Categorising a United States Based Group Insurance Carrier's Broker Network: a Graph Theoretic Approach

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Declaration

I hereby certify that this material, which I now submit for assessment on the program of study leading to the award of Master of Science, is entirely my own work and has not been taken from the work of others save, and to the extent, that such work has been cited and acknowledged with this text.

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Date: 4 September 2019

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Chapter 1: Introduction

Researchers have studied business relationships from a variety of perspectives. For example, one body of literature works towards classifying types of relationships and their respective advantages and disadvantages (Baker, 1990; Uzzi, 1997). Another body of work researches how the business relationships form and generate value (Gulati, 1999; Holm et al., 1999). Additionally, a third perspective establishes how relationships adapt to changes within their network (Anderson et al., 1994; Abrahamsen et al., 2012). Lastly, others pursue the quantification of relationships by understanding how to define a relationship's quality (Naudé and Buttle, 2000; Huntley, 2006; Rauyruen and Miller, 2007; Storbacka et al., 1994) or strength (Shi et al., 2009; Shi et al., 2016). These perspectives represent examples reviewed by this work.

Business relationships are important for a company to understand both on the supply side and on distribution side, since they directly correlate with the economic outcome. On the supply side of a business, companies need to review their partners to ensure they are actively managing relationships to optimise their business processes and keep costs down. On the distribution side, companies need to understand what drives client purchase behaviour and how that affects their revenue streams. Furthermore, the number of partnerships a company may manage varies; however, given any volume, it is advantageous to manage the relationships as an aggregate collection, namely a portfolio (Eilles et al., 2003). The purpose of this work is to review relationships within a company's distribution network. As a result, this work establishes a model focused on three key objectives. First, this work observes the types of relationships within the network. Second, this work understands how those relationships change over time. Third, this work proposes a method for quantifying those changes within the relationships. By implementing this model, a company will be able to use it as a tool to manage their relationships as a portfolio.

A business may engage in various types of relationships. Three types—transactional, relationship-oriented, hybrid—of relationship strategies have been identified for businesses (Baker, 1990; Uzzi, 1997). The main distinction between the transactional and relationship-oriented strategies is the level of involvement existing between both parties. The hybrid strategy combines aspects of both the transactional and relationship-oriented types (Baker, 1990; Uzzi, 1997). Having the ability to identify the relationship strategies within a business network allows for a company to see their strengths and weaknesses. Too much of one relationship strategy reduces the exposure to innovation, while too much of the other reduces loyalty or continuity of quality among other effects (Baker, 1990; Uzzi, 1997). Through their work both Baker (1990) and Uzzi (1997) found support that the combination of the transactional and relationship-oriented strategies resulting in the hybrid strategy occurs most prominently. Furthermore, Uzzi (1997) theorises of an optimal balance with the hybrid approach. The question remains as to how companies identify the optimal balance of the relationship strategies and work towards that point, which means relationships may need to change.

Business relationships have a tendency to evolve over time. In general as time passes and partnering companies focus on understanding one another's business, the relationship strengthens (Uzzi, 1997). In other words, there is a level of mutual commitment that results in both parties generating value (Holm et al., 1999). As long as both parties continue to perceive that value relative to other peers or competing partners, the relationship will continue to persist (Abrahamsen et al., 2012). However, it is possible that a partner over time may not meet the commitment that has been established and the relationship will decay (Abrahamsen et al., 2012) or critical instances will cause a need for the partnership to either adapt or terminate (Anderson et al., 1994). Therefore, a company's relationship network is ever changing and evolving. Yet, how does a company understand how these relationships change?

Business relationships may be thought of as a collection of attributes driving growth or decay. Relationship quality (Naudé and Buttle, 2000; Huntley, 2006; Rauyruen and Miller, 2007; Storbacka et al., 1994) and relationship strength (Shi et al., 2009; Shi et al., 2016) are two areas of work striving to better understand the inner workings of relationships and understand how they become stronger. The relationship quality perspective perceives relationships as a series of various attributes factoring in different aspects of the relationship such as trust or satisfaction (Naudé and Buttle, 2000; Huntley, 2006; Rauyruen and Miller, 2007; Storbacka et al., 1994). On the other hand, relationship strength works to provide a more concrete definition of relationships positing it as the sum of three types of strength (Shi et al., 2009; Shi et al., 2016). At any rate, the objective for both streams is to identify what would define a good relationship (Naudé and Buttle, 2000; Shi et al., 2009). Furthermore, Shi et al. (2009) strives to understand the degree to which partners maintain their relationship and how they resist terminating the partnership. In other words, stronger relationships may be attributed to a more substantial connection between partners than weaker relationships reducing the risk that the partners will terminate the relationship (Shi et al., 2009). This concept is analogous to a relationship-oriented tie, which involves a deeper commitment to reciprocity of value between partners in the relationship and have a longer duration than other relationship types (Uzzi, 1997). As a result, relationship quality or relationship strength models have the potential to be adapted to explore the quantification of relationship strategies and understand how relationships strategies change as time passes.

However, even with relationships being able to be classified and measured, there needs to be an effective method for managing large volumes of relationships. Specifically, for a company's distribution side of their business, as they may work with thousands of customers. To individually study each partnership to both understand the type of relationship strategy and calculate the strength, would be ineffective. In the case of this work, the participating company partnered with 13,938 other intermediary companies called brokers to help them sell their products. Additionally, there is another need for efficiency gained by managing all of the relationships as an aggregate group, termed as a portfolio, (Eilles et al., 2003) in an effort to build strategies leveraged towards locating and driving the company towards a theorised balance of relationship types as discussed by Uzzi (1997).

To explore this area, this work uses a graph theoretic approach. Graph theory provides a method for mapping relationships as a series of vertices with edges, and each edge connecting the vertices represents a relationship (Gorman and Malecki, 2000; Orsenigo et al., 2001). Having the ability to map relationships with partners visually is one of the first steps to managing business relationships as a portfolio (Eilles et al., 2003). Furthermore, there are a series of calculations available to explain various properties of a graph (Freeman, 1979; Gorman and Malecki, 2000). Additionally, graphs are an abstract flexible way to map relationships, such as social networks (Xiang et al., 2010), the infrastructure of the internet in the United States (Gorman and Malecki, 2000) or research agreements in the pharmaceutical industry (Orsenigo et al., 2001). Furthermore, graphs can be adapted to represent more abstract relationships such as manufacturing process dependency (Singh and Singru, 2013) or barriers to green supply chain management (Muduli et al., 2013). As a result, this work can explore both the overall network structure of tangible business relationships and the underlying network of attributes prescribed by relationship quality through the lens of graph theory.

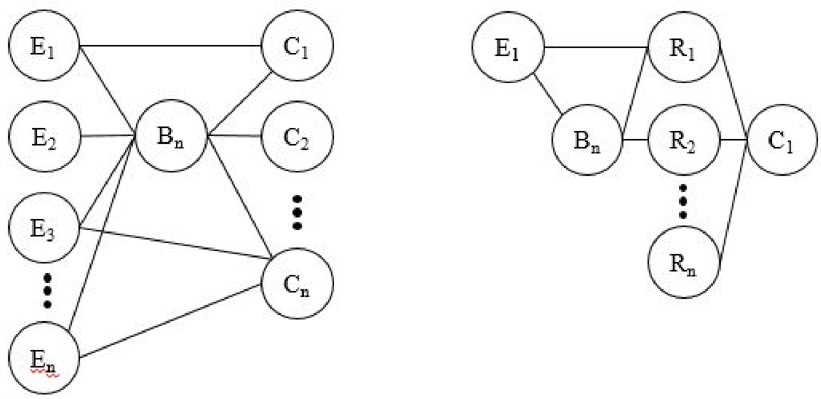
To explore the connection between the various studies of business relationships and the applicability of a graph theoretic perspective, this project collaborated with a sponsoring company. As part of the agreement, they supported the work through supply of proprietary data on their business relationships as well as access to a group of their employees for survey work to better understand the dynamics of relationships within their distribution side of business. Therefore, this work furthers understanding of the partner's methods dedicated to delivering their products to customers. Involved in this method, is an intermediary company having the role as a facilitator to match consumers with the best suited producer meeting the consumers' needs. While the participating company is a global corporation, only a specific division of their United States operation was reviewed. Chapter 2 provides additional context on the general specifics on how the company works with these intermediaries to sell their products to customers.

Chapter 2: Industry Context

In the United States, employment contracts may contain benefits in addition to salary. For example, companies may offer various insurance options including but not limited to health, vision, and dental. Therefore, an employee of a company who has purchased insurance products will obtain insurance and have the specific financial protection the insurance covers, but does not decide which carrier will insure them; unless, they choose to pursue coverage external to their company. Through this model, a company will purchase a group policy from a group insurance carrier, examples include but are not limited to: The Hartford, Unum Group, and Liberty Mutual. The purchased group policy is intended to cover either the whole organisation or a portion of the organisation at an agreed upon rate. In order to obtain coverage, a company, also known as an employer, may choose one of two primary distribution options.

An employer will purchase group insurance either directly from a group insurance carrier or indirectly from a group insurance carrier through a third-party company. When an employer purchases products directly from the group insurance carrier, an employer may contact or be contacted by a sales representative, who works for an insurance carrier. Not all group insurance carriers will accommodate this form of connection, and, for the purposes of this work, it will be excluded. As an alternative, when an employer purchases products indirectly from the group insurance carrier, the employer uses a third-party company called a broker. The role of the broker is to facilitate the fulfillment of the employer's insurance needs. In this model, the employer and insurance carrier can be connected in two ways. Either the employer will partner with a broker to research the available insurance options or an insurance carrier's sales representatives will work with a broker to find potential employers. Because the latter model institutes a third-party in addition to the insurance carrier and employer, the distribution of insurance products becomes more complex. The complexity comes from a carrier's need to manage both their relationships with employers and their relationships with brokers in order to grow their business, which was discovered when speaking with leaders in the sales organisation for the participating group insurance carrier.

The complexity of growth within the broker model derives from having three entities working together to fulfill the needs of all involved. Employers need insurance in order to provide competitive compensation packages to attract skilled employees and protect them. As shown in Figure 2.1, brokers need to match employers with insurance carriers in order to create a source of income. Insurance carriers need to sell their products in order to achieve growth targets. To sell their products, the group insurance carriers employ people called sales representatives. These sales representatives represent the group insurance carriers in sales discussions with brokers and employers.



(a) **(b)**

Figure 2.1 Group Insurance Carrier Distribution Network Via Brokers

A broker B must match its employers E with an insurance carrier C. (a) Here, B*n* matches E*1* with C*1*, E*3* with C*n*, E*n* with C*n*, and E*2* has no current match. (b) Group insurance carrier C*1* employs sales representatives R*1*, R*2*, R*n*. R*1* works with B*n* on behalf of C*1* to sell insurance to E*1*.

Therefore, an insurance carrier must remain competitive in both the perspective of the employer and broker. For employers, the group insurance carrier must provide desirable products at a manageable cost. For brokers, the group insurance carrier must fulfill the employer's needs and provide competitive compensation to the broker for their services. The broker, must then, satisfactorily fulfill the needs of the employers and generate potential customers for the insurance carrier in order to maintain their relationships. Thus, in order to achieve growth, the insurance carriers and brokers must manage this network of needs fulfillment positively, to cause relationship retention and growth.

From the perspective of the insurance carrier, growth can be achieved in three ways, when working through brokers. First, they sell additional products to employers that they have sold to previously. Second, they acquire new employers through a broker they previously worked with to acquire other employers. Third, they find new brokers with sets of employers with whom they currently have no relationship or they are introduced to a new broker through an existing employer changing brokers. Each strategy has benefits and costs, and each one is used. However, the difficulty is knowing which strategy yields the desired level of growth for the entire distribution of relationships and which specific strategy is useful, given a specific relationship. Therefore a model is needed to illustrate and measure the change in the distribution on a macro (all business relationships) and micro (a specific individual business relationship) level.

Chapter 3: Literature Review

A group insurance carrier utilising brokers in their distribution model may be illustrated as a network of employers, brokers, and sales representatives, as shown in Figure 3.1. The role of the sales representative is to sell insurance on behalf of the insurance carrier to employers through the brokers.

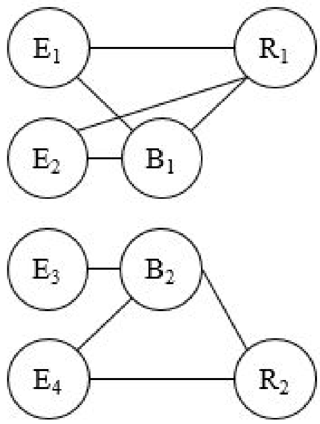


Figure 3.1 Sales Representative Relationships within Distribution Network

Abstracted example of the group insurance carrier's distribution model using a broker. In this example a group insurance carrier employs two sales representatives R*1* and R*2*. R*1* sells insurance to employers E*1* and E*2* through broker B*1*. R*2* sells insurance to E*4* through B*2*.

At the macro level considering all business relationships together, the insurance carrier needs to understand how many connections they have established and where the connections are concentrated. At a micro level, relationship management, the insurance carrier needs to understand the drivers behind individual relationships, which encompasses thousands of connections. For example, the participating group insurance carrier in this work employs hundreds of sales representatives who work with tens of thousands of brokers to sell insurance to hundreds of thousands of employers throughout the United States. Both network structure and relationship management have two components. First, for the network structure, companies need to understand their relationship strategy and how changes in relationships can affect their overall relationship portfolio (Anderson et al., 1994; Abrahamsen et al., 2012; Baker, 1990; Crosby and Stephens, 1987; Eilles et al., 2003; Gulati, 1999; Holm et al., 1999; Uzzi, 1997). For each individual relationship, a company needs to understand what drives the relationship to grow and how can it be measured (Huntley, 2006; Naudé and Buttle, 2000; Rauyruen and Miller, 2007; Shi et al., 2009; Shi et al., 2016; Storbacka et al., 1994). Second, after a company gains an understanding of the relationship networks and drivers, a method of measurement and organisation is needed to understand changes in their network across time (Ji and Fan, 2014; Orsenigo et al., 2001). Once a company gains this knowledge about their network, they may establish a strategy for reaching their relationship goals. Graph theory provides a framework to achieve this objective by modeling and measuring networks (Freeman, 1978; Gorman and Malecki, 2000; Ji and Fan, 2014; Kulkarni, 2005; Muduli et al., 2013; Orsenigo et al., 2001; Singh and Singru, 2013; Xiang et al., 2010). Using both a network level approach and individual relationship management, a model can be constructed using graph theory with the ability to model and measure relationship changes in a distribution network, inclusive of a group insurance carrier's network conducting business through brokers.

3.1 Network Structure

A business needs to form relationships in order to achieve a specific goal, usually tied to an increase of revenue or decrease in cost. The set of all their relationships builds their business network; however, their business network extends beyond all of the partners they directly work with, because each partner also has their business network of direct partners (Anderson et al., 1994; Abrahamsen et al., 2012;

Baker, 1990; Eilles et al., 2003; Gulati, 1999; Holm et al., 1999; Uzzi, 1997). In order to achieve the goal, a business must define the boundaries and definitions of their network (Anderson et al., 1994; Baker, 1990; Uzzi, 1997), form or grow relationships (Abrahamsen et al., 2012; Baker, 1990; Gulati, 1999; Holm et al., 1999; Uzzi, 1997), and manage the portfolio of relationships towards that end state (Eilles et al., 2003). These steps form the conceptual foundation for building strategies; yet, they lack a quantitative process needed to track and understand the changes within their network.

Anyone analysing a network needs two components, a means of organising the network data and metrics that represent network properties. Graph theory may prove to be a means of building both components. Researchers implement graph theory to measure networks across a variety of different disciplines including but not limited to social networks (Freeman, 1978; Xiang et al., 2010), pharmaceutical research agreements (Orsenigo et al., 2001), and the Internet in the United States (Gorman and Maleck, 2000). The versatility of graph theory derives from its abstraction of actors—people, companies, cities, etc.—and connections between actors—relationships, customer agreements, roads, etc.—into a series of vertices or nodes (V) and edges (E), as shown in Figure 3.2 (Gorman and Malecki, 2000; Ji and Fan, 2014; Orsenigo et al., 2001; Xiang et al., 2010). These related vertices and edges, also known as graphs,

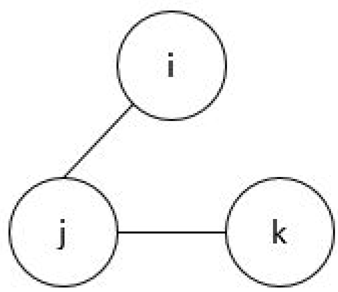


Figure 3.2 Simplified Undirected Graph with Three Nodes

A simple graph, the vertices or nodes V = {i, j, k}; the edges E = {Eij, Ejk}.

are not only useful for illustrative and organisational purposes, but contain a series of quantitative properties. Centrality and connectivity, for example, are two examples out of a variety of metrics, which can be applied to graphs (Freeman, 1978; Gorman and Malecki, 2000). Centrality may be measured in several ways and each correlates with a different meaning, visibility, influence, or control of an actor within a network (Freeman, 1978). More broadly, it ties to the importance of someone or something relative to its peers (Freeman, 1978). Connectivity, on the other hand, measures the overall connectedness, the amount of edges connecting all of the vertices, of a graph emphasising a measurement for the entire network versus the vertex-centric comparison of centrality (Gorman and Malecki, 2000).

In conclusion, for a company to achieve its goals, it must understand their network and measure the changes within. Qualitatively, they need to define their network's boundaries and roles, understand how relationships change, and manage all relationships. Quantitatively, they need to model the network and review network measures, such as centrality and connectivity, that best measure their objectives.

3.1.1 Relationships as a Portfolio

The first step to understanding business networks begins with definitions. In an ideal business network, all relationships are mapped out. A specific company under review, termed a focal company, may have a set of suppliers and customers. Each supplier or customer may have a set of their own suppliers and customers continuing on and on. However, the focal company may not have perfect knowledge of all the relationships; therefore, their perception of the network in which they exist is bounded (Anderson et al., 1994). Anderson et al. (1994) define this concept as network horizons, and the definition for each company is an “arbitrary” boundary formed by both the “experience of the actor” and “structural network features”. For example, in the case of the group insurance carrier distribution network utilising brokers, a carrier may know the brokers they work with, their insured employers, and their general competitors. Yet, they may not know about brokers they do not conduct business with or which employers are insured by which competing carriers. These are factors that shape a carrier’s network horizon, and a carrier will apply all or a set of these factors to answer a business question forming the second definition, network context. Anderson et al. (1994) propose “three dimensions” of network context as follows, the “actors”, the people, or businesses in this case, that participate in the relationship, the “activities”, the ways in which the actors are connected, and the “resources”. For group insurance carriers, actors could be competing carriers, brokers, or employers looking for insurance. Activities could be sold insurance products or quotes on products. Resources could be the employees of the carrier who help brokers find employers or simply help an employer enroll their employees in purchased insurance products. And, once the definitions are set for a problem, the relationships, “activities”, and patterns of those relationships can analysed.

