

Visual representation of knowledge networks: A social network analysis of hospitality research domain

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Abstract

Intellectual relationships and collaboration networks are the basis for the development of a knowledge domain. The visual representation of such “knowledge networks” contributes to the overall understanding of intellectual collaborations in a particular knowledge domain. Based on the co-authorship data from recent journal publications over a period of five years, the authors applied social network analysis to explore the network structures and identify their network properties in the hospitality research domain. The analysis revealed the core and peripheral networks where the power law distribution was observed on the pattern of publishing academic papers. The overall network was further examined by nine research streams in both “global” and “contextual” views to understand a broad variety of the collaboration patterns of hospitality researchers.

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Keywords: Co-authorship; Hospitality research; Knowledge domain; Knowledge networks; Social network analysis

1. Introduction

A knowledge domain is a particular field of study that creates a common ground and a sense of development of a common identity by affirming its purpose and value to members and stakeholders (Wenger et al., 2002). It is the main source of inspiration for the members to participate in and contribute to the field of study so that they make sense of their actions and initiatives. Furthermore, a knowledge domain is an evolving structure that involves the social process of interactions and collaborations among the members or participants (Galison, 1997). Similar to the concept of “*Ba*” (shared space for knowledge creation) by Nonaka and Konno (1998), the social structure of a knowledge domain consists of formal networks (e.g., academies or associations) and informal networks (e.g., work groups or task forces) that provide organizational members with a commonly shared platform to collaborate and advance collective knowledge. The extent of learning

and knowledge transfer within a particular domain depends on the quality of both formal and informal relationships among organizational members. Along with these relationships, the underlying social norms and values, and a shared meaning among the members are important for the success and advancement of a knowledge domain (Wenger, 1998).

Increased interests in knowledge management and collaborative networks of practice have resulted in techniques that provide mathematical and visual evidence of network development and evolution. Social network analysis (SNA) is one such diagnostic method for analyzing data about the patterns of collaboration within the social fabric that connects members in different groups. When applied to a particular domain, this analytical method allows one to identify interaction patterns among the network members, the number and structure of the sub-groups within the networks, and their organization and evolution (Anklam, 2003). A visual representation of such networks provides for a rich and ecological understanding of a knowledge domain. In this study, the authors used SNA to analyze the research collaboration networks within a particular academic group, the members of hospitality

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business research community. The study was in line with previous works by Galison (1997), Newman (2001b), and Barabási et al. (2002) who studied the networks of research collaborations in the context of other scientific domains. The structure of such networks reveals many interesting features of research communities. For the hospitality research community, this approach enables one to construct observable and visual measures of the available collaborative networks among academic researchers. These measures are useful for assessing the structure of network access and the formation of co-authorship networks and relationships. Visualizing the network structure of research communities provides unique advantage over conventional content-analytical methods (e.g., Jogaratnam et al., 2005; Rutherford and Samenfink, 1992; Weaver and McCleary, 1989; Weaver et al., 1990) or traditional citation studies (e.g., Howey et al., 1999; Woods and Schmidgall, 1995). Therefore, the research objectives of this study were threefold:

1. to analyze and map the networks of collaboration among the researchers in the field of hospitality business research;
2. to demonstrate the identification of key researchers by characterizing them as research hubs (i.e., structural holes in the collaboration network); and finally
3. to discuss the importance of collaboration and joint research by various research streams within the hospitality research domain.

2. Literature Review

2.1. The role of social networks in knowledge creation and sharing

Researchers have positioned social networks as a key factor in understanding the knowledge creation process (Carley, 1986; Lin, 2001; Tsai and Ghoshal, 1998). Hildreth and Kimble (2004) suggest that knowledge creation and social networks are inextricably linked, and that a positive relationship exists between the two. These networks represent not only the relationships among the members, but also the availability and exchange of knowledge resources within the network (Haythornthwaite, 1996). Prior research (Granovetter, 1985; Gulati, 1995) in organizational dynamics indicated that knowledge sharing requires social processes and interactions often because of the tacit nature of knowledge. Nonaka and Takeuchi (1995) further argued that a certain level of co-presence, social affinity, and socialization is required to allow effective sharing of knowledge that is difficult to codify. Hence, strong relationships, interactions, and dialogue among members are critical for supporting and sustaining a knowledge domain. The creation of knowledge is a social process involving interactions among individuals and organizations with different backgrounds, resources, predispositions, and insights. Such collaborative process by

which domain members interact, develop, and exchange new knowledge help shape the formal and informal networks that characterize a particular domain (McFadyen, 2003). In fact, social networks facilitate the knowledge creation process because they define members' "connectedness," which in turn directly affects the conditions of intellectual collaboration and exchange process among members. Therefore, the study of social networks has become a major organizational focus on the development of communities where networked collaborations are the key to knowledge creation and sharing process (Cross et al., 2005; Hardy et al., 2003; Klimkeit, 2005).

