitive Advantage*, Sage, London.

Neal, Z. (2014), "The backbone of bipartite projections: inferring relationships from co-authorship, co-sponsorship, co-attendance and other co-behaviors", *Social Networks*, Vol. 39 No. 1, pp. 84-97.

Newman, M. and Park, J. (2003), "Why social networks are different from other types of networks", *Physical Review E*, Vol. 68 No. 3, pp. 1-9.

Nicholson, J., Tsagdis, D. and Brennan, R. (2013), "The structuration of relational space: implications for firm and regional competitiveness", *Industrial Marketing Management*, Vol. 42, pp. 372-381.

Nicolla, C. and Teresa, D. (2016), "Young consumer-brand relationship building potential using digital marketing", *European Journal of Marketing*, Vol. 50 No. 11, pp. 1993-2017.

Obal, M. and Lancioni, R.A. (2013), "Maximizing buyer–supplier relationships in the digital era: concept and research agenda", *Industrial Marketing Management*, Vol. 42 No. 6, pp. 851-854.

Park, H.W. (2003), "Hyperlink network analysis: a new method for the study of social structure on the web", *Connections*, Vol. 25 No. 1, pp. 49-61.

Park, H.W. and Thelwall, M. (2003), "Hyperlink analyses of the world wide web: a review", *Journal of Computer-Mediated Communication*, Vol. 8 No. 4, pp. 1-30.

Porter, M.E. (1990), *The Competitive Advantage of Nations*, Free Press, New York, NY.

Porter, M.E. (1998a), "Clusters and the new economics of competition", *Harvard Business Review*, Vol. 76 No. 6, pp. 77-90.

Porter, M.E. (1998b), *On Competition*, Harvard Business Press, Boston, MA.

Porter, M.E. (1998c), "The Adam Smith address: location, clusters, and the 'new' microeconomics of competition", *Business Economics*, Vol. 33 No. 1, pp. 7-13.

Porter, M.E. (2000), "Location, competition and economic development: local clusters in a global economy", *Economic Development Quarterly*, Vol. 14 No. 1, pp. 15-34.

Pouder, R. and St. John, C. (1996), "Hot spots and blind spots: geographical clusters of firms and innovation", *Academy of Management Review*, Vol. 21 No. 4, pp. 1192-1225.

Prell, C. (2012), *Social Network Analysis: History, Theory and Methodology*, Sage, Los Angeles, CA.

Raisi, H., Baggio, R., Barratt-Pugh, L. and Willson, G. (2018), "Hyperlink network analysis of a tourism destination", *Journal of Travel Research*, Vol. 57 No. 5, pp. 671-686.

Rao, H., Davis, G.F. and Ward, A. (2000), "Embeddedness, social identity and mobility: why firms leave NASDAQ and join the New York stock exchange", *Administrative Science Quarterly*, Vol. 45 No. 2, pp. 268-292.

Ritala, P., Golnam, A. and Wegmann, A. (2014), "Coopetition-based business models: the case of Amazon.com", *Industrial Marketing Management*, Vol. 43 No. 2, pp. 236-249.

Ritala, P. and Hurmelinna-Laukkanen, P. (2009), "What's in it for me? Creating and appropriating value in innovation-related coopetition", *Technovation*, Vol. 29 No. 12, pp. 819-828.

Rosenfeld, S.A. (1997), "Bringing business clusters into the mainstream of economic development", *European Planning Studies*, Vol. 5 No. 1, pp. 3-23.

Saxenian, A. (1994), *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Harvard University Press, Cambridge, MA.

Saxton, T. (1997), "The effects of partner and relationship characteristics on alliance outcomes", *Academy of Management Journal*, Vol. 40 No. 2, pp. 443-461.

Scheel, C. (2002), "Knowledge clusters of technological innovation systems", *Journal of Knowledge Management*, Vol. 6 No. 4, pp. 356-367.

Shankar, V., Urban, G.L. and Sultan, F. (2002), "Online trust: a stakeholder perspective, concepts, implications, and future directions", *The Journal of Strategic Information Systems*, Vol. 11 Nos 3/4, pp. 325-344.

Shankavaram, V. (2016), *Travelling to the Future with Digital Platforms*, Capgemini, Bangaluru.