When it comes to relationships, an actor may employ different strategies to maintain their connections with other actors. Generally, there are three types of strategies an actor may take with its relationships (Baker, 1990; Uzzi, 1997). The first two, transactional and relationship-oriented, are considered opposites to one another, and the third, hybrid, involves a combination approach using both transactional and relationship-oriented approaches (Baker, 1990; Uzzi, 1997). The key distinction between the two approaches is the level of involvement between two parties

(Granovetter, 1973; Uzzi, 1997). Granovetter articulates this as the strength of a relationship, and that strength is defined as, "a combination of the amount of time, emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterise the tie" (Granovetter, 1973, p. 1361). Uzzi (1997) contextualises this concept using businesses within the apparel industry explaining that transactional ties tend to be socially detached money focused transactions, which typically do not repeat, versus the relationship-oriented ties, which tend to have higher levels of social interaction leading to a more personal connection. Both the transactional and the relationship-oriented focuses have positive and negative aspects to them, and, in some instances, the positives of one complement the negatives of the other.

While transactional relationships can reduce dependence on single sources, lower prices, and increase information flows, they may lack loyalty and continuity to maintain quality or solve problems in business critical objectives (Baker, 1990; Uzzi, 1997). When operating in a transactional environment, a single company is working with many other companies, which compete for business. Because of this arrangement, lower prices are yielded from companies competing to obtain the business, information flows are increased because the single company has access to the varying networks the competing companies exist within, and the volume of relationships and competition reduces dependence on a single partner to achieve their goals (Baker, 1990). However, if the company only acts in this fashion, they lack loyalty and continuity as critical tasks arise (Baker, 1990; Uzzi, 1997). Uzzi (1997) exemplifies this in the fashion industry, when a customer perceives a problem with a product, in that a transactional relationship may refuse to pay or accept the product. Additionally, if the partnering company doesn't have a deep enough understanding of the focal company's processes or product outcomes, they may not catch a problem with their product production or process supporting the focal company leading to lower quality (Uzzi, 1997). In order to overcome these disadvantages, a company participates in relationships that are opposite to transactional, the relationship-oriented transactions.

The longer term focus of relationship-oriented transactions builds a higher level of service and quality through continuity and a deeper understanding of a partner's business. As time passes in a relationship, those focused in relationship-oriented partnerships will partake in two activities: voluntary activities that benefit the partner without a formal enforcement through the business contract and gain a deeper understanding of one another's processes and products (Uzzi, 1997). Uzzi (1997), again, characterises this through the fashion industry by explaining how one partner adapts to produce a slightly different product from the original to support the other partner. However, the company adapting their process to support their partner may only do so provided they know how that company will be using the outputs in their process (Uzzi, 1997). As the companies participate in these actions in the long-term, they create higher service through continued voluntary reciprocity of actions informally, outside the definitions of a contract and produce a higher quality because their processes are aligned. However, these styles of relationships can restrict a broader knowledge about the overall market because they only participate in these relationships, and become dependent on a single partner, which can be dangerous if the relationship terminates and they lose pricing advantages (Baker, 1990). Yet, these downfalls are accounted for by the transactional approach discussed above leading to the final approach companies may pursue with relationships.

The hybrid approach uses both the transactional approach and the relationship-oriented approach to supplement the disadvantages of each with the complementing advantages. Implementing the relationship-oriented approach in addition to the transactional strategy, generates the longer term loyalty, continuity, and quality between partners, while reducing dependency and gaining price efficiency and information (Baker, 1990). Both Baker (1990) and Uzzi (1997) found that most companies implement a hybrid strategy noting that the relationship portion of the approach tend to be smaller in number relative to transactional relations. Uzzi (1997) elaborates on this finding by explaining that these ties tend to be more critical to a specific partner's process and, therefore, requires a deeper relationship. Baker (1990) agrees a company usually works with a lower amount of relationship-based connections, but also notes, in some cases, these connections may get the largest share of the business. Therefore, a company needs to decide how and where they spread their business with partners and which relationships form and grow to be each type.

In order to manage their network and develop different types of relationships to receive the desired value from their partnering companies, a company needs to understand the process required to build the different relationship types and which companies in their network are inclined to pursue each of the three relationship types. Holm (1999) provides a model aimed at establishing the necessary steps a company must partake in with another in order to establish the desired value. Yet, choosing a specific company to partake in those steps relies on that company's experience with building their own network and their resources (Gulati, 1999). Additionally, as different challenges arise, relationships may evolve out of necessity to achieve value (Anderson et al., 1994). This behaviour leads to the notion of changing perceptions companies have of one another and its effect on an overall position for a focal company in a network (Abrahamsen et al., 2012).

Beginning with the objective of generating value, two companies engaging in a relationship must progress through certain steps. Holm (1999) provides a model to explain this process starting with their definition of a business network connection, "defined as the degree to which the focal relationship is directly connected to other relationships" (Holm et al., 1999, p. 475). Understanding the business network connection definition leads to mutual commitment, "a willingness on the part of both partners to make short-term sacrifices to realise long-term benefits in the relationship" (Anderson and Weitz, 1992, cited in Holm et al., 1999, p. 473; Dwyer et al., 1987, cited in Holm et al., 1999, p. 473). Participating in mutual commitment generates mutual dependence, "the strength of a balanced dependence relation between the partners" (Kelley and Thibaut, 1978, cited in Holm et al., 1999, p. 473). This concept of mutual dependence results in value creation, "the effect of the engagement in the relationship on the joint profitability of the partner" (Holm et al., 1999, p. 473). This process can be tied to the benefits found from the relationship-based connections, also known as ties, described by Baker (1990) and Uzzi (1997). For example, Uzzi (1997) describes a property of a relationship-oriented connection, which occurs when partnering companies engage in voluntary extra effort back and forth displaying the short-term sacrifices modeled by Holm (1999) as mutual commitment. Additionally, described earlier, as the partnership grows, the depth of knowledge of each other's products and processes grows allowing for defects in products to be identified by the partnering company (Uzzi, 1997). This process exemplifies an aspect of mutual dependence because both companies begin to look out for each other to increase quality of the outputs reinforcing the relationship. Contrary to this experience, the transactional connection, may only have the value of keeping costs low and contribute towards a non-critical process, which therefore, may never expose itself for a need to enter the state of mutual commitment. As a result, some companies display more propensity to enter partnerships versus others.

In 1999, Gulati correlated the likelihood of a company to enter alliances based on their network resources. These resources become available as companies participate within their network leveraging the information flows generated by partners, which are not bounded within the company itself and emphasise social interactions of business relationships (Gulati, 1999). Gulati also makes a critical assertion that the embeddedness of the company can "restrict and enlarge the opportunity set of alliances available" (Gulati, 1999, p. 400), since companies with a suite of overly strong relationships may limit the possible partners as well as decrease the information flow, which Uzzi (1997) conceptualises as "overembeddednes". Therefore, in choosing partners, companies must take care to balance the types of their relationships in order to keep their network resources at an optimal level (Uzzi, 1997). Gulati illustrates the correlation of network resources to propensity for alliance formation by representing network resources as centrality measurement, including Freeman's definition "computed by counting the number of companies that a focal company must go through to reach other companies in the network" (Freeman, 1979, cited in Gulati, 199, p. 406). By illustrating this correlation, Gulati proves resources are not solely drawn from the capital within the company, but from a company's surrounding network. As companies go through this process, they become more likely to participate in new alliances, after realising the benefits. In summation, companies have a higher tendency to participate in building stronger relationships when they have already seen the value generation from prior experience and have not yet reached a point where their current relationship strengths prevent them from engaging in a new relationship.

However, in critical situations, a company may need to develop or change relationship dynamics in order to solve a problem. Anderson et al. (1994) utilise two case studies—saw equipment manufacturer & printing company—to map a focal relationship between two partners, chosen because a business problem arose needing resolution, to other surrounding partners. For the saw equipment manufacturer, they adapted a saw to cut through frozen timber used by the sawmills; however, the sawmills needed to engage with blade producers to adapt the blade design and content in order to work effectively with the new equipment design. For the printing company, when the paper supplier changed papers that was undesired by the printing company's customer, the printing company sought out a company that would produce a similar paper and would work with the ink (Anderson et al., 1994). Through reviewing these cases, they found the focal relationships depended on three different relationships. First, a company may depend on a company with whom they were directly connected. Second, a company may utilise a company with whom they have no direct connection, but both companies share a mutual connection. Third, the company may search for partners with whom neither they nor their partners share a connection. These relationships are sought in need of resources and activities to help resolve business problems, which lead to changes in network structure as relationships are created or terminated (Anderson et al., 1994). Furthermore, these adaptations, forced companies to engage in activities that are considered extra to a stated contract, such as changing the style and content of saw blade production or finding a new vendor who will generate a paper similar to the prior vendor. These steps begin a state of mutual commitment in Holm's (1999) model of relationship development that can lead to value creation for both companies. Additionally, these companies used their network of partners to solve the problem, and, in the case of the printer, created a new alliance with a company, out of necessity. Another concluding point becomes apparent, in that, as a company within a network shifts its strategy, other companies may shift their strategies in response leading to changing network dynamics.

Companies shifting relationship strategies or adapting to critical situations occurs across time, and, therefore leads to a continually evolving business network. Abrahamsen et al. (2012) construct network dynamics in terms of dimensions of time and space. Time, they derive, defines itself by merging experiences across all timeframes—past, present, and future—citing Easton and Araujo that this combination creates "a continuum where the parties take into account learning from their connected relationships, and these are shaped and projected to the future" (Easton and Araujo, 1994, cited in Abrahamsen et al., 2012, p. 260) acknowledging the limitations of viewing experiences separately according to time. Space, they define as "the interplay between actor bonds, resource connections and activity links (the so-called ARA-model)" (Abrahamsen et al., 2012, p. 260). Furthermore, Abrahamsen et al. (2012) aim to use these dimensions to understand change in both network position and network roles for companies. Network position is defined as "the sum of all its relationships" (Abrahamsen et al., 2012, p. 261). Network roles are defined as "how an actor interprets her/his network position and serves to understand her/his subsequent networking behaviour" (Abrahamsen et al., 2012, p. 262). Because actors act within the context of others, perceptions of connections may influence position and role

(Abrahamsen et al., 2012). As a result, in order for companies to change properties within the network, they need to change properties of their connections and have shared understanding of positions and roles, a concept supported by Abrahamsen et al. (2012). For example, Abrahamsen et al. (2012), study a fish distribution network in which a fish market is found to have less attractive storage, processing, and sanitation qualities, which leads the perceptions of the clients within the market to value them less as an option, but the fish market has not taken the steps to improve upon these concerns. This process displays the decaying perception and change of that market's role in the network, and, if they are willing to understand the outside perspective of their role and increase the quality, they could re-establish a higher level of importance (Abrahamsen et al., 2012). Similarly, Holm's (1999) model and Uzzi's (1997) both indicate in their work, when building a relationship, there is a stage of commiting to one another through reciprocity over time. Through this process each partner is changing their perception of the other's role in the network, described in terms of the work of Abrahamsen et al. (2012). Thus, changes in relationships locally have the potential to impact other relationships in the network because network roles are changing, to which other companies will evaluate and react over time. Therefore, business networks as a whole will evolve its content and shape over time.

In summation, as a company prepares to better understand its network, they need to understand their network properties. First, a company needs to understand the components of the network including the types of other companies involved as well as maintaining an understanding that their perspective may contain limits. Second, there are different types of relationship strategies companies will review or inherently implement to achieve their goals. Third, as companies adapt relationships to achieve their goals across time, participating companies within the network reevaluate their perceptions of the other companies and their roles in the network, which leads to constantly changing network. Thus, if a company is attempting to understand the network dynamics, they need a framework in which to view the changes and manage accordingly as a whole.

Viewing the set of a company's relationships as a portfolio allows for companies to observe changing relationship dynamics in their network. Eilles et al. (2003) introduce a three stage approach to managing a network of relationships. They describe the steps as, "develop a capability-based strategy", "build a portfolio of relationships", and "manage the relationship portfolio" - as a way to "partner intelligently" (Eilles et al., 2003, pp. 30-31). Additionally, Eilles et al. (2003) describe the implementation of a relationship map, which identifies the relationship connections and their roles as well as patterns of inefficiency. Using this process allows a company to visualise their network and relationship roles; thus, as the roles in a company's partnership change or perceptions of a partnered company's position changes and relationships are generated or terminated, the impacts are observed in the context of the other relationships and inefficiencies can be avoided or dealt with. However, for the group insurance carrier's distribution network, visually mapping out all network relationships and identifying roles and changes using the Eilles et al. (2003) method may become difficult and time-consuming to manage for thousands of relationships it contains. For example, the group insurance insurance carrier distribution network in this work investigates the relationships of over 500 sales representatives working with over 10,000 brokers and 400,000 employers. Therefore, another method should be researched. Orsenigo et al (2001), as an example, mapped out thousands of relationships in the pharmaceutical industry and analysed them through a discipline called graph theory. As a result, this method should be investigated as a possible tool to analyse the group insurance industry, where thousands of relationships are managed.

3.1.2 Network Metrics

Graph theory provides a platform on which to analyse a network with a higher volume of relationships. Because graph theory abstracts and organises information into a mapping of relationships between entities, as shown in Figure 3.3, its data can be processed using a series of techniques to generate insights.

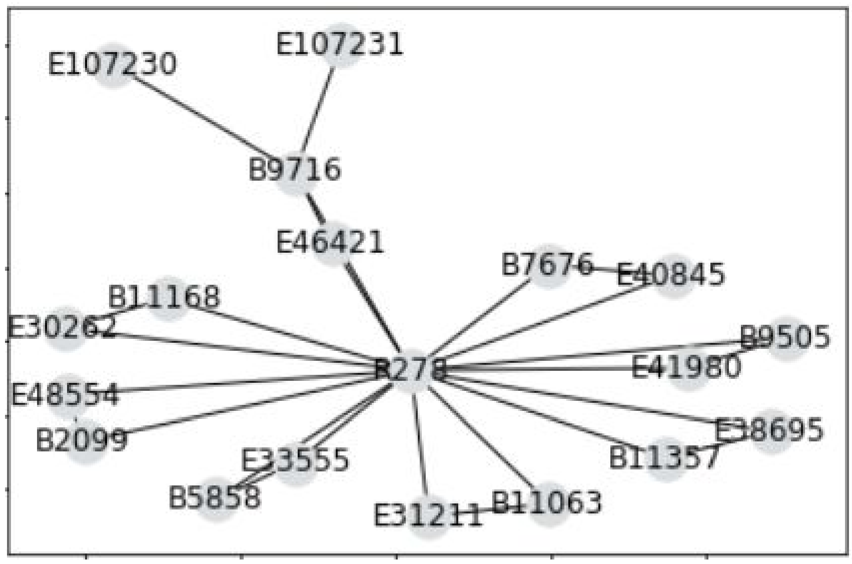


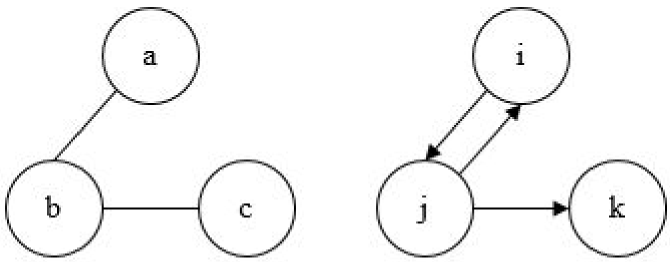
Figure 3.3 Actual Network Example for a Sales Representative

Illustrates a real example for one of the sales representatives employed by the participating group insurance carrier. The sales representative (R278) worked with eight brokers to sell insurance to eight employers.

For example, Orsenigo et al. (2001) implemented graph theory to research over "5000 collaborative agreements among around 2000 firms/institutions" across 20 years in the pharmaceutical industry. Furthermore in 2010, Xiang et al. applied aspects of graph theory to understand relationships within social networks using data from thousands of users and relationships across two social media companies. Therefore, researchers have used graph theory as a tool in different contexts to investigate high volumes of relationship connections and, therefore, could be applied to analyse the volume of relationships existing in an insurance carriers network. While Wagner and Neshat (2010) do not directly study insurance carriers with graph theory, they allude to their graph theoretic models to be useful for insurance carriers to implement. Therefore, while this research does not implement the methods of Wagner and Neshat (2010), it provides a new investigation into how graph theoretic measures may be applied to study the distribution networks of group insurance carriers, an approach not observed in the literature.

In addition to handling networks with high volumes of relationships, graph theory provides options on how to organise and measure the network properties. Different graph formats allow for relationship data to be represented to varying degrees depending on the relationship existing between two participants. Therefore, the graphs can be structured in the appropriate way that answers questions about the network. Furthermore, the quantitative measures used to understand the network explain different perspectives, namely network wide characteristics or a specific participant's characteristics with respect to the rest of the network.

Networks can be formatted into two types of graphs, undirected and directed. Undirected graphs, as shown in Figure 3.4a, contain a set of vertices (V) representing the participants involved in a relationship and a set of edges (E), where a single edge connects two vertices, representing the relationships between participants. Identical to undirected graphs, directed graphs, as shown in Figure 3.4b, contain a set of vertices representing relationship participants and a set of edges; however, the edges indicate a directionality of the relationship. Thus, in order to have a mutual relationship, there must be two edges, such as Vi→Vj (Eij) and Vj→Vi (Eji), and, if the relationship is one way, then only one edge is used, such as Vj→Vk (Ejk). Therefore, if the directionality of the relationship is not important to the question needing answers, an undirected graph would be used, but if that level of detail is necessary, a directed graph is needed. For example, if someone attempted to map their friendships in a graph and only wished to map if a friendship simply existed, they would choose an undirected graph; however, if they wanted to map who initiated the friendship first, they would need a directed graph. As a result, the type of graph selected depends on the problem being solved.