2.2. Social network analysis

SNA is a powerful diagnostic method used to analyze the nature and pattern of relationships among members of a particular domain. It is a collection of graph analysis methods developed to analyze networks in social sciences, communication studies, economics, political science, computer networks, etc. SNA provides mathematical definitions of certain characteristics of the actors and the network itself: cohesion, equivalence (role-groups), power of actors, range of influence, and brokerage (Bonacich, 1987; Burt, 1992). These characteristics are expressed in terms of corresponding network-structure parameters derived from the relations among the actors. According to Burt (1992), a social network is a group of collaborating entities (i.e., actors) that are related to one another. Mathematically, this is a graph wherein each participant in the network is called an *actor* and depicted as a *node* in the network. Actors can be persons, organizations, or groups, or any other set of related entities. Relations between actors are depicted as *links* between the corresponding nodes. Network analysis provides a rich and systematic means of assessing such networks by mapping and analyzing relationships among people, teams, departments or even the entire organization (Lutters et al., 2001). There has been an increased interest in this methodology to analyze the nature and role of informal relationships among individual members in formal business organizations (Cross et al., 2002; Cross and Prusak, 2002). Organizations are considered as a network of individuals and researchers have used network analysis to map information flow as well as relational characteristics among strategically important groups to improve knowledge creation and sharing (Cross et al., 2001; Wu et al., 2004). Recent work in the field of network analysis combined with advances in artificial intelligence and information technology have enabled a close examination of large distributed networks. Specifically, network analysis techniques made it possible to study networks of collaboration such as entire scientific communities and academic disciplines.

2.3. Research collaboration and social networks

Collaborations between researchers are a phenomenon of growing interest from the education and research policy

perspective (Biehl et al., 2006; Newman, 2001b). As the result of team work and coordination between multiple researchers, the advancement of scientific research is primarily observed by the growing number of co-authored papers in leading journals representing various domains (Fox and Faver, 1984). This phenomenon is further accentuated by the involvement of government, educational and funding agencies who insist on research collaborations since it leads to better idea generation, lowering costs of equipment, and more efficiency in goal attainment (Melin, 2000). However, the academia has never reached a consensus either on the exact meaning of research collaborations or the structural and contingent factors that drive these collaborations. According to Katz and Martin (1997), research collaboration involves equal input from different researchers to develop a common goal. This usually happens in a formal or institutional setting. As every domain demands more specialized skills and narrowly defined fields of expertise, no single individual possesses all the necessary skills to achieve a larger research project. Hence, the need for collaborations is strongly emphasized (Melin and Persson, 1996). On the other hand, Subramanyam (1983) argued that collaboration occurs within informal settings where researchers coordinate their social and cultural goals for which economic and intellectual conditions playing a facilitating role. Despite the different perspectives, there is a general agreement within both the academia and policy makers that research collaborations are the primary facilitators of knowledge sharing that leads to growth and advancement of a domain (Kyvik and Teigen, 1996; Laudel, 2001; Melin, 2000; Wagner and Leydesdorff, 2005).

A research community or a knowledge domain can be viewed as a large network of individual researchers with a mix of formal and informal mechanisms that enable both face-to-face and mediated communications. These communication mechanisms can be extended to various forms such as visiting scholars, interpersonal communication channels, and collaborations on research and writing. Such networks of researchers give momentum to the intellectual refinement and advancement of a domain (Goldman, 1979). One way of studying such networks in academic research communities is to conduct co-citation analysis where the links are established through the way authors refer to one others' research and publications (Horn et al., 2004; Lin, 1995). Another good way to study similar networks was observed by Newman (2001a,b, 2004) who studied co-authorship networks and research collaborations within academic research communities to understand collaboration network patterns and characteristics. In this paper, the authors adopted the co-authorship analysis rather than co-citation analysis because the co-authorship more directly reflects the nature and structure of formal relationships among members of a research community (Newman, 2001b). Co-authorship (i.e., collaboration in researching and publishing journal article) is an important primary descriptor of scientific publications. Fox and

Faver (1984) indicated that the average number of authors per paper has risen to nearly two in business literature and that 67% of papers have more than one author, paralleling a similar increase in the rate of co-authorship throughout academia. Studying co-authorships and their patterns can serve as a useful means for understanding collaborative relationships in a research community.

2.4. *Hospitality Business Research Community*

The hospitality research community is dedicated to enhance and enrich the field of hospitality services/management through continued emphasis on teaching, research, and services (Rutherford and Samenfink, 1992; Samenfink and Rutherford, 2002; Weaver and McCleary, 1989). Scholars in this field have been a major intellectual force that impacts and shapes the research and practice in the hospitality industry. Over the past few decades, this domain has spawned into many associations, journals, and research consortia, and has been linked to researchers in other domains such as marketing and information technology. Leading hospitality research journals provide a major platform for members in the research community to publish and communicate their research to the entire domain. Such a practice is seriously considered as a major contribution to the knowledge advancement of the field (Jogaratham et al., 2005). As members of this esteemed community, the authors concur that the effort to investigate the nature and structure of their research community is not only an interesting but also a worthwhile exercise.