Shumate, M. and Dewitt, L. (2008), "The North/South divide in NGO hyperlink networks", *Journal of Computer-Mediated Communication*, Vol. 13 No. 2, pp. 405-428.

Stephen, A.T. and Toubia, O. (2010), "Deriving value from social commerce networks", *Journal of Marketing Research*, Vol. 47, pp. 215-228.

Sternberg, R. (1999), "Innovative linkages and proximity: empirical results from recent surveys of small and medium sized firms in German regions", *Regional Studies*, Vol. 33 No. 6, pp. 529-540.

Thornton, S.C., Henneberg, S.C. and Naude, P. (2015), "An empirical investigation of network-oriented behaviors in business-to-business markets", *Industrial Marketing Management*, Vol. 49 No. 1, pp. 167-180.

Uzzi, B. (1997), "Social structure and competition in interfirm networks: the paradox of embeddedness", *Administrative Science Quarterly*, Vol. 42 No. 1, pp. 35-67.

Van den Bulte, C. and Wuyts, S.H.K. (2007), *Social Networks in Marketing*, Marketing Science Institute, Cambridge MA.

Vaughan, L. (2004), "Web hyperlinks reflect business performance: a study of US and Chinese IT companies", *Canadian Journal of Information and Library Science*, Vol. 28 No. 1, pp. 17-31.

Vaughan, L. and Wu, G. (2004), "Links to commercial web sites as a source of business information", *Scientometrics*, Vol. 60 No. 3, pp. 487-496.

Vaughan, L. and Yang, R. (2013), "Web traffic and organization performance measures: relationships and data sources examined", *Journal of Informetrics*, Vol. 7 No. 3, pp. 699-711.

Vaughan, L. and You, J. (2006), "Comparing business competition positions based on web co-link data: the global market vs. the Chinese market", *Scientometrics*, Vol. 68 No. 3, pp. 611-628.

Villadsen, A.R. (2013), "Similarity or difference? The relation between structure and strategy isomorphism in public organizations", *British Journal of Management*, Vol. 24, pp. S62-S75.

Volschenk, J., Ungerer, M. and Smit, E. (2016), "Creation and appropriation of socio-environmental value in coopetition", *Industrial Marketing Management*, Vol. 57, pp. 109-118.

Waits, M.J. (1996), "State of cluster-based economic development in AZ", in Breault, R. (Ed.), *Global Networking of Regional Optics Clusters*, International Society for Optical Engineering, Denver, CO, pp. 1-10.

Wang, Y. and Krakover, S. (2008), "Destination marketing: competition, cooperation or coopetition?", *International Journal of Contemporary Hospitality Management*, Vol. 20 No. 2, pp. 126-141.

Wang, V.L., Lou, H., Wang, Y.J. and Guo, C. (2015), "Differences in organizational website design across cultures: a comparative study of US and Chinese industrial SMEs", *Asia Pacific Journal of Marketing and Logistics*, Vol. 27 No. 4, pp. 582-599.

Wang, W.L., Malthouse, E.C., Calder, B. and Uzunoglu, E. (2017), "B2B content marketing for professional services: in-person versus digital contacts", *Industrial Marketing Management*.

Wasserman, S. and Faust, K. (1994), *Social Network Analysis: Methods and Applications*, Cambridge University Press, Cambridge.

Watts, D.J. and Strogatz, S.H. (1998), "Collective dynamics of 'small-world' networks", *Nature*, Vol. 393, pp. 440-442.

Yi, H. and Scholz, J.T. (2016), "Policy networks in complex governance subsystems: observing and comparing hyperlink, media, and partnership networks", *Policy Studies Journal*, Vol. 44 No. 3, pp. 248-279.

Ying, T., Norman, W.C. and Zhou, Y. (2016), "Online networking in the tourism industry: a webometrics and hyperlink network analysis", *Journal of Travel Research*, Vol. 55 No. 1, pp. 16-33.

Further reading

Shumate, M. and Lipp, J. (2008), "Connective collective action online: an examination of the hyperlink network structure of an NGO issue network", *Journal of Computer-Mediated Communication*, Vol. 14 No. 1, pp. 178-201.

Corresponding author

Yong Jian Wang can be contacted at: ywang2@wcupa.edu