(a) **(b)**

Figure 3.4 Comparison of Undirected and Directed Graphs

Examples of the two graph types. (a) Undirected graph with vertices V = {a, b, c}; the edges E = {Eab, Ebc}. (b) Directed graph with vertices V = {i, j, k}; the edges E = {Eij, Eji, Ejk}

Analogous to the terms of network horizon and network context as described in section 3.1.1, as in Anderson et al. (1994), the definitions of the network dictate the structure and shape of the graph. The observer's knowledge about the network horizon will put boundaries on the number of vertices and edges contained in the data set. Additionally, modelling the actors as the vertices and understanding the relationship type will determine if the edges will be directed between nodes or undirected illustrating aspects of network context. In other words, these conceptual decisions lead to the appropriate selection of the correct tool needed to accurately reflect the problem. For example, Ji and Fan (2014) analyse the global crude oil markets and pricing power between markets using a specific type of undirected graph called a minimal spanning tree. Their decision results from a desire to reduce the complexity in the connections amongst all their network participants, while maintaining core information they needed to measure the markets. Ji and Fan's (2014) network horizon was rather large and, because the markets interact with one another in a two way relationship, an undirected graph could be implemented and simplified into a minimal spanning tree to illustrate their problem. Similarly, Gorman and Malecki (2000) implemented undirected graphs in their work on internet provider networks because they simply needed to know if two physical locations, namely cities, were connected via fibre optic cable; therefore, the vertices are cities and the edge is a physical cable with no preference for direction. On the other side, however, Orsenigo et al. (2001) needed to distinguish the direction of the connection between two different nodes—the "Originators" and the "Developers"—in order to analyse the patterns of generated research agreements between companies and institutions; hence, since the question included a need to know which organisation generated the agreement, they implemented a directed graph. In each case, the network horizon, the boundaries of knowledge within the network, or network context, the defined participants and relationships within the network, dictated the decision for which graph type needed to be used in order to understand the problem effectively. Yet, selecting the correct graph is only the first step to using graph theory to solve a problem; the graph's properties need to be measured to derive insights.

To take the next step in using graph theory to analyse a problem, the appropriate properties and measurements intrinsic to the graph, and which correspond to the problem, need to be selected. While there are various forms of properties and measurements within a graph, connectivity and centrality offer simplistic insights into understanding the network. On the one hand, connectivity aims to measure the overall level to which the network as whole is connected by using the vertices and edges (Gorman and Malecki, 2000). On the other hand, centrality, aims to measure the network position of a node, where the position of the node indicates its influence or power over the other nodes in the network (Freeman, 1978). For example, Freeman (1978) explains that a node with a high number of connections relative to its peers may be perceived as holding greater volumes of information than its peers; therefore establishing a higher position of importance in the network. Additionally, both measurements encompass variations of measurement methods aimed at understanding different perspectives of the same idea and similar to graph type selection and measurement selection, the choice of the measurement depends on the problem.

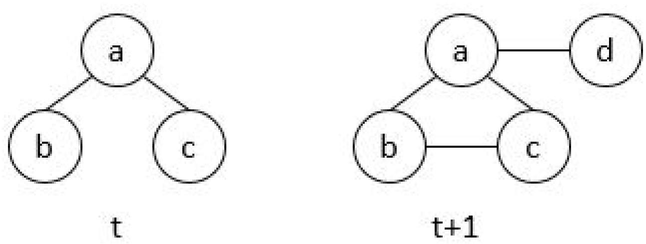
First, even though the number of edges and vertices in a graph are used to calculate connectivity, slight variations in the calculations create different meanings. Gorman and Malecki (2000) implement four variations of connectivity—cyclomatic number, alpha index, beta index, and gamma index—to measure internet provider networks. They define the cyclomatic number as the difference of the number of edges and the sum of the number of vertices and the number of sub-graphs, the beta index as the number of edges divided by the number of vertices, the alpha index as “the ratio between observed number of circuits (loops) to the maximum number of circuits that could exist in a network”, and the gamma index as “the ratio between the actual and the maximum number of edges (links) in a network” (Gorman and Malecki, 2000, pp. 119-120). Additionally, each of the measures indicates a specific concept -

> The cyclomatic number gives a basic indication of the size of a network. . . The beta index indicates complexity of the network. . . A more useful index of connectivity is the alpha index or ‘redundancy index’. . . An alpha index value of 0 would indicate a branching network, where the removal of any one link would break the network into two sub-graphs. A value of 1 or 100% indicates a fully connected network. . . the gamma index … gives an indication of the level of interconnection within the network, or the proliferation of alternate routes available to transit data from one node to another [Gorman and Malecki, 2000, pp. 119-120].

Gorman and Malecki also associate the gamma and beta indices with “a high correlation with economic development: the more economically developed a country, the greater the number of different routes by which goods or data can be transported, increasing efficiency and decreasing congestion” (Gorman and Malecki, 2000, pp. 120-121). Therefore, the proper index or indices needed to analyse the problem depends on the problem itself, whether it is network size, complexity or level of connectedness.

Additionally the measure of centrality offers varying perspectives on the position of a specific node in the context of its network. The root of different perspectives on centrality begins with their definitions. Freeman (1978) defines three forms of point centrality: degree, betweenness, and closeness. For degree centrality, Freeman (1978) expands upon Nieminen’s (1974) concept defining the centrality as the number of direct connections immediately adjacent to a single node. Next, Freeman (1978) defines betweenness centrality as sum of all the probabilities a particular node is contained within a shortest path between two other nodes in the network relative to all of the shortest paths available between the two neighbouring nodes. Lastly, Freeman (1978) defines the third point centrality closeness as, expanding upon Sabidussi’s work in 1966, relating to the sum of the number of edges contained within the shortest path of one node to every other node within the network. Additionally, Freeman (1978) provides methods for measuring each centrality on a node that is both graph size dependent and graph size independent in order to relatively compare one of the centrality measures of two nodes from different graphs. Therefore, it is important to understand if the problem needs to compare nodes from different graphs because it would determine which calculation to implement. Furthermore, there are three proposed definitions of centrality because they aim to measure different aspects of position in a network. Degree centrality measures the level of communication activity, the more nodes a node is directly connected with, the higher level of communication; whereas betweenness and closeness centrality measure different aspects of communication control; betweenness measures the information flow between to nodes, while closeness measures how efficiently one node can communicate with the entire network (Freeman, 1978). In conclusion, similar to selecting the correct graph type and connectivity measurement, the centrality measure selected needs to match the definition of the problem.

Furthermore, observing network measurements throughout time as networks change provides a more robust process for analysing a problem. Specifically for business networks as previously discussed, businesses continually make changes whether it is working with different suppliers or changing customers, either terminating a contract or generating a new one, and these changes result in changes in the network structure in the form of generation and decay of edges and the entering or departing of vertices. Thus across time, the number of edges and vertices will be different as well as their structure, and, as a result, metrics such as connectivity and centrality have the potential to change because their foundation is based on graph structure. For example in Figure 3.5, the graph at time t has three vertices and two edges, where vertex a is connected to both vertex b and vertex c; however, vertex b and vertex c are not connected. As time passes to t+1, the graph now as four vertices and four edges, where a new vertex d is now connected to a and vertex b and vertex c are finally connect. Thus, both the amount of vertices and the amount of edges has increased changing the graph structure, which may result in a change in the network measurements. As part of their analysis on the international oil markets, Ji and Fan (2014) implemented a series of techniques to understand changes across time. A portion of work included reviewing two periods of time between 2000-2008 and 2008-2011. When comparing graphs of these periods, Ji and Fan (2014) concluded, through degree and betweenness centrality, the United States remained an important actor in the oil markets, despite decreases in their graph theoretic measures, and African markets increased their importance (Ji and Fan, 2014, p. 97). Additionally, Orsenigo et. al (2001) reviewed 20 years of directed graphs on pharmaceutical research agreements illustrating several properties including rapid growth in the network, varying points of network stability, and correlations between new technology implementation and structural network changes (Orsenigo et al., 2001, p. 500). Therefore, when using graph theoretic measures to understand networks and how they change, it is imperative to measure properties such as degree or connectivity across time in order to observe structural changes, which can then be correlated with network behaviours.



(a) **(b)**

Figure 3.5 One Graph Viewed from Two Points in Time

A single graph at two points in time: t (a) and t+1 (b), where t+1 is a point in time after t.

Graphs are tools which can be used to understand network structure; however, the measurements and graph types chosen must represent the problem under review, and, while they can illustrate and quantify change or lack thereof, they lack the finer grained detail, at this level of analysis, to explain the drivers behind the changes. Centrality can measure the power of each vertex within the network. Connectivity can measure the overall connectedness of all vertices. Edges can explain if a relationship exists between two entities and provide directionality of the relationship in a directed graph, if required by the problem. Time can show how these measurements change. Yet, these properties cannot conclude why the power of a vertex grew over time or how a network became less connected. As a result, another tool is needed to better understand those changes.

3.2 Relationship Measurement

In order to understand the structural changes taking place amongst the relationships in the network, the changes in the relationships themselves must be understood. From a business network perspective, specifically in the marketing of a company, the key objective for companies is to build strong customer relationships (Kim and Frazier, 1997, cited in Shi et al., 2009; Sheth and Parvatiyar, 2002, cited in Shi et al., 2009). Additionally, there is an emphasised importance on customer relationships being of good quality and long-term (Parasuraman et al., 1985, cited in Shi et al., 2009, p. 659; Crosby and Stephens, 1987, cited in Shi et al., 2009, p.659; Crosby et al., 1990, cited in Shi et al., 2009, p. 659). In other words, this perspective aligns with relationship-oriented relationship style, previously discussed (Baker, 1990; Uzzi 1997). Furthermore, the goal of building a strong customer relationship can be understood in terms of Granovetter's (1973) concept regarding the strength of a tie mentioned in section 1.1 of this work, where a combination of factors characterise the strength or weakness of a tie. Therefore, companies strive to build the strength of these ties towards a relationship-oriented strategy. Yet, in order to achieve this goal, companies need to understand what drives growth in a relationship and what methods exist for measuring the drivers. To address relationship measurement needs, researchers have developed two main categories of literature: relationship quality (Naudé and Buttle, 2000; Huntley, 2006; Rauyruen and Miller, 2007; Storbacka et al., 1994) and relationship strength (Shi et al., 2009; Shi et al., 2016).

3.2.1 Relationship Constructs

The perspectives of relationship quality and relationship strength both aim to understand the properties of relationships between partners promoting the relationship-oriented style and long-term participation. However, they approach the problem from different viewpoints. The literature defines relationship quality through relationship attributes (Naudé and Buttle, 2000; Huntley, 2006; Rauyruen and Miller, 2007; Storbacka et al., 1994). As the strength of the attributes grow, they will affect the business outcomes with respect to loyalty and profitability (Huntley, 2006; Rauyruen and Miller, 2007; Storbacka et al., 1994). However, the literature on relationship strength views the relationship quality perspective as lacking a clear definition (Shi et al., 2009; Shi et al., 2016), a perspective Huntley (2006) agrees with and works to resolve. As a result, Shi et al. (2009) derives a definition for relationship strength as, "the extent to which the partners are bound, and reflects the ability of the relationship to resist both internal and external challenges" (Shi et al., 2009, p. 665), and propose a model to measure the definition, based on three components. In both cases, the goal is to understand both the growth of a relationship between two companies and why it persists across time. On the one hand, as a relationship grows, it evolves towards the relationship-oriented approach on the spectrum discussed in section 3.1. On the other hand, if it decays, it becomes more transactional in nature or terminates. By understanding these movements and growth in the individual relationships, a company can understand the aggregate impact to their relationship network strategy. Yet, both the relationship quality and relationship strength literature need exploration to answer whether the relationship quality perspective or relationship strength perspective best measures the change in relationships.

Beginning with relationship quality, the lack of clear definition produces varying understandings of the concept. Storbacka et al. (1994) and Huntley (2006) construct causal models where attributes may have a direct impact to business objectives such as customer loyalty and profitability or they may indirectly impact those objectives by influencing another attribute in the chain. For example, Storbacka et al. (1994) expand upon an established simplified sequence of service quality influencing customer satisfaction driving customer relationship profitability by altering the path to include customer satisfaction as influencing relationship strength. Altering the path in this way affects relationship longevity, which drives customer relationship profitability (Storbacka et al., 1994). Additionally, Storbacka et al. (1994) add attributes to account for unexpected conditions, which do not follow their redefined core path. Huntley (2006), however, implements a method using the attributes of goal congruity, trust, and commitment to influence profitable outcomes. Goal congruity not only contributes to relationship quality, but contributes influence to trust and satisfaction, which in turn influence relationship quality; as a result, partners experience profitable outcomes (Huntley, 2006). Rauyruen and Miller (2007), on the other hand, focus on a non causal model for demonstrating impacts to customer loyalty. They use four attributes—service quality, commitment, trust, and satisfaction—which are correlated positively with loyalty (Rauyruen and Miller, 2007). Naude and Buttle (2000) approach the topic from different perspective by isolating relationship attributes through interviews with company leaders; through this approach, they discovered by understanding the importance of the attribute to the overall relationship, "there are different views of what determines a good relationship" (Naudé and Buttle, 2000, p. 360). As a result, these different perspectives, without a unified clear definition can lead to difficulty in testing the relationship attributes and their contribution to success, a notion supported by Shi et al. (2016). However, despite the differences in perspectives, there are some attributes that appear across the literature.

Across the relationship quality literature there are core attributes affecting relationship outcomes. Yet, the are attributes outside the core spectrum that should be considered. Satisfaction appears widely as core attribute in discussions of relationship quality (Storbacka et al., 1994; Naudé and Buttle, 2000; Huntley, 2006; Rauyruen and Miller, 2007). Satisfaction derives from the service or product quality (Storbacka et al., 1994; Huntley, 2006; Rauyruen and Miller, 2007). Some resources point to commitment (Storbacka et al., 1994; Huntley, 2006; Rauyruen and Miller, 2007) and trust (Naudé and Buttle, 2000; Huntley, 2006; Rauyruen and Miller, 2007) as core factors. Outside of these few attributes, however, there are factors which do not appear widely across the models. For example, Storbacka et al. (1994) include a concept of bonds in their model capturing several barriers, including but not limited to "knowledge", "social", “cultural”, and “technological”, that prevent the termination of a relationship (Storbacka et al., 1994, p. 27). Additionally, Naude and Buttle (2000) synthesise major constructs across the literature including Storbacka et al. (1994). Through this approach they also identify communication (Storbacka et al., 1994, cited in Naude and Buttle, 2000, p. 353; Mohr and Spekman, 1994, cited in Naude and Buttle, 2000, p. 352), joint problem solving (Mohr and Spekman, 1994, cited in Naude and Buttle, 2000, p. 352), goal congruence, and investments (Wilson and Jantrania, 1996, cited in Naude and Buttle, 2000, p. 353). Naude and Buttle (2000) also include power and profit in their own work surveying executives of companies. As a result of their process, Naude and Buttle (2000) found that several attributes dominated the list, which suggests business leaders themselves have different ideas of what attributes drive their relationships. Therefore, it is important to take this into consideration, when measuring relationships. For example, in this work two types of relationships with different purposes are analysed. The purpose of the employer is to find an insurance company that meets their insurance and service needs to manage their employees. The purpose of the broker is to match the insurance companies with the employers in exchange for compensation, a dynamic different from the employer. Therefore, it can be hypothesised the relationship attributes selected for each relationship may be different. However, this variability in reviewing relationships has lead researchers to choose differing attributes leading to a lack of definition for relationship quality.

On the other hand, the relationship strength literature strives to define a clearer construct for relationships. As previously discussed, the variability in methods and constructs in relationship quality has led to a lack of a definition. Shi et al. (2009) propose a definition to remedy this problem, “the extent to which the partners are bound, and reflects the ability of the relationship to resist both internal and external challenges" (Shi et al., 2009, p. 665). In addition to defining relationship strength, Shi et al. (2009) propose a model consisting of three different strengths—affective strength, cognitive strength, conative strength—intended to measure different aspects of the relationship. Affective strength reflects the bond between partners in a relationship that is based on "emotional attachment" (Shi et al., 2009). Cognitive strength reflects the economic benefits both partners perceive impacting the decision to continue partnership (Shi et al., 2009). Conative strength reflects the likelihood of a relation to terminate if a variety of incentives to do so are present (Shi et al., 2009). In summation, the relationship strength definitional model contains emotional, economic, and termination barriers under incentive components, which, in their nature, overlap with the constructs of relationship quality.

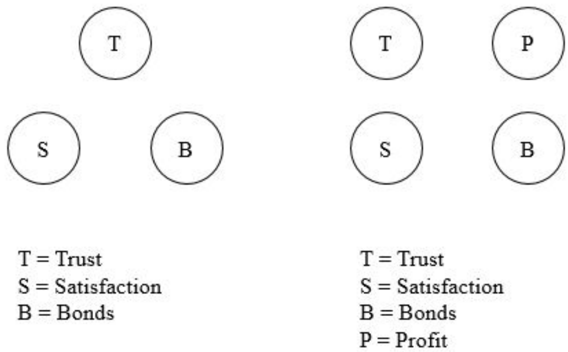
While the relationship strength approach provides a clear definition of what relationship constructs measure, there is considerable overlap in the models. For example in their explanation of affective strength, Shi et al. (2009) cite customer satisfaction as an input into the decision making that leads to the persistence of a relationship. Furthermore, the concept of bonds put forth by Storbacka et al. (1994) is directly aimed at understanding the barriers to termination similar to conative strength by definition and includes aspects that are social and cultural. This leaves the economic aspects, which are encapsulated by cognitive strength (Shi et al., 2009). Additionally, Naude and Buttle (2000) consider profit in their work which would fall under the affective strength dimension, since it relates to an economic basis for deciding to continue a relationship. As a result, the definition of relationship strength is an important clarification; however, the three part model is very rigid in definition and contains overlapping characteristics with the relationship quality research. Despite this clarity in definition, relationship quality offers flexibility providing a better foundation for understanding the broker and employer relationships in this work.

In summation, the relationship quality approach provides a framework for measuring attributes in order to categorise which relationships in a business network are transactional versus relationship-oriented. Using Naude and Buttle's (2000) survey approach to identifying important relationship attributes allows for a company to understand which attributes are most important in their relationships, an important step, since importance rankings amongst attributes have the potential to change. For example, this work focuses on a single group insurance carrier working with brokers to insure employers. The insurance carrier's relationships with brokers perform a different function than its relationships with employers; and, therefore, may display different characteristics. However, it is simply not enough to know which relationship attributes are important in determining if a relationship is strong enough to be considered relationship-oriented or transactional. Naude and Buttle (2000) also found that the importance of one attribute over the other may not carry equal weight. In other words, given two relationship attributes, attribute one could be two times more important in determining the quality of a relationship than the other. Therefore, the relationship quality perspective needs to be expanded to not only account for varying attributes, but account for varying importance among the attributes. This work aims to provide a method for measuring both of those types of importance supplementing the current literature.