3. Methodology and data collection

Co-authorship data from four leading and influential hospitality research journals were collected and analyzed by the social network analytical software, *Pajek* (Batagelj and Mrvar, 2006a). The authors examined research collaborations based on such co-authorship data collected from the past five years (2001–2005) to capture recent development. Co-authorship of articles in leading journals provides a view of the networked patterns of collaboration within an academic community (Newman, 2004). Newman studied networks of scientists in which two scientists are considered connected if they have co-authored a paper. His assumption is based on a reasonable definition of scientific acquaintance: most people who have written a paper together will know one another quite well. Such a stringent condition of acquaintance is very acceptable if it is applied consistently throughout data collection. The data set used in this study consisted of structural and individual attributes of the nodes in the network. The primary unit of analysis was a published research paper and the relationship analyzed was the co-authorship. Short communications, editorials, book reviews, and conference reports were excluded from the final analysis because the primary focus of the study was on major research collaborations in the field as reflected by full-paper journal

publications. Four prominent journals in the field of hospitality research were carefully chosen because of their seniority, reputation, and leading status in the hospitality discipline. It has been suggested that leading scholarly journals play the role in nurturing the development of a research community (Xiao and Smith, 2005). The list of journals and their supporting database sources are provided below:

- *International Journal for Hospitality Management* (<http://www.sciencedirect.com/science/journal/02784319>).
- *Cornell Hotel and Restaurant Administration Quarterly* (<http://www.sciencedirect.com/science/journal/00108804>).
- *Journal of Hospitality and Tourism Research* (<http://www.sagepub.com/journal.aspx?pid=102>).
- *International Journal of Contemporary Hospitality Management* (<http://www.emeraldinsight.com/info/journals/ijchm/ijchm.jsp>).

For each record, the variables collected were article title, authors' names, affiliations, year of publication, journal name, keywords, and abstract. The keywords and abstract combined with the title formed the basis in ascertaining the research stream to which each author was categorized. Nine research streams that emerged from this categorization were Marketing & Sales, Consumer Behavior, Finance & Accounting, Human Resources, Information Technology, Customer Service & Operations, Food & Beverages, Industry Studies & Education, And Strategic Management & Performance Studies. A challenge in collecting the bibliographic data was the lack of common standards of representation among all selected journals. This includes determining the unique name identifiers for authors who have been represented in various forms in different journals. Another difficulty was the relatively subjective categorization of research streams. Since there was no common classification system of research streams across all selected journals, subjective judgments were made to distinguish various research streams and categorize the articles and authors accordingly. These challenging tasks were handled carefully by double verifications between the authors. In addition, this study followed similar work in the past with respect to single-authored papers. Previous network studies (Morlacchi et al., 2005; Newman, 2001b) have omitted single-authored papers as they did not strongly imply "collaborations" in a network. However, the authors contend that single-authored articles published by prolific researchers may play some important role in the research community and therefore these authors need to be recognized. Hence, the descriptive analysis included the single-authored articles published in the given time period. When selecting data for the final analysis, the authors only used the multiple-authored papers published in the studied period. The justifications for this restriction were: (1) it provided for a better identification of the most actively

"collaborative" researchers in the research community, and (2) it made the resulting maps of collaboration networks more visually readable and comprehensible.

4. Results and discussion

4.1. Descriptive analysis

In total, 331 articles and 441 unique authors were included in the study. Among them, 27.5% were single-authored articles whereas the remaining 72.5% of the articles had multiple authors. The frequency distribution of the authors by research stream is cross-tabulated in Table 1.

The authors found that the distribution of the number of co-authored papers behaved a power law distribution instead of a common bell-shaped normal distribution. This showed that the hospitality research community in the study was a "scale-free" collaborative network where only a few authors contributed large number of co-authored papers whereas the vast majority of authors only published a small number of co-authored papers. This power law distribution is presented in Fig. 1. Commonly observed in nature and economy, Such distribution pattern is usually composed of a large number of common events and a small number of rarer events (Shiode and Batty, 2000). This finding conformed to those of similar studies (Barabási et al., 2002; Newman, 2001b) indicating that the power law distribution is a common property of complex and self-organizing systems such as the academic research communities (An et al., 2004; Morlacchi et al., 2005).

The overall pattern of research collaborations of the 441 authors is shown in Fig. 2. Each researcher is represented by a node and the link between any two nodes denoted by an arc (directed arrow). If two researchers are linked by an arc in the network, then they must have co-authored at least one paper. Further, if an arc is directed from one researcher to the other, then the former is the primary (first) author and the latter is the secondary author. Also observed in Fig. 2 was the existence of isolated individuals

Table 1
Frequency distribution of authors by research stream category.

Stream	Freq	Freq %	Cum freq %	Category
1	33	7.5	7.5	Marketing & Sales
2	75	17.0	24.5	Consumer Behavior
3	30	6.8	31.3	Finance & Accounting
4	100	22.7	54.0	Human Resources
5	16	3.6	57.6	Information Technology
6	50	11.3	68.9	Customer Service & Operations
7	29	6.6	75.5	Food & Beverages
8	86	19.5	95.0	Industry Studies & Education
9	22	5.0	100.0	Strategic Mgmt & Performance Studies
Total	441	100.0	100.0	

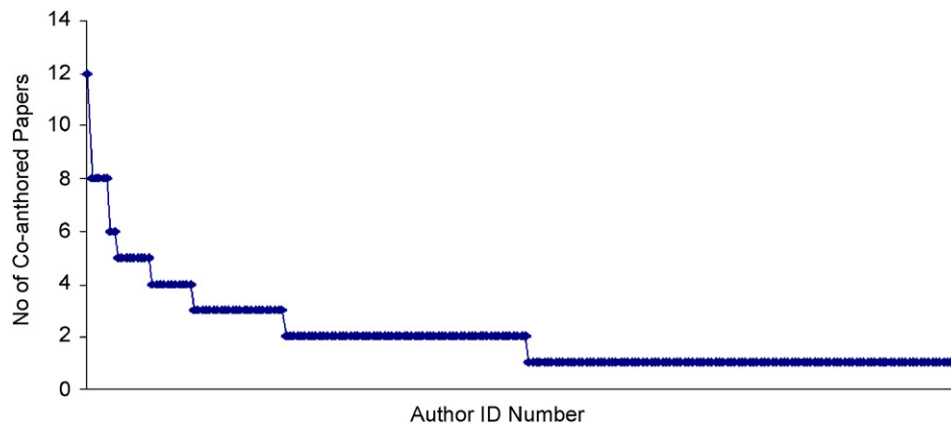


Fig. 1. Power law distribution of the co-authored articles in this study.

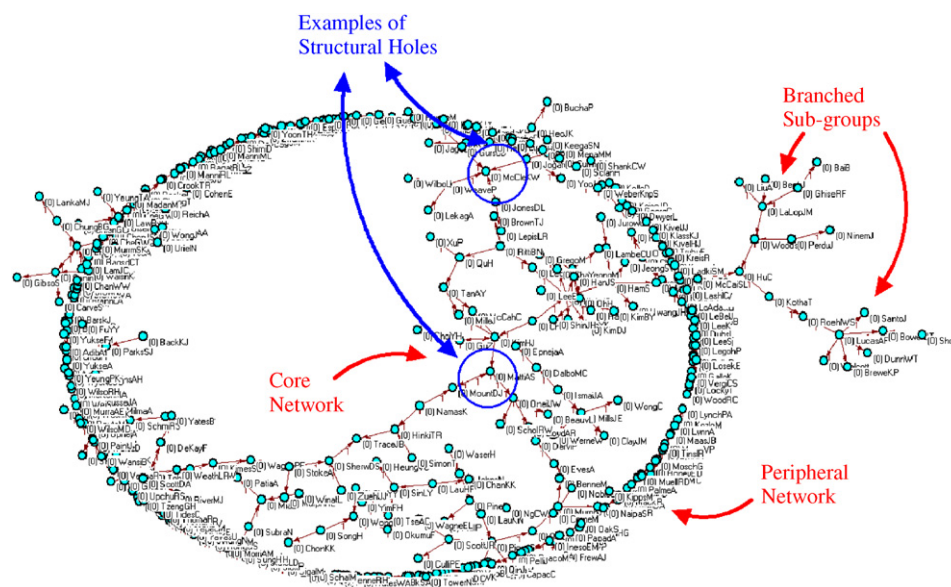


Fig. 2. Mapping the hospitality research collaboration network (with a core-periphery structure that branches in and out).

and subgroups. Some of the isolates were indirectly connected to the main network through the co-authored links. This network pattern of connections indicates the presence of a “core–periphery” structure (Borgatti and Everett, 1999) where a core network is “branched-in” towards the cores (centers that consist of most collaborative authors) from peripheral networks in the outer layer of the network. Such particular core-periphery structure was observed in this study. Interestingly, in addition to providing each co-author’s collaborated position in the knowledge network, Fig. 2 also helps identify the “research hubs” (e.g., MattiAS and McClerkW) in the overall network. These research hubs serve as “structural holes” which are strategically occupied by those researchers who can further span groups that are otherwise rarely connected and inaccessible to other different groups in the network (Burt, 2000; Knox et al., 2006). Merton and Storer (1973) studied the structures of scientific communities and concluded that scientists who are more connected and visible

than their peers tend to control more resources and receive more rewards and acknowledgements. This can also be recursive in the sense that scientists who control more resources and obtain more rewards become well-connected and more visible. Either way, those researchers situated in structural holes play a facilitating role in research collaborations and can create valuable opportunities for themselves and others by acting as a bridge (i.e., collaborative link) between sub-networks of researchers. This phenomenon was also observed in the analysis, wherein the structural holes in the hospitality research community tend to have more collaboration and journal publications than their peers. This somehow “supports” the famous “Matthew Effect in science” by Merton (1968) who argued that, in cases of independent multiple discoveries or collaborations, the more eminent few of collaborating scientists will get the lion’s share of the credit even if those persons did a small amount of the work. It should be noted that the major argument here is not who

did most of the work. Rather, the authors emphasize the knowledge-diffusing role played and peer-acknowledged recognition received by structural holes in the network of scientific collaborations.

4.2. Network attributes

Knowledge networks are characterized by cohesive groups, and dense clusters of researchers (i.e., the co-authors in this study). Cohesion means that a network of individuals contains many ties and yields a tighter structure. Interest in cohesive groups arose from prior research of scientific communications that focused on communication networks and explored the concept of invisible colleges, a term coined by Price (1963) and later extended by Crane (1972) to describe a knowledge network's connectedness in social diffusion process. Crane (1969; 1972) argued that cohesive social groups (circles) are crucial for the advancement and necessary conditions for rapid scientific growth in any field. Crane's research into the structure of the rural sociology domain supported the notion that small group of researchers function as powerful elites, exchanging research reports and ideas well in advance of their publication in print within most fields of scientific research. In rural sociology, Crane discovered small cohesive groups of highly productive and interconnected researchers who function as main nodes connecting many peripheral members. This discovery was contended by Hagstrom (1965, 1973) who further argued that large groups of collaborators and centrally located leaders play important roles in communicating knowledge and diffusing innovations in a research area.