3.2.2 Relationship Measurement

Graph theoretic principles provide a platform for producing a measurement of individual relationships. This method will account for relationship definitions to have both varying attributes and varying importances among those attributes in order to determine relationship quality. The following techniques have been exposed to a variety of industries including Total Quality Management evaluation (Kulkarni, 2005), barriers to green supply chain management evaluation (Muduli et al., 2013), and manufacturing system evaluation (Singh and Singru, 2013). Conceptually, the approach considers attributes of a process to be vertices of a directed graph (Kulkarni, 2005; Muduli et al., 2013; Singh and Singru, 2013), where the edges between vertices represent the importance of one vertex over another (Kulkarni, 2005; Muduli et al., 2013). If the system is modeled via this method, then, because graphs can be modeled as a matrix (Gorman and Malecki, 2000; Orsenigo et al., 2001; Kulkarni, 2005; Muduli et al., 2013; Singh and Singru, 2013), the permanent function of the matrix can be used to generate an index (Kulkarni, 2005; Muduli et al., 2013). Furthermore, this index can be used to compare relationships (Kulkarni, 2005; Muduli et al., 2013). The permanent function of the matrix is defined as an equation in combinatorial mathematics and is considered as a "standard matrix function" (Jurkat and Ryser, 1966, cited in Muduli et al., 2013, p. 340). In general, it is similar to the determinant of a matrix; however, all negative terms in the determinant equation are changed to a positive term (Grover et al., 2004, cited in Muduli et al., 2013, p. 340). As a result, using graph theory in this manner generates an index with potential to measure the relationships a group insurance carrier has with its brokers and employers. Furthermore, while Shi et al. (2009) use the insurance industry to develop their ideas on relationship strength, the current literature does not show the distribution networks of group insurance carriers as an industry where the graph theoretic method of generating an index has been applied. Therefore, this work takes on a new perspective of how to develop a method for quantifying broker and employer relationships with a group insurance carrier. Yet, understanding the first step of identifying relationship attributes and second step of understanding of their importance were explored.

In order to build a relationship index, the first step requires the mapping of the relationship attributes as vertices in a directed graph. Kulkarni (2005) developed a process to evaluate the performance of companies implementing a process called total quality management by isolating implementation performance attributes—infrastructure, top management support, strategic planning, employee empowerment, customer satisfaction—and modelling them as a directed graph. In a similar approach reviewing green supply chain management, Muduli et al. (2013) reviewed the Indian mining industry to understand the barriers preventing companies from adopting green supply chain management policies. Through the process, they identified these attributes—Information Gap, Insufficient Society Pressure, Poor Legislation, Capacity Constraints—and modeled them as vertices in a directed graph (Muduli et al., 2013). In both instances, they had to identify the factors best representing the situation. However, this application is not limited to abstract processes, such as the performance of process implementation explored by Kulkarni (2005) or the barriers to green supply chain management explored by Muduli et al. (2013). Singh and Singru (2013) apply the process to understand the components within a manufacturing process analysing a more tangible system. Because of this method's flexibility in modelling both abstract and concrete systems, it can be used to model a relationship. Consider some of the relationship attributes discussed in section 3.2.1, trust, satisfaction, and bonds. If a company identified these attributes as the highest determinant of a quality relationship, then they could be modeled as vertices as shown in Figure 3.6a. Furthermore, if the company identified additional attributes driving the quality of the relationship, an additional node could be added to the graph as shown in Figure 3.6b. However, while the relationship attributes have been modeled as vertices, the graph lacks edges.

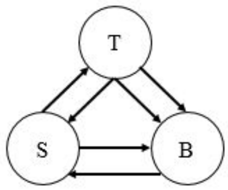


(a) **(b)**

Figure 3.6 Modeling Relationship Attributes as Vertices

Modelling relationship attributes as vertices in a graph without edges: (a) models three attributes and (b) models four attributes.

Once, the attributes in a system are modeled as vertices, the importance between attributes can be modeled as the directed edges. Naude and Buttle (2000) discovered the attributes' importances may vary across relationships. As a result, a model measuring relationships should have a means for including measures of importance. The graph theoretic model used by Kulkarni (2005) and Muduli et al. (2013) provides such a method by connecting all the vertices in the directed graph with all possible edges, as shown in Figure 3.7.

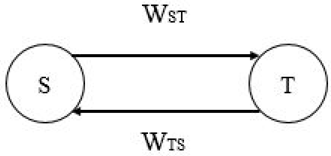


T = Trust
S = Satisfaction
B = Bonds

Figure 3.7 Fully Connected Graph of Relationship Attributes

Modified relationship attribute graph to include the maximum possible amount of directed edges.

By having a fully connected directed graph, the importance of one attribute over another can be modeled by applying a weight to each edge (Kulkarni, 2005; Muduli et al., 2013). Thus in Figure 3.8, the weight W_{ST} signifies how much more important satisfaction is compared to trust in a relationship and W_{TS} signifies how much more important trust is compared to satisfaction in the relationship. Both Kulkarni (2005) and Muduli et al. (2013) recommend constructing a graph that contains all directed edges with weights to avoid information loss. However, if all edges cannot be measured, the method may still be applied, but the resulting index will be less accurate because of missing terms in the permanent function of the matrix used in calculating the index (Singh and Singru, 2013). After a system's attributes are both identified and weighted, the index can be calculated.

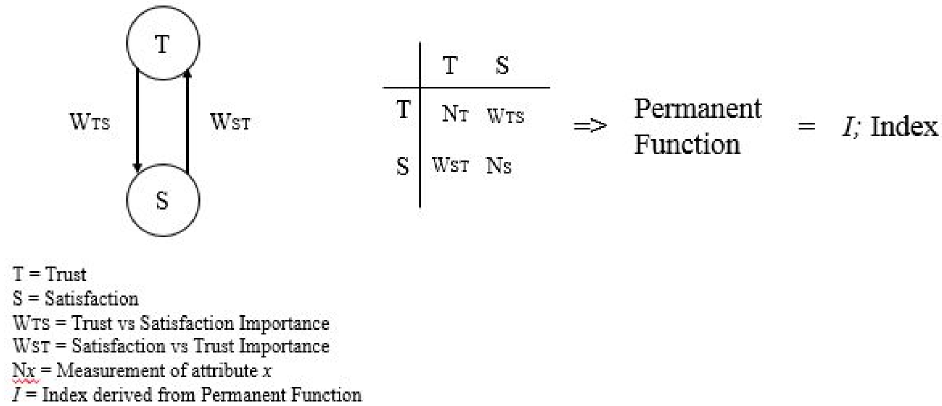


T = Trust
S = Satisfaction

Figure 3.8 Identifying Edge Weights Between Relationship Attributes

Relationship attribute graph containing two attributes with weighted directed attributes representing the importance of one attribute over the other.

The index created, as illustrated in Figure 3.9, by calculating the permanent function of the matrix representing the directed graph allows for comparisons across relationships (Kulkarni, 2005).



(a) **(b)**

Figure 3.9 Translating Relationship Attribute Graph into Relationship Index

Displays how a graph of relationship attributes (a) translates into a matrix (b). (b) The index *I* is created by calculating the permanent function of the relationship attribute matrix. *I* calculates to be a numerical value.

While calculating relationship indices for a group insurance carrier's relationships with brokers and employers is out of scope for this work, it is important to understand how the indices could categorise a relationship as either transactional or relationship-oriented. In order to complete the matrix representing the directed graph, measurements representing the attributes modeled as vertices need to be collected; then the index can be calculated (Kulkarni, 2005; Muduli et al., 2013). Despite the lack of index calculation in this work, the methods in this work complete the initial steps to the approach by both establishing which relationship drivers are important and generating insight into how those drivers are relatively weighted with respect to their importance within the relationship. This work follows the methods of Kulkarni (2005) and Muduli et al. (2013). Muduli et al. (2013) collected both measurements for the attributes and the importances between attributes in their work on barriers to green supply chain management. As part of their measurements, they were able to create maximum and minimum values for their indices, between which all companies could be evaluated on their status for implementing green supply chain management (Muduli et al, 2013). A relationship quality model could apply the same approach. The minimum value for the relationship quality index would relate to relationships behaving in a transactional manner. Therefore, the maximum value represents relationship-oriented connections. As a result, if all relationships could be categorised as transactional or relationship-oriented, a company could understand the ratio of transactional to relationship-oriented relationships existing in their portfolio of relationships. This ratio would allow for them to monitor their relationship strategy. Furthermore, as relationships weaken or strengthen over time, their index values will change helping to explain the changes in relationship network structure described in section 3.1.2 through graph theoretic measures like degree and gamma index. In conclusion, combining the graph theoretic approaches from overall network structure, section 3.1.2, and the relationship quality index, section 3.2.2, allows for a company to establish an understanding of both the types and prevalence of the various relationship types within their network. Once a company builds that understanding, they can take action to drive towards an optimal relationship strategy, whether it is a transactional, relationship-oriented, or hybrid approach.

Chapter 4: Methodology

This work generates foundational measures of the participating insurance carrier's sales representative network. To accomplish this task, there were two installments of work. The first phase implemented work to generate graphs of the network over a period of six years from 2011 to 2016. Each sales representative active throughout the six years had a graph constructed for each year and product their relationships were active. However, while four products exist in the data, only one was analysed in this work. This particular product was chosen because it represents a large share of revenue in the core products the participant offers. Therefore, this product provides a larger volume of relationships to observe and measure. Future work should compare a sales representative's performance between all four products, but was beyond the scope and time constraints of this work. Once graphs were built, both the degree (Freeman, 1978) of each sales representative and gamma index (Gorman and Malecki, 2000) of each sales representative's graphs provided a means of measuring the change in networks for sales representatives. However, these measures of degree and gamma index, as discussed in Chapter 3, have limitations in the level of detail the data can provide. It does not directly indicate why the network changes. As a result, a secondary approach is needed. In this approach, the goal was to understand relationship drivers and their influence on customers' decisions. However, there can be varying characteristics and relative levels of importance which dictate the decision (Naude and Buttle, 2000). For instance, as discussed in section 3.2.2, Naude and Buttle (2000) found varying definitions of quality relationships defined by the various combinations of different attributes. Additionally, section 3.2.2 outlined sources that had different attributes defining relationship quality as well as overlapping attributes. As a result, this work reviews varying approaches to relationship drivers (Cosby et al., 1990; Mohr and Spekman, 1994; Storbacka et al., 1994; Wilson and Jantrania, 1996; Naude and Buttle, 2000; Huntley, 2006; Rauyruen and Miller, 2007) synthesising a set of attributes. Once attributes were isolated, sales representatives from the participating insurance carrier were surveyed to understand both the order of importance of attributes in determining the decisions of brokers and employers and the degree to which one attribute was important relative to the other. The outputs from the surveys provide an input into a model adapted from other industries (Kulkarni, 2005; Muduli et al., 2013; Singh and Singru, 2013), which model attributes as a directed graph and use the permanent function of resulting matrix to develop an index to measure their respective fields. In the case of this work, the index has the potential to measure broker and employer relationships. It should be noted this work measures attribute importance at a single point in time. However, for longer studies using this index approach, it is appropriate to remeasure the attributes. Attributes should be remeasured periodically at the discretion of the company conducting the study, since networks adapt and perceptions change (Abrahamsen et al., 2012). Despite this consideration, by measuring the changes in these indices, the underlying changes that drive the network structure could be studied.

4.1 Network Structure

Measuring a group insurance carrier's sales representative network requires several steps to produce analysis. These steps can be broken into graph generation and analysis. While commonly used in social networks (Freeman, 1978; Xiang et al., 2010), using graphs to represent relationships has also been implemented on business networks (Gorman and Malecki, 2000; Orsenigo et al., 2001; Ji and Fan, 2014). Because a group insurance carrier's distribution relies on sales agents working with brokers and employers to sell insurance, graphs provide an optimal means of organising the data and analysing the sales network. Using graphs in this context establishes a new approach on how to handle this specific distribution network. Once graphs are built, they can be analysed using graph theoretic measures such as degree (Freeman, 1978) and gamma index, a measurement for connectivity (Gorman and Malecki, 2000). The purpose of using these two measures is to identify what type of relationships exist within the group insurance carrier's distribution network. This application furthers the work of Baker (1990) and Uzzi (1997) by providing a new method for characterising the transactional, relationship-oriented, and hybrid relationships.

Using degree and gamma index in conjunction with one another captures both the volume of total relationships and the volume of activity within a relationship. Taking these two measurements allows for a relationship to be categorised as a specific type. Section 3.1.1 outlines in detail the three relationship types, transactional, relationship-oriented, and hybrid. However, to relate them to the degree and gamma index measures, more detail is needed. The key distinction between the transactional and relationship-oriented approaches are the level of involvement between the partners; whereas, the hybrid approach represents a combination of the other two (Baker, 1990; Uzzi, 1997). Baker (1990), taking this notion further, establishes the concept of the two bounds, one strictly transactional in nature and one strictly relationship-oriented in nature. The transactional boundary represents a company who never repeats business with another company using a new company for every business deal, while the relationship-oriented boundary represents a company using only one other partner company to conduct all business (Baker, 1990). In summation, these two boundaries represent the volume of business a company conducts with its partners, which correlates with the gamma index. The purpose of the gamma index is to measure the actual amount of relationships in a network versus the total possible number of relationships (Gorman and Malecki, 2000). Therefore, for example in the context of relationship types, the relationship-oriented boundary represents two companies with all business connecting them. Since there are only two companies in that network and they are connected to one another, the actual number of relationships equals the maximum possible resulting in the maximum possible gamma index. Additionally, implicit in the definition of the boundaries is the number of relationships in existence. For the transactional boundary, many relationships exist, and, for the relationship-oriented boundary one relationship exists (Baker, 1990). Additionally, Uzzi (1997) also concludes transactional relationships tend to appear greater in number than relationship-oriented approach. The degree (Freeman, 1978) measures the amount of relationships a single entity maintains. Therefore, these measures can be used together to identify relationships; however, they need to be related to the group insurance carrier's distribution network, a new industry for analysis.

A group insurance carrier's distribution may use the gamma index and degree to identify relationship types. Within the network, in a simple model, a sales representative sells insurance to employers through a broker. In this model, the degree represents the number of employer and broker relationships managed by the sales representative. However, the broker, depending on their relationship with the sales representative, may not allow the sales representative to sell business to everyone of the employers with which they partner. Therefore, there is some variability in the number of actual employers to which the sales representative may sell products versus the total possible number of employers, which translates into the gamma index. Therefore, when correlating the gamma index and degree with the boundary concept of Baker (1990), a transactional sales representative is one who manages a lot of relationships, but only uses a broker one time to sell insurance to one employer. This represents a high degree low gamma index sales representative graph. The relationship-oriented approach, on the other hand, represents a sales representative who works with one broker and sells insurance to every employer in that broker's network. This represents a low degree high gamma index sales representative. Figure 4.1 illustrates these relationships.

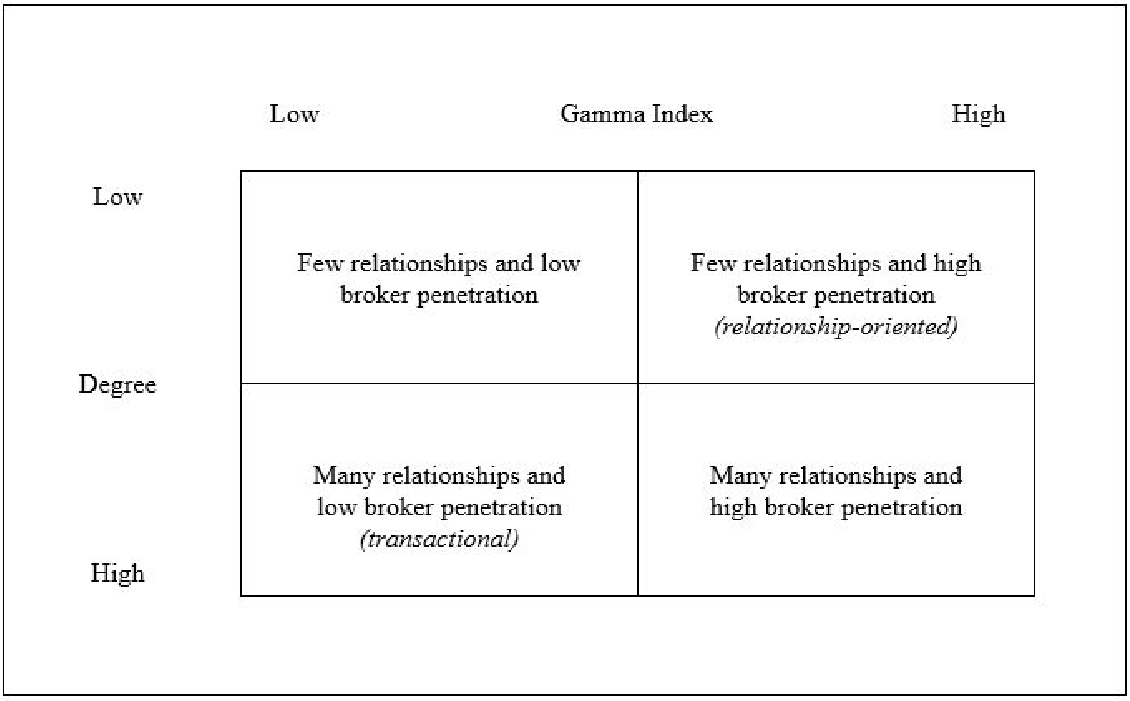


Figure 4.1 Correlating Graph Theory Measurements with Relationship Types

Grid mapping degree versus gamma index. It explains the relationship in terms of low and high values amongst the axes.

The other two corners of the index, found in Figure 4.1, represent extremes of the two discussed. A sales representative with a low degree and low connectivity represents someone who does not hold a strong relationship with brokers to acquire a majority of their business, but also is not successful at maintaining a high level relationships.

Therefore, because of the low gamma index, they are transactional. An example of this type of sales representative could be one who recently started their position at a company. On the other hand, a high degree high gamma index measurement represents a sales representative with the ability to both manage a high volume of relationships, while maintaining a majority share of business the broker is offering. This behaviour indicates a relationship-oriented approach with an ability to manage high relationship volumes. Finally, since the hybrid approach represents a combination of the transactional and relationship-oriented types, it occurs within the centre of the grid found in Figure 4.1. However, before the sales representatives can be categorised as a relationship type, data needs to be collected and refined in addition to implementing the graph theoretic measures.

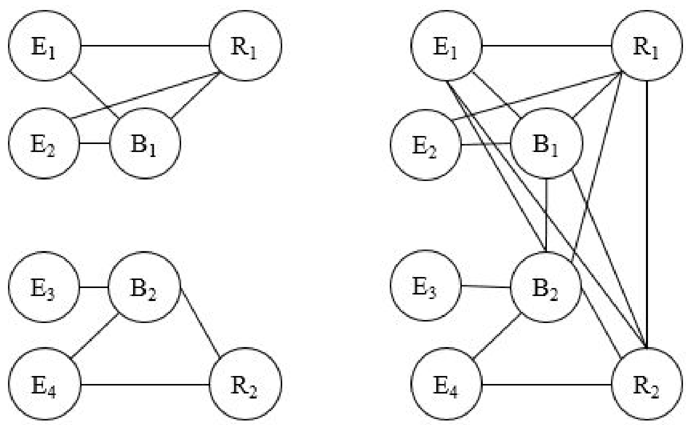
For this work, the participating insurance carrier's data was rather complex in its structure for how it represents brokers, employers, and their connections to sales representatives. For example, the participating carrier sells a variety of products to its employers and both the records of sale and the client management of those products are carried out on different systems. Additionally, there may be multiple sales agents or brokers assigned to a single employer. Furthermore, the volume of relationships considered in this work breaches a magnitude of hundreds of thousands. As a result, the data used to generate graphs needs to be collected and structured appropriately. Once structured appropriately, the generated graphs may be analysed.

Python (Python Software Foundation, 2019a) provides the tools for all of the graph analysis within this work. Since the participating group insurance carrier stores the data necessary to complete this work in Teradata databases (Teradata Corporation, 2019), this work required a technology capable of communicating with the Teradata databases via SQL (Teradata Corporation, 2012), while having the ability to easily transform the SQL datasets into graphs and analyse them. Python through the use of several libraries simplifies this process. To import the SQL, the libraries *pyodbc* (Python Software Foundation, 2019b) and *pandas* (PyData.org, 2019) provided a simplified option to connect to Teradata and read the SQL datasets respectively. Converting the SQL into graphs was accomplished through a library called *networkx* (NetworkX Developers, 2019), which also provided the basis for calculating the network measurements. Additionally, Python and its libraries can be coded to handle the repetitive calculations for the hundreds of thousands of relationships within this work automatically. Therefore, Python met the needs required of this work. The following sections outline the steps necessary to generate the network analysis in greater detail.

4.1.1 Network Data Collection

To build graphs representing the group insurance carrier's sales network, data is needed to represent which sales representative sold insurance products to which employers through which brokers. However, in order to understand how the group insurance carrier's data represents these connections, more information on the company's business structure must be learned. Before a product is sold to an employer, the sales representative works with the broker to deliver a quote. A quote provides an estimate of the cost of insurance the employer will need to pay if they agree to a contract. When the employer agrees to the sale, the sales representative completes the sales transaction and the information is sent to a group within the insurance carrier who administers the policy. This group creates records of the employer in the form of policies, an identification number representing the employer and their purchased products. Under these policies, bills can be configured and generated according to how the employer wants to represent their employees allowing them to pay for the coverage. The computer systems for these two departments, sales and employer administration, provide the backbone for the generation of data for this research. However, depending on the sales representative's relationship with the broker and employer and how the employer desires to be structured, the data supporting this work can become complex and needs to be simplified.

Sales representative relationships are complex by themselves. A single sales representative will work with several different brokers. Each broker may work individually or work for a broker group, a company employing a group of brokers. Furthermore, a sales representative is not restricted from working with multiple brokers from the same broker group. Each broker may work with one or several employers. As a result a complex web of relationships begins to form. To further complicate matters, multiple sales representatives can work together to sell products to a single employer through a single broker or through multiple brokers.



(a) **(b)**

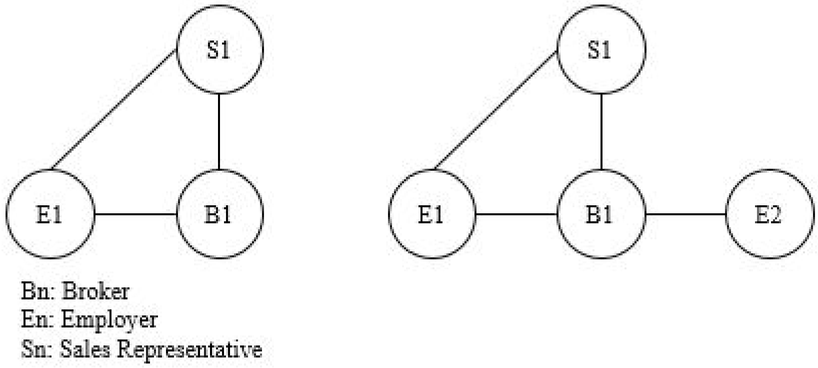
Figure 4.2 Simplification of Sales Representatives' Network

Compares a simplified approach (a) to representing the group insurance company's distribution network with the complex reality (b). (a) Does not allow for connections between sales representatives and brokers who split sales. (b) R*1* and R*2* split a sale between B*1* and B*2*, when selling insurance to E*1*, which increases the number of relationships in the graph.

Additionally, there are various levels of communication activity within the relationships. A sales agent may interact with a new broker to generate sales, but never actually generate a quote or a sale. In other cases, they will generate quotes, but not sales, or generate sales. Therefore, the relationship network itself needs to be clearly defined as well as the activity that establishes the connection. For the purposes of this work, relationships were simplified to a one to one to one connection meaning only one sales representative can sell to one employer through one broker, thus reducing the number of connections. This simplification will impact the graph theoretic measures as it will reduce the number of relationships for one sales representative involved in the sale. However, while sales leaders at the participating insurance carrier acknowledged it is their common practice for sales representatives to split sales, they also acknowledged it occurs primarily with their large employers, which employ 2,500 employees or more. This distinction is important because the count of large employers is outweighed by the remaining employers with less than 2,500 lives as explained by the participating group insurance carrier. As a result, the impact to the graph theoretic measures should be insignificant to the results produced on the participating group insurance carrier. Should future work require analysis by size of the employer, this simplification should be reviewed and adjusted as necessary. In addition, in order for a connection to exist, the sales representative must have sold insurance products through the broker to the employer. A quote or other communication activity is not considered. However, simplifying the sales relationships is only one step of the process required to produce the data necessary for the graphs in this work.

The participating group insurance carrier's sales data only records the products it sold; however, brokers work with other group insurance carriers to sell products, which leaves a gap in data. One of the network measures used in this work is the gamma index, which analyses the number of edges actually present among actors in the network against the total number of edges (Gorman and Maleck, 2000). In the context of a group insurance carrier's sales network, the gamma index of a sales representative's network would relate to the number of employers to which a sales representative sells insurance products through a broker against the total number of employers with whom a broker works. For the purposes of this work, the value of the sales in terms of dollars is not considered. While the value of the sale is important, this work is focusing on the relationship connections themselves. However, the value of the sale may be important as a driver of the relationship, which may be discovered in the second part of this work. However, the participating group insurance carrier's sales data only contains information on insurance products sold to their employers by sales representatives, as shown in Figure 4.3a. As a result, the gamma index loses value because it will yield a value of one, because the number of edges equals three and the maximum possible edges is three. Thus the ratio is three to three, which equals one. Therefore, information is needed on the employers with whom a broker works, but did not purchase products from the participating group insurance carrier.

In order to solve a lack of sales data from the broker, a third-party's data purchased by the participating group insurance carrier supplemented the sales data. The participant in this work specifically works with a company called Group Market Share, a third-party company dedicated to collecting insurance sales information from a group of insurance carriers to create a market level view of insurance. As a result, the data from Group Market Share was combined with the data of the participating group insurance carrier to build a complete data set. Therefore, the sales network's graph appears similar to the simplified version in Figure 4.3b. In this Figure, the sales representative (S1) works with a broker (B1) to sell insurance to an employer (E1); however, B1 works with another employer (E2), but S1 did not sell insurance to E2. Because of this the gamma index decreases below one, since the number of edges equals four and the maximum number of edges in the graph is five; therefore, the ratio of actual edges to maximum edges is four fifths, which is less than one. Theoretically, the maximum number of edges in Figure 4.3b is be six; however, because the group insurance carrier's sales network has been simplified to a one to one to one relationship, as described above, the only edges allowed are sales representative to broker, sales representative to employer, and broker to employer There is no data to support an employer to employer relationship, which reduces the maximum number of possible edges. Hence, because the data allows for gamma index values between 0 and 1, sales representative relationships with brokers may be analysed. If a sales representative maintains a high level of gamma index with a broker, the sales representative sells insurance products to the majority of the broker's employers. This may indicate that the relationship represents the relationship-oriented strategy discussed by Baker (1990) and Uzzi (1997) because of the volume of repeat business. However, before computing the gamma index values for the sales network, the data needs to be further supplemented.



(a) **(b)**

Figure 4.3 Sales Representative Relationships to Employers Through Brokers

Two simple graphs of a group insurance carrier's sales network. (a) Sales representative 1 (S1) sells insurance to employer 1 (E1) through broker 1 (B1). (b) S1 still sells insurance to E1 through B1; however, B1 is connected to employer 2 (E2), which does not buy insurance from S1.

At this stage, the graph data has complete sales data for the relationship connections between sales representatives, brokers, and employers for a specific year. Yet, once the group insurance carrier enters a new year, the sales data resets to only consider sales for the current year. At the time a sales representative sells insurance to an employer, the record of the sale persists in the sales system as a current sale until the end of the year. At that point, it becomes a historical sale and the sales software does not track the decisions the employer chooses to make with maintaining or terminating their purchase. The employer's decisions to manage their products is done through various other departments within the company outside of the sales department. Therefore, if an employer decides to terminate their insurance, thus removing edges from the graphs considered in this work, it is not observed in the sales data. As a result, unless the employer makes the decision to terminate the edge, data from another department's computer system is used to supplement the sales data to prevent edges from disappearing in the graph.

This work supplements the participant's sales data with their employer's administration data in order to understand which employer and broker relationships survive and which terminate year after year. The employer administration department works with the sales representatives and employers to create the structure of how the employer wants their purchases to be managed and billed through a series of options. Within the computer system, the employer is labelled as active, in which case bills are issued for payment, or terminated, in which case the employer no longer will pay for or receive insurance from the participating group insurance carrier. Dates are also recorded for when the employer became active and when the employer terminates their insurance. Therefore, by using the active or terminated status and associated dates, relationships can be maintained and terminated in the graphs used by this work to analyse the group insurance carrier's sales network. The employer administration data is connected to the sales data by using the policy number, which is a unique identifier representing the employer's purchased insurance products generated at the time a product is officially sold. At this stage, the graphs have data that records when an employer begins a relationship with the participating group insurance carrier through a specific broker, how long that relationship remains active, and the number of other employers each broker works with, but does not sell products to the participating group insurance carrier. Therefore, enough information now exists to generate the group insurance carrier's sales network; however, one further modification is needed to the data utilised by the participant purchased from the third-party.

As discussed earlier, the participating group insurance carrier in this study purchases data from Group Market Share. Group Market Share works with other insurance carriers to create a market level view of the volume of products brokers are selling. While this data broadens the network horizon (Anderson et al., 1994) of the group insurance carrier's sales network, it has two major limitations. First, similar the participant's sales data, the Group Market Share data only records sales volumes for brokers. It provides neither the company name who purchased the insurance nor the insurance carrier who sold the product. Additionally, the data provides no record of how long the sold product was active at a particular insurance company. As a result, this work needed to make some assumptions. The first assumption states that, for a given transaction in Group Market Share, the transaction represents one employer and that employer does not purchase the same insurance in the following years, because they already have insurance. In addition to this, this work did not assume a termination rate for Group Market Share. As a result, once a transaction is recorded as a distinct employer that transaction persists throughout the duration of the study. As a result, when the network measures are calculated, as described in section 4.1.2, the only edges to disappear from the graphs are those where the participating insurance carrier's sales representatives had relationships with employers who decided to terminate the relationship. Therefore, from one year to the next, sales representatives are categorised based on the number of new relationships they create against the possible number of new relationships in the current year, and their historical success with maintaining relationships from prior years against the historical possible number of relationships to which they could have sold insurance. The second major limitation existing in the data from Group Market Share is a lack of understanding if an employer bought multiple insurance products. Group insurance carriers may sell more than one type of insurance product. For example, the group insurance carrier participating in this work sells four core products, but offers many additional products. As a result, since Group Market

Share does not share if one company bought multiple products, an employer in the Group Market Share data cannot be identified as a single employer with *n* number of products, but rather *m* number of employers with one product each. This is in contrast with the participating group insurance carrier's data, where the number of products owned by each employer is known. Therefore to carry out the analysis properly, both the participant's data and the Group Market Share data needed to be represented and joined together at the individual product level, because the Group Market Share data is unable to be consolidated to a single employer. In conclusion, once the participating group insurance carrier's data was collected and refined, the third-party's data needed to be refined through assumptions and joined to the participant's data to generate the graphs representing the sales relationships.

Finally, once all data was collected and refined to the correct specifications, the graphs, one for every sales representative for every product in each year, could be constructed. Again, the sales amounts in terms of dollars is not considered in this work because the relationship connections generate the networks. The sales amounts may provide insight on the drivers of the connections, but would be pursued as a future enhancement. The participating group insurance carrier stores copies of all data, including the sales, employer administration, and Group Market Share data, in Teradata Databases. Therefore, this work utilised Teradata SQL in order to extract, clean, and manipulate the data. The final data set to be imported into Python for graphical analysis was formatted in SQL as a data set with five columns, as shown in Table 4.1.

Year	Product ID	Sales Representative ID	Broker ID	Employer ID
2011	2	R1	B6447	E36045
2012	2	R1	B6447	E36045
2013	2	R1	B6447	E36045
2014	2	R1	B6447	E36045
2015	2	R1	B6447	E36045
...	...	...	...	...
2016	4	R614	B2896	E51181
2016	4	R614	B2518	E32309
2016	4	R614	B3205	E28510
2016	4	R614	B6560	E23359

Table 4.1 Data Format for Sales Representative Relationships

Table of data representing the relationship connections for each sales representative, broker and employer. It categorises the relationship by year in which the relationship existed as well as the product that was owned by the employer.

The columns represented which sales representative worked with which broker to acquire each employer, while the other two columns represents the year the relationship exists and the insurance product for which the relationship exists. Additionally, to protect the proprietary data of the participating insurance company, all data was masked to protect individual sales representatives, brokers, and employers; however, each one was assigned a unique masked id for identification in year over year analysis. Sales representative ids begin with the character “R”. Broker ids begin with the character “B”. Employer ids begin with the character “E”. The data set reviewed relationship data from 2011 to 2016, and, during that time, the process identified:

- 659 sales representatives;
- 13,938 brokers;
- 471,992 employers.

At this stage, all data, an estimated size of 48 Megabytes, was imported using Python to begin graphical analysis.

4.1.2 Graph Construction and Analysis

To perform the analysis on the graphs, the data needed to be imported from Teradata to Python. Python was chosen to construct and analyse the graphs because of the suite of established libraries already in existence. Thus, the need for custom code was reduced, because these sources are widely implemented, maintained, and tested in an open source platform. Once the data was adapted for Python using Jupyter Notebook (Project Jupyter, 2019), the graphs were generated for each individual sales representative for every year and product they maintained an active relationship. The maximum number a graphs a sales representative could have is 24, one for each of the four products in each of the six years. Not every sales representative will have a graph for all six years. For example, a sales representative starting their job in 2013 will not have graphs for 2011 and 2012, the first two years of the study. Loops were developed to handle the generation of each sales representative's graph for every year in the study. Once built, the graph theoretic measures of degree and gamma index for every graph a sales representative participates in throughout the study were calculated and recorded in a two-dimensional matrix, as displayed in Table 4.2, for further analysis.

Sales Representative ID	Year	Product ID	Degree	Gamma Index
R140	2011	1	6	0.76
R194	2011	1	6	0.74
R295	2011	1	7	0.74
R140	2012	1	6	0.71
R352	2012	1	6	0.76
...	...	...	...	...
R607	2016	1	9	0.79
R629	2016	1	6	0.76
R642	2016	1	8	0.73
R89	2016	1	6	0.79

Table 4.2 Data Format of Sales Representative Graph Measurements

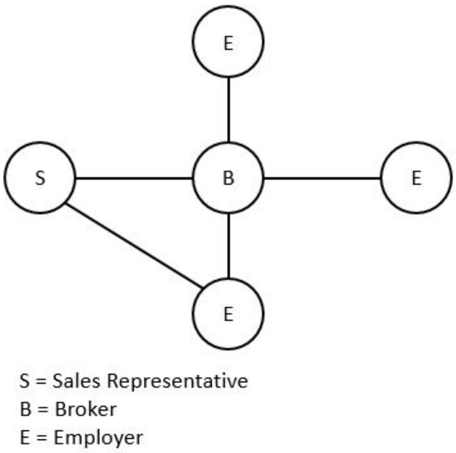
Displays the matrix storing the degree and gamma index for every product, year, and sales representative within this study.

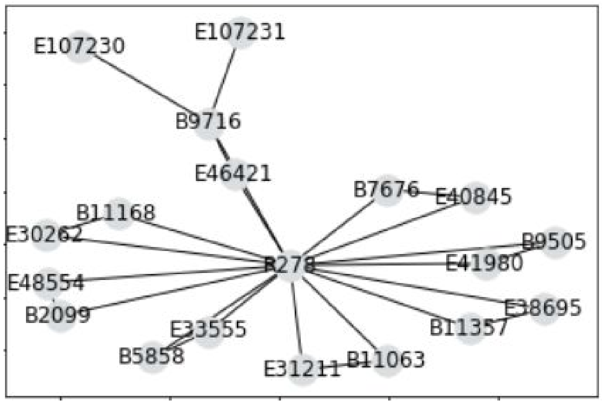
To build the graphs, a series of libraries needed to be imported. The *pyodbc* provided the necessary methods to connect to Teradata. The *pandas* library submitted Teradata SQL statements through the established *pyodbc* connection and read the results into a dataframe matrix. Three matrices were built to hold lists of all the sales representatives, products, and dates utilised by this study. These matrices were used as the boundaries of the loops, which generated the specific Teradata SQL statements that identified a sales representative's sales network for a specific product and a specific year. *Numpy* and *islice* were used to convert the data in the matrices representing the loop boundaries into a scalar form in order for Teradata to return the results without errors. Teradata results returned a two-dimensional matrix recording which brokers a sales representative worked with to sell insurance to which employers as well as the relationships the brokers had with other employers, but the sales representative did not sell insurance to those employers. The python library *networkx* implemented the graph data structure and loops were constructed to iterate through the results from Teradata to add the nodes and edges to the graph. At this stage, the graphs were built and their degrees and gamma index values could be collected.