In this study, the idea of cohesive subgroups was captured by the density of the network. Density is defined as the number of arcs expressed as a proportion of the maximum possible arcs in a network (Batagelj and Mrvar, 2006b). The density of the hospitality research network in this study was measured at 0.0022984 (see Table 2), which indicates that only about 0.2% of all the possible arcs are present. However, it should be noted that the low density is a characteristic of large networks as it is inversely related to the network size. The larger the network, smaller is the density. It is also interesting to learn about the density of each cohesive sub-network in terms of its research stream (see Table 3). When the network size is comparably equal, the density shows how cohesive the research collaboration in one research stream as relatively compared with that in another. For example, the density findings indicate that research collaborations were relatively more cohesive in the "Finance & Accounting" than in the "Marketing & Sales" stream. The second important attribute of networks is the degree, which defines the number of relationships developed by each vertex (actor). Vertices with high density will most likely be found in the densest section of the network. Table 2 also details the distribution of "degree" in the network where 43 authors (about 10% of total number of authors) only published by themselves (single-authored

Table 2
Frequency distribution of "degree" in the network

Degree ^a	Freq	Freq %	Cum freq %	Exemplary author(s)
1	253	57.37	67.12	Adib, A., etc.
2	74	16.78	83.90	Agut, S., etc.
3	41	9.30	93.20	Parks, S.J., etc.
4	12	2.72	95.92	LaLopa, J.M., etc.
5	8	1.81	97.73	David, M.C., etc.
6	3	0.68	98.41	Canina, L., etc.
7	4	0.91	99.32	Toh, R.S., etc.
8	1	0.23	99.55	Ham, S.
11	2	0.45	100.00	Kim, H.J.; Mattila, A.S.
Total	441	100.00	100.00	

^a"Degree" refers to the number of collaboration links that a single vertex (an author) has. For example, Kim, H.J., who is one representative member in the group in which each author had a degree of 11 (11 collaborators with whom he has co-authored articles).

Table 3
Density measures of the network by research stream

Stream	Category	Density ^a	Network size
1	Marketing & Sales	0.013258	33
2	Consumer Behavior	0.009422	75
3	Finance & Accounting	0.034444	30
4	Human Resources	0.008000	100
5	Information Technology	0.035156	16
6	Customer Service & Operations	0.015600	50
7	Food & Beverages	0.019025	29
8	Industry Studies & Education	0.010141	86
9	Strategic Mgmt & Performance Studies	0.028926	22
Overall network		0.002298	441

^aDensity = the number of arcs expressed as a proportion of the maximum possible arcs in a network.

publications) and never co-authored with others. Most authors (57.37%) had one co-authored journal publication in the past five years. Three most collaborative authors (Ham, S., Kim, H.J., and Mattila, A.S.) had published at least eight co-authored articles with their colleagues.

From the knowledge distribution perspective, recent network analysis studies (Newman, 2004; Barabási et al. 2002) have focused on network distance between vertices. The distance is defined as the number of nodes along the links in the network that one needs to traverse, to move from one node to another. In co-authorship networks, a pair of individuals who have co-authored the articles together have a distance of 1 whereas two individuals who share a common co-author in the middle of chained connections have a distance of 2. In terms of co-authorship analysis, the shorter the distance, the closer the collaborative relationship is between two authors. Based on the number researchers connected to a key researcher and also

upon the distance at which they are connected, it is possible to ascertain the degree of an individual researcher. This analysis is important since it provides a snapshot view of the research linkages of the most prolific researchers in a domain and how they operate and collaborate. An interesting fall out of cohesive sub-networks is “appreciation.” According to Woodruff (1999), cohesion of a particular sub-network enhances the appreciation of each of its members. The more appreciation group members have for each other, the more they will interact. Interaction, being a glue factor, will further reinforce cohesion. The production of knowledge is a social process involving interactions among people with different backgrounds, predispositions, and insights. The members of such sub-networks interact, develop, and exchange new knowledge, and in the process contribute and shape the community over a period of time (Wenger, 1998). For example, the cohesive network of Mattila (i.e., MattiAS in Fig. 3) shows an extensively and closely knit network with her collaborators. As the distance increases, the collaborations expand to link others further through the network.