In the context of the group insurance carrier sales network, degree and gamma index quantify aspects of relationships useful to business understanding. From a business perspective, it is useful to know how many relationships a sales representative is managing and the amount of contracts a sales representative conducts with each broker. For example, if a sales representative is managing a high volume of relationships, but sells below average contracts of insurance to each broker, the sales agent may be operating inefficiently to drive growth in sales because their relationships are not as strong with brokers. As a result of lower relationship investment on behalf of the sales representative, the broker may not feel strongly towards working to bring business to the sales representative in the future. Therefore, it is important for a group insurance carrier to be able to measure the number of relationships in their network and how successful they are in achieving a majority of a broker's business. Using the degrees and gamma index of a sales representative's network directly correlates with these two measurements. A degree simply measures how many particular connections a node in a graph contains (Freeman, 1978). In the context of the sales representative's network, it directly represents the number of employers and brokers with which a sales representative works. To supplement degree, the gamma index provides a measurement on the number of edges within a graph over the total number of possible edges which correlates with the connectivity of a graph (Gorman and Malecki, 2000). For this work, the gamma index directly defines how many relationships a sales representative manages against the total number of relationships the sales representative could theoretically manage. However, because of the way these graphs are constructed, the network measures utilised require adaptation.

With respect to degree, if the size of the graph is important or different graphs need to be compared to one another, the choice of degree measurement changes. Freeman (1978) discusses degree in the form of a centrality, which intends to measure, within a graph, each node's level of communication activity. With respect to the sales representatives in this network, the communication activity reflects the number of employers and brokers the sales representative is working with to sell insurance. For centrality, Freeman (1978) presents two forms of the centrality: one using a graph size dependent definition, which is the degree of a node (Nieminen, 1974 cited in Freeman, 1978), and a size independent definition, which divides the degree of the node by V - 1, where V is the number of nodes in the graph. On the one hand, the size dependent form is useful for measuring pure communication activity of a node; while on the other hand, the size independent form is useful for measuring centralities of nodes across different graphs (Freeman 1978). For this work, the size dependent version, simply the degree, was chosen because it measures the amount of activity, in which one sales representative engages. Additionally, knowing the volume of broker and employer relationships a sales representative manages, the communication activity, allows for comparisons of one sales representative versus another sales representative. As a result, this work also compares the degrees across all of the sales representative's graphs in order to understand their varying communication volumes, which diverges from Freeman's (1978) size independent comparison. However, this only describes a portion of the network activity. The gamma index supplements the volume of communication of a sales representative, provided by the degree, with the sales representative's success rate in selling products.

The gamma index offers a basis for measuring how successful a sales representative is at acquiring business with all of their brokers. Gorman and Malecki define the gamma index as "the ratio between the actual and the maximum number of edges (links) in a network" (Gorman and Maleki, 2000, p. 120). In the context of the group insurance carrier sales representative network, the actual number of relationships represents two relationship types. First, the relationships the sales representative maintains with the employers and the brokers through which they sold insurance products. Second, the relationships brokers maintain with employers to which the sales representative did not sell insurance products. The maximum number of relationships possible for a sales representative's network is equivalent to the actual number of relationships plus the number of employers every broker works with to which the sales representative did not sell insurance products. For example, consider Figure 4.4a, where the sales representative works with one broker and one employer, but the broker works with three employers. In this example, the actual number of relationships is five and the maximum is seven. Therefore, the gamma index, as evaluated to be 50 using Gorman and Malecki's equation in Figure 4.4a, is a ratio of actual relationships to maximum relationships. The difference between actual relationships and maximum relationships is the number of employers in the network to which the sales representative did not sell insurance products. As a result, the success rate of the sales representative can be measured. Therefore, if the gamma index is low, approaching zero, the sales representative did not sell to a majority of the available employers through the brokers. If the gamma index is high, approaching one, then the sales representative is successful in acquiring business through the brokers. However, due to the structure of the sales representative's network, this version of the gamma index deviates from the standard equation.





Gamma Index (Gorman and Malecki, 2000) $= \frac{2E}{V(V-1)} * 100 = \frac{2(5)}{5(5-1)} * 100 = 50$

Gamma Index (Gorman and Malecki, 2000) $= \frac{2(26)}{19(19-1)} * 100 \approx 15$

(a) **(b)**

Figure 4.4 Gamma Index Calculations for Simplified and Real Examples

Two graphs depicting the gamma index, where E represents the number of edges in the graph and V represents the number of nodes in the graph (Gorman and Malecki, 2000). (a) Illustrates a simplified graph for the sales representative's distribution network, where the gamma index is 50. (b) Illustrates a real graph from the data in this work for the sales representative's distribution network, where the gamma index is approximately 15.

For this work, the gamma index needs to be modified due to definitions of this network's network horizon. In addition to the definition Gorman and Malecki state in 2000, they provide an equation for the index as "2E/V(V-1) * 100", where "E = number of links (edges) in the network" and "V = number of nodes (vertices) in the network" (Gorman and Maleck, 2000, p. 120). In a standard undirected graph, for which this equation is intended, any node has the potential to be connected to any other node in the graph. However, for the group insurance carrier network, certain nodes may not be connected to one another, because the information is unknown or not within the network horizon established. For example, relationships between brokers are unknown as well as relationships between employers. As a result, the maximum number of edges possible in the graph is reduced and the denominator of the Gorman and Malecki equation needs to be modified to meet the needs of the graphs studied in this work. Consider the simplest fully connected version of the sales representative's network in Figure 4.5.

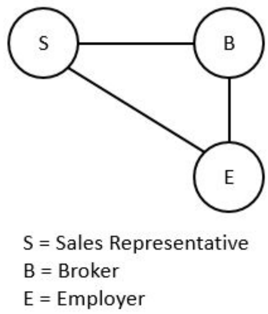


Figure 4.5 Simplest Version of a Sales Representative's Network

One sales agent works with one broker to sell insurance to one employer.

In this example, all three actors work together; however, it is possible for the sales representative to employer connection to disappear. In this case, the sales representative and broker connection also disappears because the sales representative no longer holds insurance contracts with employers through that broker. Therefore, a sales representative should always have an edge with a broker, provided that the sales representative has at least one connection with an employer connected to that broker. Additionally, brokers always have an edge with every employer they are directly connected to; however, those employers may not have connections with the sales representative. As a result, the difference between the actual number of relationships in the graph versus the maximum possible number of relationships is driven by whether and employer purchases a product from the sales representative. If all employers in the sales representative's graph purchased products from the sales representative, then the actual number of relationships equals the maximum possible number of relationships allowed in the graph. However, this example does not occur a majority of the time. They will either have one connection, if they are solely connected to the broker, or two connections, if they are connected to both the broker and the sales representative. Therefore, the maximum possible edges for the graphs in this work is 2E + B, where E equals the number of employers in the graph and B equals the number of brokers in the graph. In conclusion, the equation presented by Gorman and Malecki (2000) for the gamma index can be modified to Equation 4.1, while maintaining the definition as the ratio of actual edges to the maximum possible. As a result, the gamma index values, 50 and 15, calculated in Figure 4.4 for the simplified graph Figure 4.4a and the real example Figure 4.4b respectively become 5 / (2 * 3 + 1), which evaluates to 0.71 for Figure 4.4a, and 26 / (2 * 10 + 8), which evaluates to 0.93 for Figure 4.4b.

$$\Upsilon = E' / (2E + B)$$

Υ = Gamma Index
E'= number of actual edges in graph
E = number of employer nodes in graph
B = number of broker nodes in graph

Equation 4.1 Modified Gamma Index

Derived from definition by Gorman and Malecki (2000) implemented in this work. The 100 was removed from the original definition to maintain a decimal between zero and one.

However based on the modified definition of the gamma index, there may be questions around its similarity to the size independent formula of degree centrality and the appropriate measure to use. Discussed earlier in this section, Freeman's (1978) version of size independent degree centrality divides the degree of a node by V - 1, where V is the number of nodes in the graph. For the group insurance carrier networks for sales representatives studied in this work, V would equal the sum of the number of sales representatives, brokers, and employers in the graph. If the degree centrality of the sales representative is measured, then V - 1 becomes the number of brokers and employers, which has similarities to the denominator of Equation 4.1, the gamma index used for this work. However, centrality would not consider the connections between brokers and employers. Furthermore, the gamma index in Equation 4.1 is an outcome of the known network horizon of the business being studied. Should other relationships become possible, such as broker to broker relationships or multiple brokers to a single employer, the maximum possible of connections increases towards the definition proposed by Gorman and Malecki (2000). As a result, the definition of gamma index would diverge away from its similarity to degree as it exists in the context of this work. This realisation supports the decision to implement and use a gamma index instead of size independent degree centrality to measure the success of sales representatives in maintaining relationships and establishing new ones.

Additionally, degree centrality and gamma index provide good indicators of sales representative performance relative to the other forms of centrality and connectivity. For centrality, the goal is to understand the position of an actor, node, within the context of a network, usually related to influence (Freeman, 1978). Freeman (1978) articulates centrality in terms of communication activity, whether it be volume or control. For sales representatives, it is important to know the volume of relationships being fostered over time, as more employer relationships over time indicates growth within the company and more broker relationships over time may indicate the potential for more potential relationships with new employers. Degree centrality directly ties to the volumes of relationships (Freeman, 1978), which meets the need. Whereas, at this stage, there is less concern about how information is being controlled by the sales representatives and brokers, whether it be information between nodes, betweenness, or how efficiently one particular node is at communicating with the entire network, closeness (Freeman 1978). Brokers are an intermediary between the sales representatives and the employers. In many ways, they have a lot of control over suggesting which group insurance carrier will be the best option for an employer. It is not that these measures may not be important, but, rather, degree centrality provides a more meaningful measurement to be tracked by the group insurance carrier to understand their sales growth.

Similarly, the gamma index provides the most meaningful measurement for the group insurance carrier as opposed to its counterparts. By comparing the number of actual relationships to the total number of potential relationships (Gorman and Malecki, 2000), the group insurance company can begin to understand the penetration rate they face with each broker. If an insurance company only sells to 25 percent of one broker's employers versus another broker at 75 percent, there is potential to establish more of a relationship with the broker at the lower rate in an effort to gain more business. The other indices for connectivity are concerned with complexity, beta index, and redundancy, alpha index, within the network (Gorman and Malecki, 2000). The beta index used by Gorman and Malecki (2000) measures the amount of edges over the number of vertices. For the networks in this study, the complexity is well defined by the edge restrictions discussed previously. As the work evolves in the future, it may be useful to measure the change in complexity should sales representative to sales representative or broker to broker relationships become available in the network horizon. Additionally, the alpha index keeps track of how many loops, or alternative paths, exist amongst the nodes (Gorman and Maleki). The sales representative networks paths are clear: a representative must work through a broker to sell to an employer;

therefore, the networks operate in a branching fashion. And, should a critical edge between a sales representative and broker would be removed, it would be reflected in the degree and, potentially, the gamma index. Therefore, the beta and alpha indices do not provide the immediate benefits provided by the gamma index. As a result, degree centrality and gamma index were implemented to measure the networks in this study.

In conjunction with the construction of the graphs representing the group insurance carrier's sales representative networks, the degree and gamma index were calculated in Python. *Networkx*, a Python library, provides methods to calculate the degree of a graph, and, therefore, can be used on every graph within this work a sales representative participates. Additionally, the edges and nodes of the graph may be accessed directly allowing for code to be constructed to match Equation 4.1 to calculate the reformatted gamma index. For the numerator, the the Python code simply uses the method to retrieve the number of edges. For the denominator, the logic pulls the lists of nodes in the graph and iterates through counting the numbers of broker nodes and employer nodes. All measurements were stored in a two-dimensional matrix, as illustrated in Table 4.2, with the sales representative, year, and insurance product the degree and gamma index represent, which totaled to 3,954 records. Finally, the graph output was imported into SAS (SAS Institute Inc., 2019) for statistical analysis and scatter plot generation.

4.2 Relationship Quantification

While section 4.1 describes measurements for the group insurance carrier's relationships at the network level, this section focuses on the relationships at an individual level by isolating the attributes driving relationship quality and understanding how those attributes work relative to one another. In order to research these methods, as described in Section 3.2.2, the group insurance carrier participating in the study volunteered a sample of their sales representatives to participate in a pilot study. The pilot included two surveys designed to balance resource restrictions with the process of evaluating each attribute's importance over every other attribute in the relationship by modelling the relationship attributes as a fully connected directed graph, where the edges have weights representing importance (Kulkarni, 2005; Muduli et al., 2013). Therefore, before describing the survey methodologies themselves, the resource restrictions of the pilot shall be explained.

Partnerships with leaders from the studied group insurance carrier's sales organisation provided resources to complete this portion of the study. Because of the high volume of work sales representatives need to complete, leaders at the group insurance carrier needed to prioritise this research with other internal corporate projects. At the time of data collection in 2018, the company could not allocate resources during the fourth quarter of the year. Therefore, data collection took place during the third quarter of 2018 to accommodate the sales organisation. However, during this time, there were other regularly scheduled surveys distributed; thus, the insurance carrier offered a pilot of four field offices out of 30 to reduce the fatigue on their employees. Furthermore, to reduce time commitments for sales representatives, the survey was broken into two parts.

Due to the high volume of questions needed to measure relationship attributes against one another using the methods implemented by Kulkarni (2005) and Muduli et al. (2013), the survey needed to be designed so as to reduce the number of questions by prioritising which attributes were perceived to be the most important to the relationship.

In order to create a relationship index using the permanent function method, the weight of each attribute over every other attribute in the graph needs to be identified (Kulkarni, 2005; Muduli et al., 2013). Therefore, for every attribute, the number of weights needed is equal to the total number of attributes minus one. If this is done for every attribute, then the total number of weights is equal to the total number of attributes minus one multiplied by the total number of attributes, as shown in Equation 4.2.

$$W = V(V - 1)$$

W: Total Number of Weights Needed
V: Total Number of Attributes Studied

Equation 4.2 Calculate Total Number or Needed Relationship Weights

The equation needed to calculate the total number of relationship weights needed in order to calculate a relationship index.

However, using a measurement scale of 0-10, as in Kulkarni (2005) and Muduli et al. (2013), reduces the number of weights needing to be surveyed by half. This is accomplished by calculating the missing weight using the weight originally measured (Kulkarni, 2005; Muduli et al., 2013). Using attributes A and B in Figure 4.6, W_{AB} is equal to 3. Since a scale of 0 to 10 was used to measure the weight between A and B, the weight between B and A equals 10 - W_{AB} or 7. As a result, only half of the total number of weights produced by Equation 4.2 need to be measured. However, for this work, since seven attributes, whose selection criteria is described in section 4.2.1, were used to describe the relationships between the group insurance carrier and their broker and employer relationships, this would equate to 21 weighting questions within a survey for only one relationship type, either the broker or employer. In an effort to reduce the total number number of questions the sales representatives would need to answer, a survey was implemented before the weights were measured.

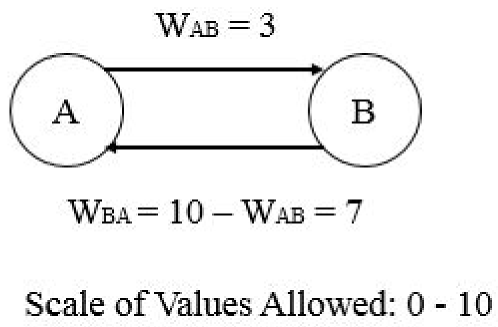


Figure 4.6 Calculating Relationship Weights

Using a pair of attributes, the weight of one attribute over another may be used to calculate the weight in the opposite direction.

4.2.1 Survey 1: Relationship Attribute Prioritisation

The first survey distributed to the sales representatives ranked a set of relationship attributes from greatest importance to least importance with respect to growing a relationship. Before constructing the survey, relationship attributes were identified through a review of the relationship quality research, as described in section 3.2.1. Once attributes were identified, the survey was constructed and distributed through SurveyMonkey (SurveyMonkey, 2019). The survey was distributed in August of 2018. At that time, the participant employed 357 sales representatives, which varies from the 659 sales representatives studied through graphs. This variance in number of sales representatives is due to sales representative turnover throughout the course of the research. The 659 sales representatives were employed by the participant between 2011 to 2016. Their employment may have terminated within that time frame. By 2018, when the surveys were distributed, only 357 sales representatives were employed by the participant. As part of the agreement with the participant, the survey was distributed to 95 sales representatives. After collection was completed, results were analysed and used to narrow down the list of attributes used in the second survey, which was distributed to the same sample of participants in September of 2018 and is described in section 4.2.2. The following contains more detailed descriptions of the discussed steps to produce and execute on the first survey: Relationship Attribute Prioritisation.

After a review of the literature on relationship quality, seven attributes were selected for surveying in this work. Originally, a review of seven sources lead to an initial list of 12 distinct attributes. The list of 12 was narrowed down through review of overlapping definitions and applicability to the employer and broker relationships studied. The 12 attributes originally reviewed were as follows:

- trust (Cosby et al., 1990; Mohr and Spekman, 1994; Wilson and Jantrania, 1996; Naude and Buttle, 2000; Huntley, 2006; Rauyruen and Miller, 2007);
- satisfaction (Cosby et al., 1990; Storbacka et al. 1994; Wilson and Jantrania, 1996; Naude and Buttle, 2000; Rauyruen and Miller, 2007);
- commitment (Mohr and Spekman, 1994; Storbacka et al. 1994; Huntley, 2006; Rauyruen and Miller, 2007);
- coordination (Mohr and Spekman, 1994; Naude and Buttle, 2000), communication (Mohr and Spekman, 1994; Storbacka et al. 1994);
- joint problem solving (Mohr and Spekman, 1994);
- bonds (Storbacka et al. 1994; Wilson and Jantrania, 1996);
- goal congruence (Wilson and Jantrania, 1996; Huntley, 2006);
- investments (Wilson and Jantrania, 1996);

- power (Naude and Buttle, 2000), profit (Naude and Buttle, 2000);
- service quality (Rauyruen and Miller, 2007).

The final seven attributes were narrowed down to:

- trust
- satisfaction
- commitment
- joint problem solving
- investments
- power
- profit.

Table 4.3 summarises all 12 attributes and also indicates which attributes were chosen for this work. As Naude and Buttle (2000) describe, five of the attributes—commitment, coordination, communication, bonds, goal congruence—have overlapping characteristics. As a result, this work selected only one, commitment, in order to simplify the attribute listing for the sales representatives and reduce any confusion about overlapping definitions. This work focuses in on commitment based on its definition, which broadly describes the intent of partners in a relationship to continue the partnership (Mohr and Spekman, 1994; Storbacka et al. 1994; Rauyruen and Miller, 2007), more specifically that interactions and intentions are carried out in a positive manner (Storbacka et al. 1994). Additionally, service quality was removed because the lack of a clear definition and the focus in on a perception based model makes it difficult to provide clear definition to the sales representatives participating in the survey (Rauyruen and Miller, 2007). Having a definition clear enough to succinctly inform the sales representatives of the attributes with minimal questioning was a key component of feedback provided by the participating group insurance carrier's leadership in the development of the survey. Therefore, for each attribute, definitions of attributes were used to represent the attribute in the survey design.