4.3. Network reduction

Network reduction is an essential process by which a large network can be systematically divided into smaller but mutually exclusive sub-networks. It enables a closer look at sub-networks within a larger network such as the hospitality researcher network. In this study, the network was reduced in three ways, namely global view, contextual view, and cluster analysis. Fig. 4 shows the global view of how research collaborations among different research streams are directionally linked and to which research streams the leading co-authors (i.e., first authorships) belong. For example, “Marketing & Sales” researchers as leading authors initiated collaborations with their

“Consumer Behavior” colleagues. Also, there were more “Customer Service & Operations” researchers as leading authors driving their “Consumer Behavior” peers for co-publications. Furthermore, the collaboration patterns were examined by expanding individual researchers in one research stream (e.g., “Consumer Behavior” category in Fig. 5). Nodes are labeled with different colors to enable easy identification. The nodes in the light green are the researchers categorized into the Consumer Behavior stream, whereas other colored nodes indicate different research streams. Such an expansion provides a contextual view of how individual researchers in one particular research stream collaborate with other researchers in other different streams within the knowledge domain. For instance, Mattila who published in the “Consumer Behavior” stream also collaborated with her peers to publish hospitality research in both “Customer Service & Operations” and “Finance & Accounting” streams. This implies that Mattila, as a member of “Consumer Behavior” stream, serves as a critical node to bridge (or provide access to) her collaborated researchers in other research streams.

4.4. N-Clique Analysis

The pattern of network connections in Fig. 2 suggests the existence of core and periphery networks. However, an *n*-clique analysis can be used to identify and confirm that such a pattern actually exists inside the larger network. The notion of a clique formally depicts a narrow exclusive circle of a core group within a network. The focus was on the minimum degree of all vertices in each clique. These cliques are called *k*-cores, where *k* is the minimum degree of each vertex within the core. Fig. 6a shows a *k*(2)-core clique wherein each vertex (i.e., an identified author) has at least a degree of 2 (have collaborated with at least two other co-authors). Careful observations suggest that cliques are

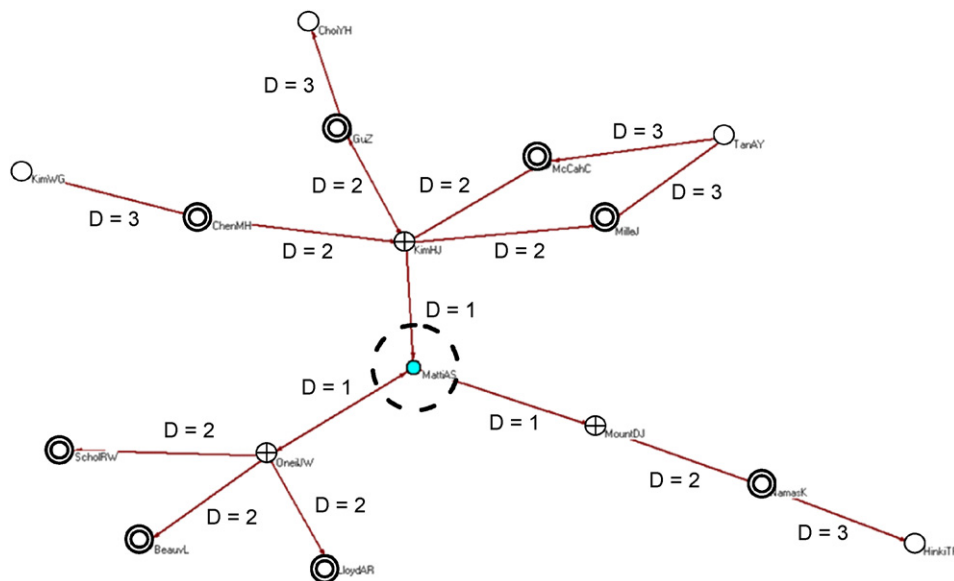


Fig. 3. A cohesive network for Matti (“MattiAS” as the center) within the distance of 3.

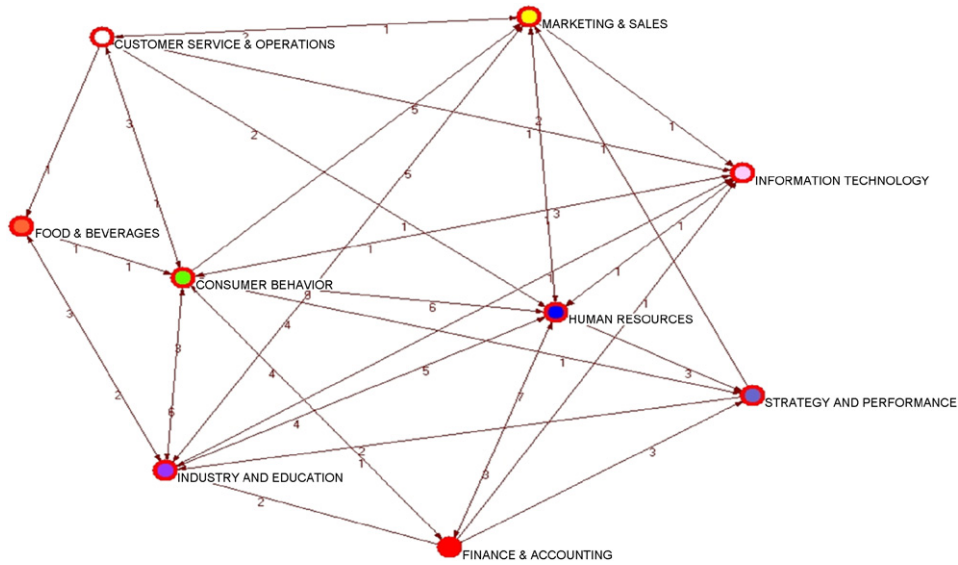


Fig. 4. Global view of collaboration between research streams.