Relationship Quality Attribute	Cosby et al. (1990)	Mohr and Spekman (1994)	Storbacka et al. (1994)	Wilson and Jantrania (1996)	Naude and Buttle (2000)	Huntley (2006)	Rauyruen and Miller (2007)	This Work
Trust	x	x		x	x	x	x	x
Satisfaction	x		x	x	x		x	x
Commitment		x	x			x	x	x
Coordination		x			x			
Communication		x	x					
Joint Problem Solving		x						x
Bonds			x	x				
Goal Congruence				x		x		
Investments				x				x
Power					x			x
Profit					x			x
Service Quality							x	

Table 4.3 List of Relationship Attributes by Literary Source

Summarises the 12 relationship attributes reviewed in literature by source and which attributes this work captured in surveys.

The first survey, available in Appendix A, distributed to sales representatives represented the seven attributes as statements and required the statements to be ranked from greatest to least importance with respect to growing the relationship. For this survey, the respondents were not informed of the attribute names before the survey. Instead, the attributes were represented in a survey in the form of a statement representing the definitions in the literature. The statement for trust, satisfaction, power, and profit were based of the relationship quality work of Naude and Buttle (2000). Commitment was represented by the definitions explained by Storbacka et al. (1994). Joint problem solving was represented by the definitions explained by Mohr and Spekman (1994). Finally, the definitions from Wilson and Jantrania (1996) represented investments. Once attributes were stated, the survey was constructed.

This work utilised SurveyMonkey to develop an online survey for respondents. The survey structure included four sections, participation agreement, demographic questions, attribute ranking for broker relationships, and attribute ranking for employer relationships. The participation agreement section included information on who was conducting the study, why the data was being collected, and how it will be used. Additionally, respondents were made aware the survey was anonymous and voluntary in its participation. A respondent's agreement to participate was the only required question to answer within the survey. If they did not agree to participate, questions were unavailable for them to review. The demographic questions collected data about their sales office location and their job title that best described their role. As part of the offered pilot, the group insurance carrier provided office locations in different regions of the United States and varying roles of sales representatives in order to avoid any response bias by those parameters. For the broker and employer relationship attribute ranking sections, respondents were asked to rank the seven statements, representing the seven attributes, from having the greatest to least impact on a broker's or employer's decision to choose the participating group insurance carrier as a partner to supply their employee benefits. The rankings for brokers and employers were separated because they serve different functions in the relationships. Employers are looking to purchase products for their employees. Brokers help employers find the right group insurance carriers to provide products in exchange for a commision on the sale. Additionally, since Naude and Buttle (2000) discovered through their work that relationships may have varying definitions, it cannot be assumed the attributes driving broker relationship decisions will be the same as the attributes driving the employer relationships. After the survey was constructed and approved by the participating group insurance carrier, the first survey was distributed to the sales office locations allowed to participate.

As a result of suggestion by sales leadership in the participating group insurance carrier, the survey was distributed in the third quarter and respondents were given a deadline of two weeks to complete. Sales leaders were concerned about participation rates in the locations if a longer deadline was given. Thus, their recommendation was two weeks as their prior experience has shown higher participation behaviour if there is a time pressure. Additionally, due to competing workloads and surveys internal to the company, they only provided time available at the end of the third quarter of the year, July through September. To distribute the survey via SurveyMonkey, participating offices were notified via email five business days ahead of the distribution date that they would receive another email containing a link and instructions on how to complete the survey in addition to the deadline. Email reminders were delivered to respondents at seven and three days before the deadline. The participating group insurance carrier provided four sales locations to be participants in the survey totalling 95 possible respondents out of a total population of 357 sales representatives yielding a sample size of 26.6%. These constraints and parameters also apply to the second survey discussed in Section 4.2.2. For the response rates, of the 95 possible respondents, 91 submitted responses; however, 14 broker and 17 employer related responses were incomplete and discarded. After discarding these responses, the response rates were calculated to be

81.05 percent and 77.89 percent for broker and employer related responses respectively, which was determined to be suitable for analysis. After the deadline passed, the survey link was closed and results analysed and incorporated into the second survey discussed in the following section.

4.2.2 Survey 2: Relationship Attribute Weighting

The second survey distributed to sales representatives collected data on the importances of one relationship attribute over another in the decision of brokers and employers to choose the studied group insurance carrier as the insurance provider for employers. Results from Survey One: Relationship Attribute Prioritisation narrowed down the list of attributes to three for brokers—*satisfaction*, *joint problem solving*, *profit*—and three for employers—*joint problem solving*, *satisfaction*, *trust*—, which is further discussed in Section 5.2.1. These attributes were incorporated into a second survey on SurveyMonkey, in which respondents were asked to quantify the importance of each attribute against the other attributes on a scale of 0 to 10, using the scale method and reasonings used to develop indices in other industries (Kulkarni, 2005; Muduli et al., 2013). Once data was collected, results were analysed. The following contains a detailed outline of the steps taken to complete this process.

In order to understand and explain the changes in the gamma index and degree over time observed in the sales representative's network outlined in section 4.1, a method of measuring an individual sales representative to broker or sales representative to employer relationship is needed. After a review of the relationship quality literature, the method of modelling relationship attributes as a fully connected directed graph and calculating the permanent function of the matrix representing the graph (Kulkarni, 2005;

Muduli et al., 2013; Singh and Singru, 2013) organises and represents the relationship attributes observed in business relationships effectively. As a result, this work focuses in on methods implemented by Kulkarni (2005) and Muduli et al. (2013). Singh and Singru (2013) was not within focus as their work focused in on using the various components of the permanent function and the missing connections between departments in manufacturing processes to derive insight on improvements. Developing the index consists of two measurements, measuring the attributes themselves and measuring the relative importances of the attributes (Kulkarni, 2005; Muduli et al., 2013). For this work, measuring the relative importances was in scope. The attribute measurement was excluded due to time and resource constraints within the company and schedule of the programme sponsoring this research. In order to measure the relative importances of the relationship attributes, the relationship attributes were modeled as nodes in a fully connected directed graph, as shown in Figure 4.7.

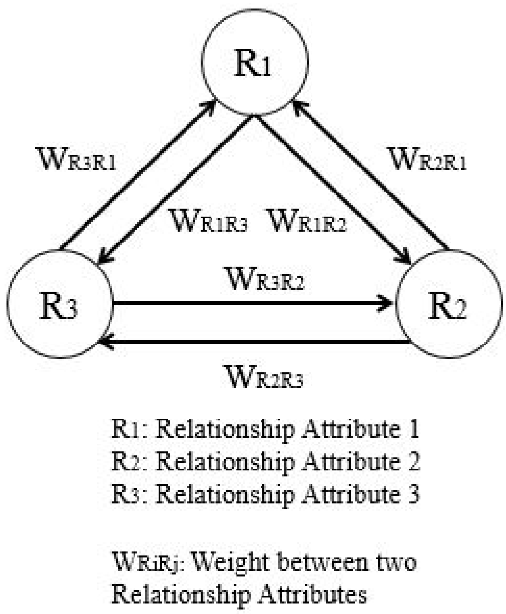


Figure 4.7 Fully Connected Directed Graph of Relationship Attributes

The weight of importance of one attribute over another in determining relationship continuity is represented as WRiRj. For example, the relative importance of WR2R1 represents how much more important R2 is over R1.

Kulkarni (2005) and Muduli et al. (2013) suggest using a scale of 0 to 10 in order to measure importances. They suggest this because a five would indicate equal importance between two attributes; therefore, using Figure 4.7, if R1 and R2 have equal importance, then WR2R1 equals WR1R2, which equals five. In other words, since the scale has a max value of 10, if one relationship weighting is measured to be a specific value, then the relationship weighting in the opposite direction is 10 minus the measured weighting (Kulkarni, 2005; Muduli et al., 2013). Using this method, a survey was developed asking sales representatives to quantify the relative importances of relationship attributes over the other attributes using the subset of most important attributes discovered through the first survey.

Similar to the first survey, SurveyMonkey was used to design, distribute, and collect data for the second survey. The survey structure included four sections, participation agreement, demographic questions, relative attribute weighting for broker relationships, and relative attribute weighting for employer relationships. The participation agreement section included information on who was conducting the study, why the data was being collected, and how it will be used. Additionally, respondents were made aware the survey was anonymous and voluntary in its participation. A respondent's agreement to participate was the only required question to answer within the survey. If they did not agree to participate, questions were unavailable for them to review. The demographic questions collected data on which sales office location they are based and what job title best describes their role. As part of the offered pilot, the group insurance carrier provided office locations in different regions of the United States and varying roles of sales representatives in order to avoid and response bias by those parameters. The relative attribute weighting sections for brokers and employers presented the top three attributes, discovered via the first survey, in a series of three questions for brokers and three questions for employers. Again, brokers and employers need to be treated differently because the different roles of the relationships may yield different results. In fact, the three attributes chosen for brokers and employers in the first survey showed differences. Using the statements representing the attributes implemented in the first survey, each question contained two of the statements and asked the respondent to use the sliding scale to assign a value indicating which statement was more important in the decision to choosing the participating group insurance carrier. Because three attributes were selected and the scale from 0 to 10 implemented as discussed above, only three questions were necessary to assign all of the weights in the fully directed graph. The fully connected graph between three nodes as in Figure 4.7 has six edges. Since one weight can be derived using the surveyed weight and the highest value of the scale, 10, only three questions are needed in the survey to understand the interactions between the three nodes. After the second survey, found in Appendix A, was constructed and approved by the participating group insurance carrier, it was distributed to the sales office locations allowed to participate. The same constraints and concerns expressed in the first survey, as discussed in Section 4.2.1, applied to the second survey as well. However, participation dropped off. Of the possible 95 respondents, 65 responses were submitted. After discarding incomplete responses, three for brokers and four for employers, the response rates were 65.26

percent and 64.21 percent for brokers and employers respectively. Despite the decline in response rate, it was determined to be suitable to complete analysis.

Chapter 5: Findings

Our findings consist of two parts, graph structure network measures and relationship driver survey results. Each part has its own purpose for analysing potential changes in the participating group insurance carrier's sales representative network. The graph's structural measures aim to explain shifts in power or influence within the network via degree (Freeman, 1978) and connectivity via gamma index (Gorman and Malecki, 2000). In the context of the network within this study, degree measures the total number of relationships a particular sales representative is managing, while the gamma index measures the magnitude of business a sales representative conducts with brokers. For example, one sales representative may work with 50 brokers and sell products to 50 percent of those brokers' employers; however, a second sales representative may work with five brokers and sell products to 95 percent of those brokers' employers. Which sales representative structure is better for the group insurance carrier? There are several established relationship strategies discussed in Chapter 3 Section 1, namely transactional, relationship-oriented, and hybrid (Baker, 1990; Uzzi, 1997). The work in that field suggests hybrid is optimal because it combines the benefits of the transactional and relationship-oriented approach (Uzzi 1997). For the purposes in this example, sales representative two sells to 95 percent of the brokers' employers, which would be indicative of a relationship-oriented approach; whereas sales representative one conducts business with far more brokers, 45 more, but has less success in selling products, 45 percent less, which would be indicative of a transactional approach. However, how can this be tested?

To test the network structure measures, the relationships between both the sales representatives and brokers and the sales representatives and employers need to be measured. Chapter 3 Section 2 reviewed a means of measuring relationships by identifying the drivers of relationships important to the specified relationship (Naudé and Buttle, 2000; Huntley, 2006; Rauyruen and Miller, 2007; Storbacka et al., 1994) and quantifying their relationship to one another in order to develop a relationship index (Kulkarni, 2005; Muduli et al., 2013). By developing an index, the broker and employer relationships can be reviewed to see a distribution of strengths and ascertain whether the sales representative is transactional, relationship-oriented, or hybrid. Unfortunately, for the contents of this work, a limitation of participant data readiness and duration of the project prevented the full development of an index. However, the survey results discussed in this section take the first step in identifying the important drivers and quantifying the relationship between them.

5.1 Network Structure Results

The group insurance carrier's sales network can be very complex with the various broker structures and products sold. While several steps were taken to simplify the data, outlined in Chapter 4 Section 1, it should be noted these results are depicted as accurately as possible and are subject to change pending modifications or enhancements to the network's horizon or product mixture. From 2011 to 2016 for the product investigated in this work's findings, the volume of sales representatives, brokers, and employers grew. Sales representatives grew from 477 in 2011 to 608. Brokers grew from 7,971 to 10,601. Employers grew from 30,399 to 123,432. Next, the graph measures may be detailed.

Table 5.1 provides a summary of core statistics on the graph measure called degree. Note that the sales representatives column represents the number of sales representatives operating in a particular year. The minimum amount of relationships a sales representative maintained in all six years of the study was two, which also happened to occur the most frequently. However, the maximum number of relationships managed grew from 240 in 2011 to 764 in 2016. The mean degree also increased between 2011 from 50.59 relationships to a maximum of 78.13 in 2015, which then declined to 76.26 in 2016. The standard deviation, on the other hand, is rather large and increases as the mean increases. This indicates the distribution of sales representative relationships is not concentrated around the mean, but rather widespread. At a high level, the degree statistics indicate a growing network.

Degree							
Year	Sales Representatives	Median	Mode	Mean	Stdev	Min	Max
2011	477	33.0	2	50.59	50.36	2	240
2012	504	37.5	2	59.96	60.20	2	287
2013	538	40.00	2	67.18	69.63	2	344
2014	565	44.00	2	75.29	80.12	2	401
2015	588	46.00	2	78.13	84.84	2	433
2016	608	44.00	2	76.26	83.44	2	764

Table 5.1 Results for the Graph Theoretic Measure of Degree

Table of core statistics to display changes in the value for the degree.

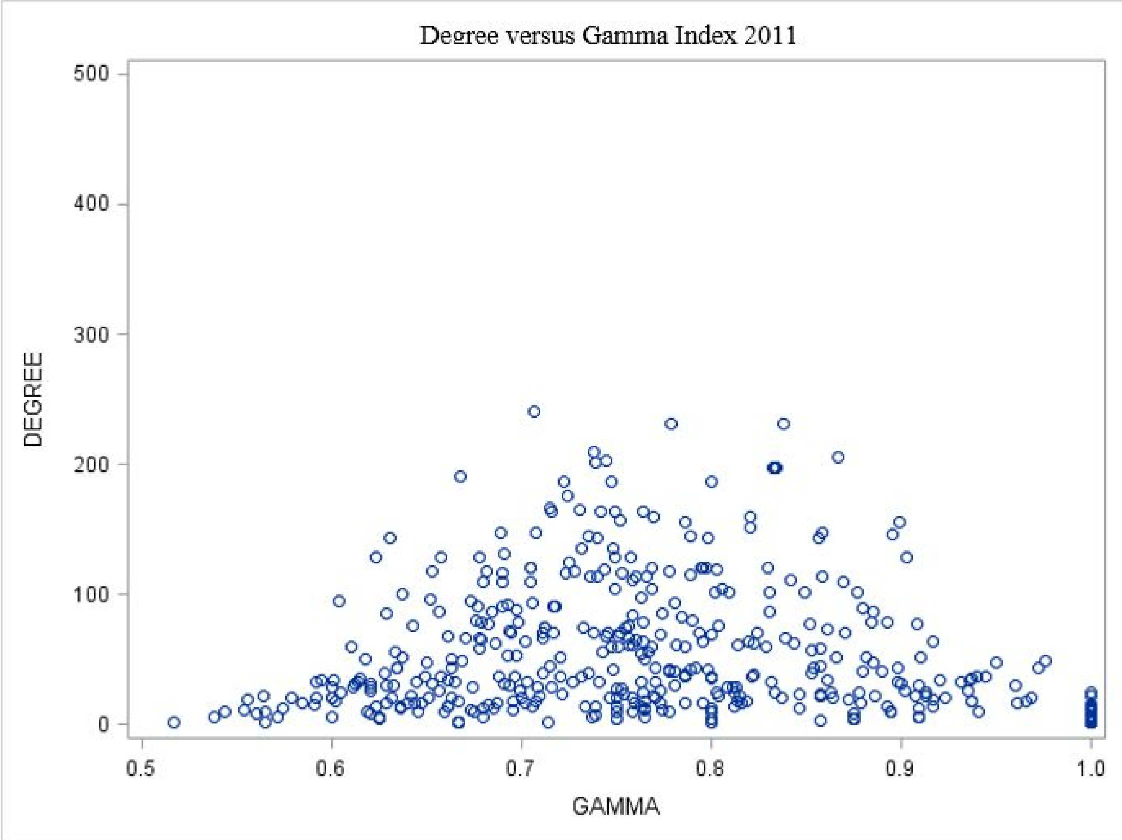
Table 5.2 provides a summary of core statistics on the graph measure called gamma index. Note that the sales representatives column corresponds to Table 5.1. The minimum gamma index value across the six years occurred in 2015 at 0.4964; the maximum minimum value over the same time period was 0.5165 in 2011. Over the six year study, the maximum value was 1.0000 and all six years. In other words, in each year, at least one sales representative maintained relationships with all of a broker's employers managing a fully connected network. With respect to the mean, the gamma index decreased every year starting at 0.7887 in 2011 and finishing at 0.5835 in 2016. This suggests the sales representatives are not selling as many products to the pool of employers controlled by the brokers at the same rate as the years before. However, there is a data limitation with the Group Market Share data used in this study. Since the data only discloses when a particular broker had employers purchase products, it does not disclose which products from the past have terminated coverage. For example, if an employer purchased a product from a competitor of the participant and then terminated their coverage in 2015, this study has no knowledge of the termination. Therefore, once a record is reported in group market share, it exists throughout the duration of this study. As a result, this limitation has the ability to impact the gamma index by inflating the denominator. Despite the limitation, the data may be reviewed on a individual year basis to look for new contracts. Doing so would provide more insight as to whether or not the overall network is declining in connectivity.