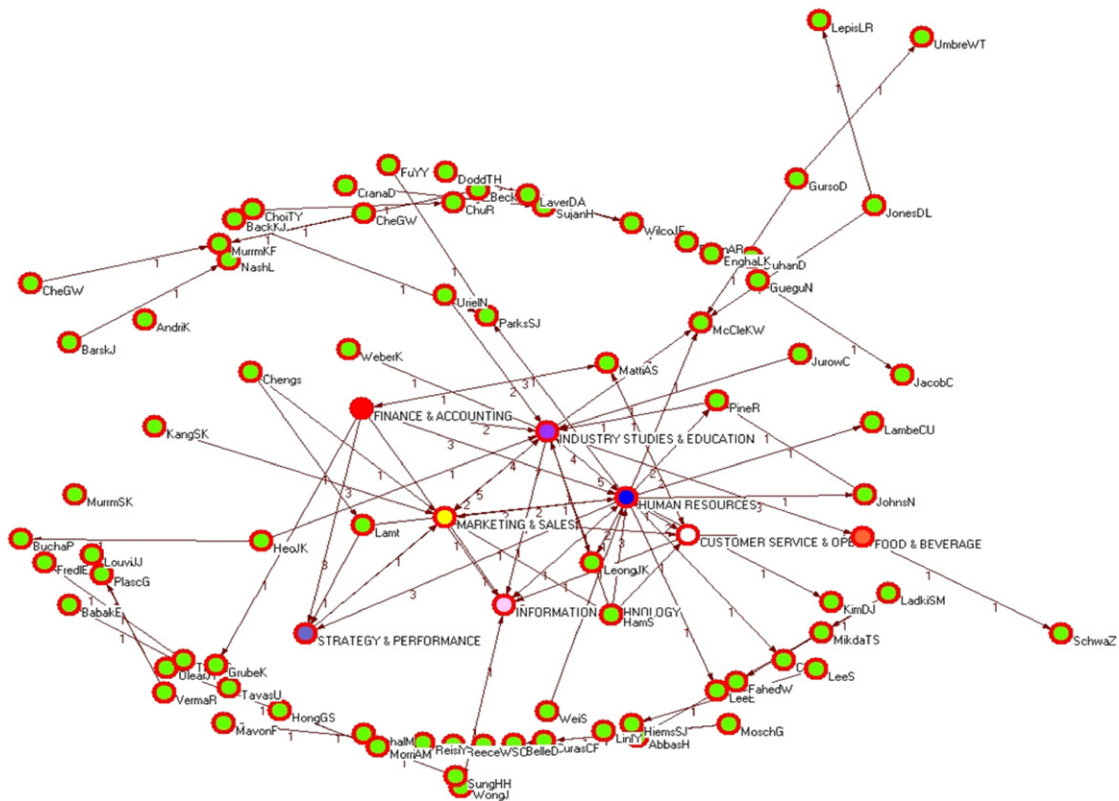


Fig. 5. Contextual view: collaborations between Consumer Behavior researchers and other research streams.

structured around some key vertices (i.e., major researchers) and indicate that these “key” nodes are important in linking other researchers together in the knowledge network. For example, Reich (depicted as ReichA in Fig. 6a) plays an important role as a “research hub” in direct linkage to three other researchers, who otherwise do not have any immediate links among them independently. The importance of the research hubs can be further stressed

by eliminating them in this exemplary $k(2)$ -core network. Fig. 6b shows the k -cliques with two key vertices (ReichA and TanAY) removed. The resulting network becomes disconnected because those directly linked nodes are also eliminated from the network when those three hubs are removed. This analysis demonstrates the importance of research hubs to the development and sustenance of formal research collaborations.

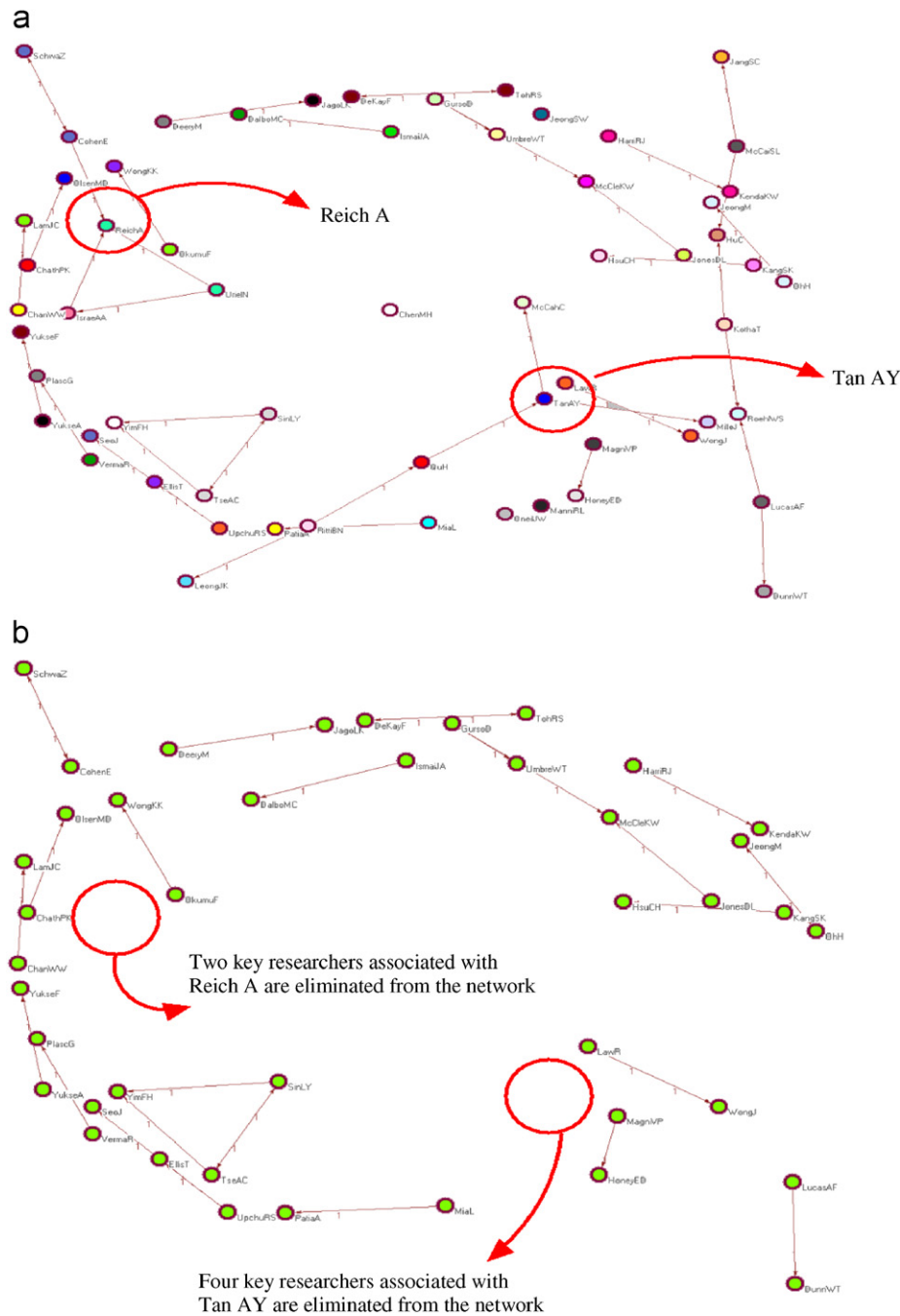


Fig. 6. (a) K -core network ($k = 2$) showing vertices with collaborations with at least another two co-authors. (b) The k -core network ($k = 2$) with two key vertices (ReichA & TanAY) removed.

5. Conclusion

This study attempted to understand the knowledge network based on social network analysis of co-authorships in the field of hospitality business research. These researchers have accumulated major intellectual capital to advance hospitality business research and practice.

The findings showcased the collaborative nature and knowledge diffusion patterns in the hospitality research domain in recent years. The findings of social network analysis confirmed that social structure affects knowledge

acquisition (Carley, 1986) because the presence of cohesive sub-networks of researchers disseminate knowledge by collaborating with one another in the form of co-authored journal publications. The n -clique analysis also demonstrated that absence of key research hubs destabilizes the network due to eliminating their collaborating researchers (i.e., breaking the links to access collaborated knowledge). The evidence gathered through the network analysis suggests that the hospitality research community is a large yet cohesive knowledge network that is still evolving through rich collaborations that are important for its

advancement as a scientific field. The network structure can also serve as alternative metrics to evaluate (or at least imply) research impacts and contributions of individual researchers by research collaborations, which in many cases is difficult to detect by the conventional approaches. Given the flourishing interdisciplinary nature of the hospitality discipline, another finding deemed important is that this study provided a useful means to understand the collaborations and structural positioning of the researchers who mediate among different research streams.

6. Limitations and future research directions

This study reflected upon many important and interesting dimensions of hospitality researcher community. However, the analysis based on “hard” evidence of co-authorship data from top journals bears its own limitations. Primarily, it does not capture the “softer” aspects of research collaborations. Research into the sociology of scientific communities (Hagstrom, 1965; Garvey and Griffith, 1971) indicated that such communities develop also as a result of strong inter-personal and informal communication patterns (e.g., ideas are exchanged and research projects are devised when researchers meet in conferences and inter-university visits). The rich essence of these informal communications and their impact on collaborations cannot be fully captured by co-authorship data. The second limitation of co-authorship data is its inability to include the power, politics, and other social mechanisms into the social network analysis. The current study cannot answer certain questions such as “why are certain groups more cohesive than others?” and “what are the motivating factors that lead to the formation of research collaborations?” Subsequently, these interesting scientific inquiries become important directions for future research. Furthermore, this study provided new opportunities for future research. One direction this study can be extended is the inclusion of other major journals in the hospitality or even tourism research. This inclusion will enable the study of how far the core researchers in their represented domains collaborate with others from different domains. The study of evolution and advancement of networks is also an increasingly important area of research. Future studies in this direction can include studying the development of the networks overtime and observe how different networks and their structures change longitudinally. This study is the first step in these new directions for hospitality research and will encourage more efforts towards understanding the growth of knowledge networks and the building of social and intellectual capitals.

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