Gamma Index							
Year	Sales Representatives	Median	Mode	Mean	Stdev	Min	Max
2011	477	0.7688	1.0000	0.7887	0.1236	0.5165	1.0000
2012	504	0.6720	1.0000	0.7084	0.1322	0.5097	1.0000
2013	538	0.6181	1.0000	0.6631	0.1326	0.5054	1.0000
2014	565	0.5877	1.0000	0.6311	0.1263	0.5022	1.0000
2015	588	0.5653	1.0000	0.6083	0.1223	0.4964	1.0000
2016	608	0.5463	1.0000	0.5835	0.1124	0.4989	1.0000

Table 5.2 Results for the Graph Theoretic Measure of Gamma Index

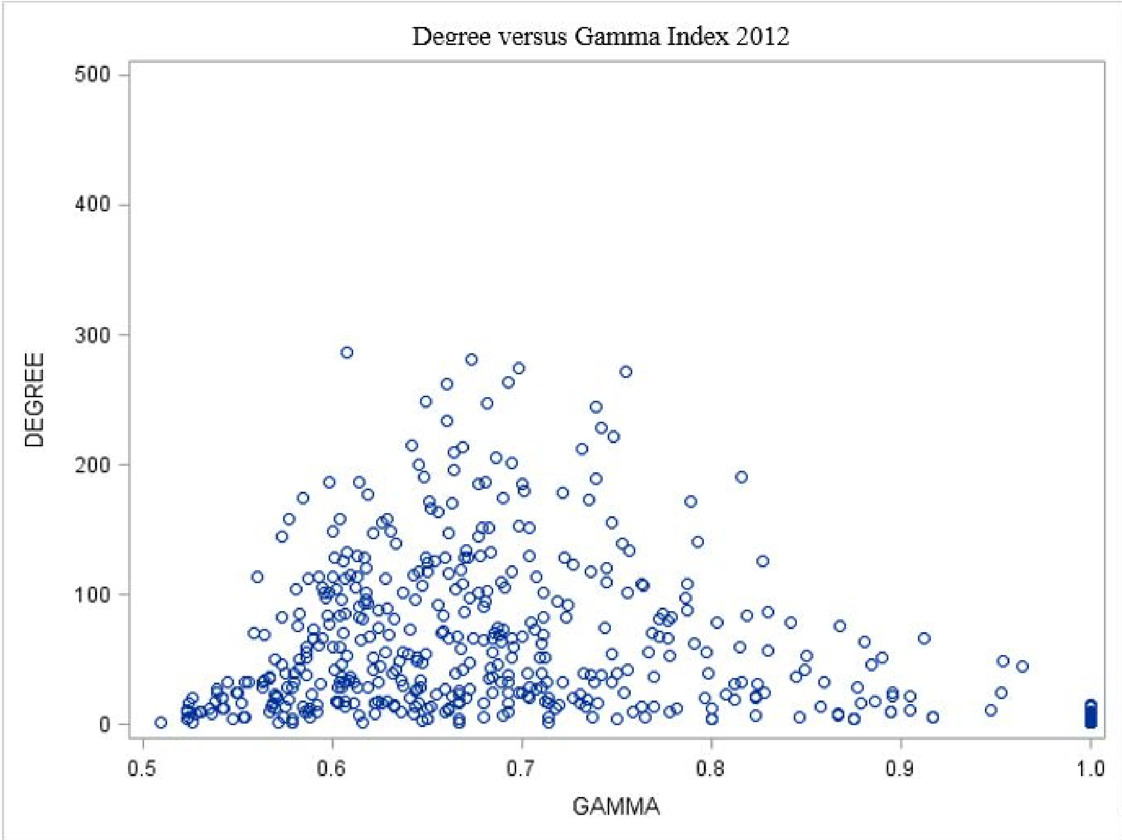
Table of core statistics to display changes in the value for the gamma index.

To build a comprehensive view of the network, both the degree and gamma index need to be viewed together. For example, given a sales representative that has a gamma index of one, meaning fully connected, but has only a degree of two, what learnings come from that style of relationship versus another sales representative who maintains a degree of 50 and a gamma index of 80 percent? Perhaps the sales representative, while maintaining a high level of connectivity, is underutilised because they maintain only two relationships. As a result, this work plotted the degree versus the gamma index to qualitatively observe any shifts over the period. Graphs 5.1 through 5.6 plot the degree versus gamma index on scatter plots. Qualitatively, the plots generated correlate with the raw statistics in Tables 5.1 and 5.2, in that the degree increases over time and the gamma index decreases indicating a growing network in which the partner is decreasing in its connectivity. Starting in 2011, the plot is widespread across the gamma index with the highest degrees occurring between a gamma of 0.7 and 0.9. However, by 2013, the gamma index is condensing between 0.5 and 0.7 with a heavier concentration of sales representatives with a degree of 100 or less. However, there are still sales representatives maintaining a growing degree within the middle of the gamma index concentration between 0.5 and 0.7. By 2016, the concentration of sales representatives, which began in 2013, is increasing. A majority of the sales representatives are concentrated between a gamma index of 0.5 and 0.6; however, while there is still a high level of concentration of sales representatives with a degree of 100 or less, there is growth in the concentration of sales representatives between 100 and 200 relationships, indicating some growth in the number of the relationships. Another observation around relationships, the sales representatives with high connectivities 0.8 or higher have lower degrees by 2016, which would indicate in order to increase relationship volume, a tradeoff is made with the connectivity. In summation, the scatter plots provide a visual to the evolution of the network measures over time and their relationship; however, in order to understand why the measures are changing the relationships need to be measured and reviewed.



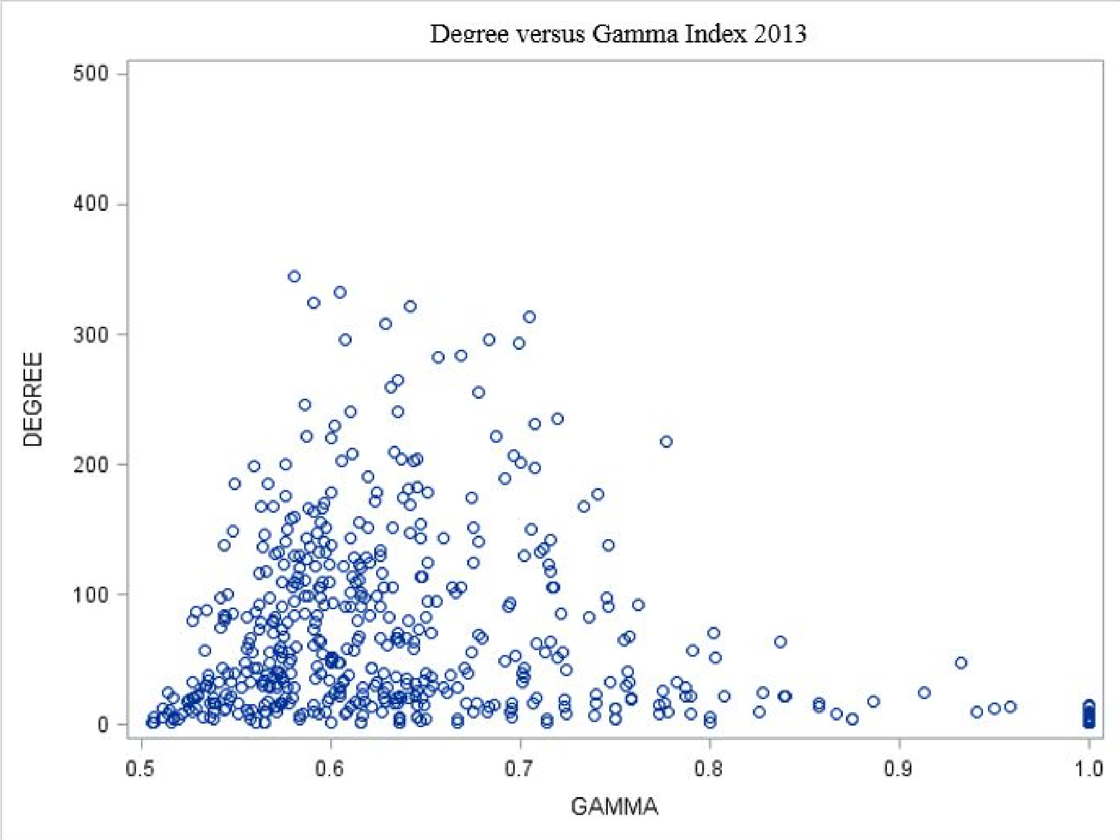
Graph 5.1 2011 Scatter Plot of Degree Versus Gamma Index

2011 Scatter plot for degree, the number of relationship a sales representative maintains, versus the gamma index, the connectivity of the sales representative's network. Each point represents a sales representative.



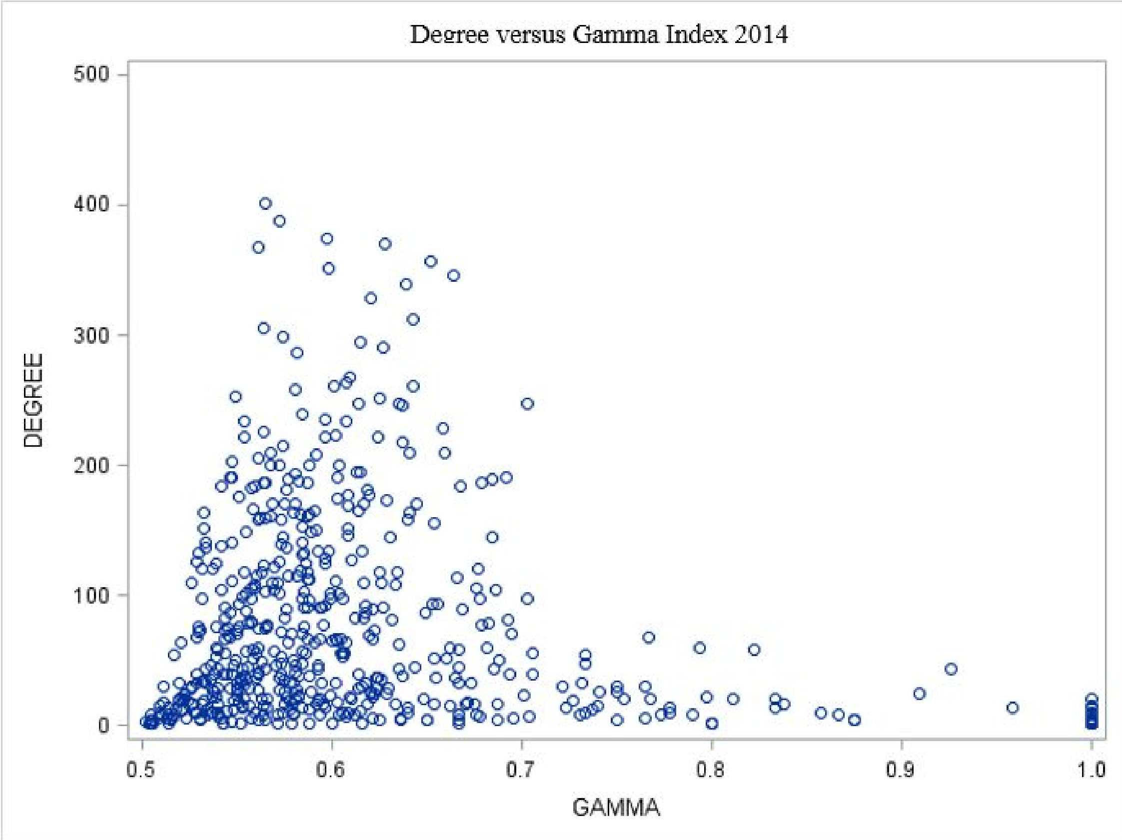
Graph 5.2 2012 Scatter Plot of Degree Versus Gamma Index

2012 Scatter plot for degree, the number of relationship a sales representative maintains, versus the gamma index, the connectivity of the sales representative's network. Each point represents a sales representative.



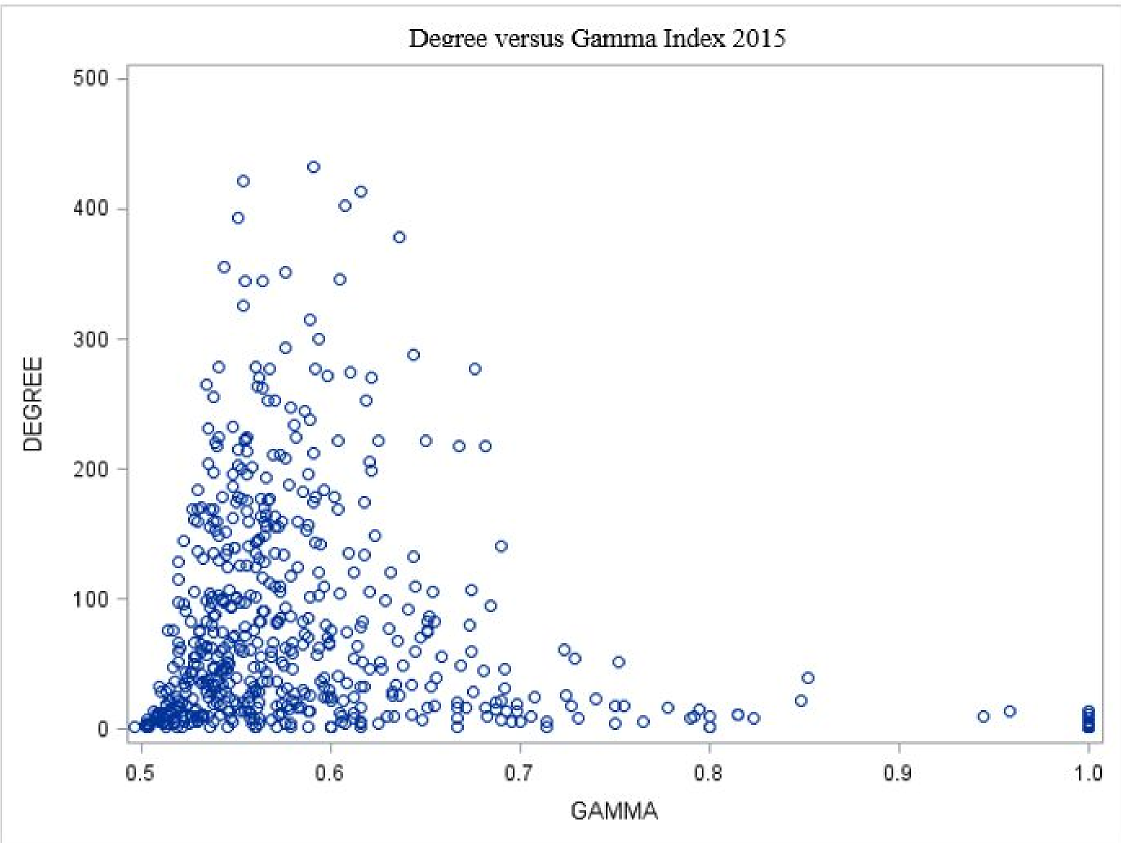
Graph 5.3 2013 Scatter Plot of Degree Versus Gamma Index

2013 Scatter plot for degree, the number of relationship a sales representative maintains, versus the gamma index, the connectivity of the sales representative's network. Each point represents a sales representative.



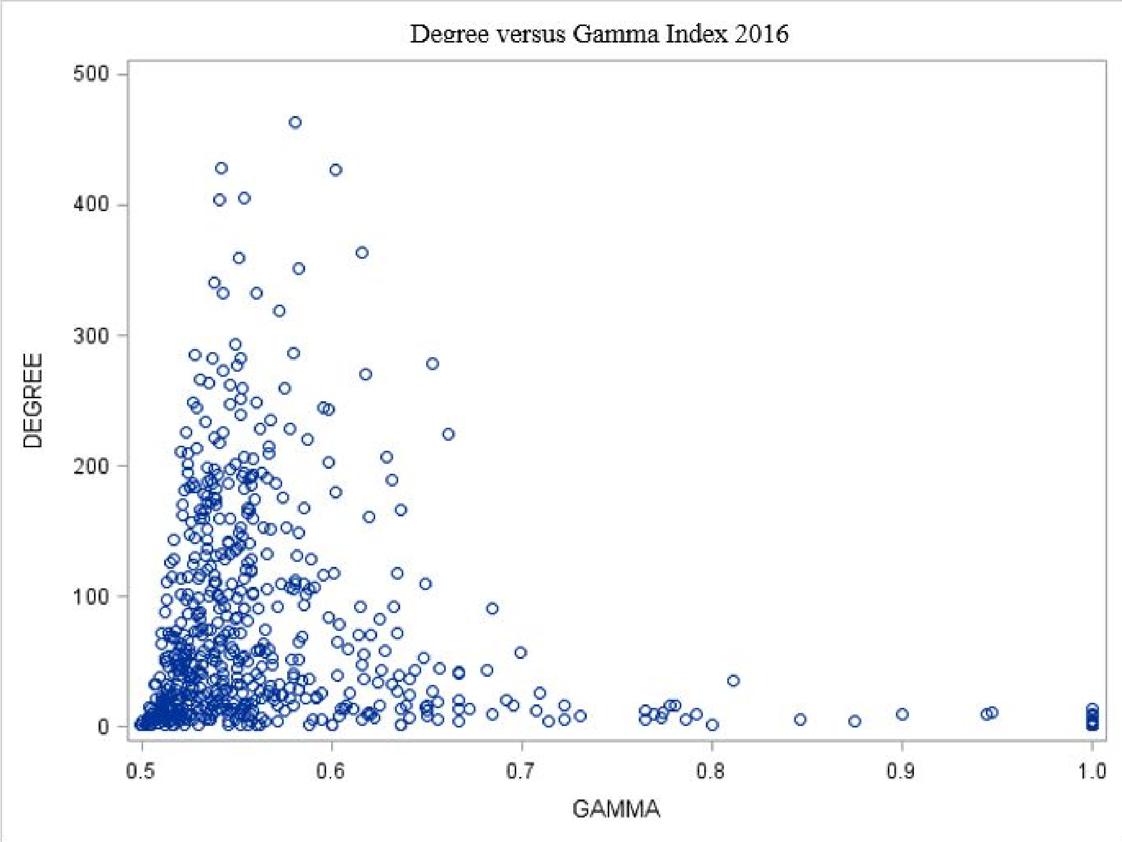
Graph 5.4 2014 Scatter Plot of Degree Versus Gamma Index

2014 Scatter plot for degree, the number of relationship a sales representative maintains, versus the gamma index, the connectivity of the sales representative's network. Each point represents a sales representative.



Graph 5.5 2015 Scatter Plot of Degree Versus Gamma Index

2015 Scatter plot for degree, the number of relationship a sales representative maintains, versus the gamma index, the connectivity of the sales representative's network. Each point represents a sales representative.



Graph 5.6 2016 Scatter Plot of Degree Versus Gamma Index

2016 Scatter plot for degree, the number of relationship a sales representative maintains, versus the gamma index, the connectivity of the sales representative's network. Each point represents a sales representative.

5.2 Relationship Survey Results

Chapter 5 Section 1 outlined the transition in the overall network structures for the degree and gamma index of every known sales representative. The key observation was the growth in the degree coupled with the decline in gamma index. These movements suggest a growing sales network, but a decline in the success rate of selling insurance products. Yet, more information is needed to understand why those shifts occurred. Research shows varying relationship strategies are employed by businesses (Baker, 1990; Uzzi, 1997). Additionally, relationship quality research reviews various drivers considered to affect a relationship's quality or strength (Naudé and Buttle, 2000; Huntley, 2006; Rauyruen and Miller, 2007; Storbacka et al., 1994). By combining these two streams of work, it can be hypothesised that as relationships become stronger they can be classified as a relationship-oriented strategy versus the transactional. Furthermore, if an entity, such as a sales representative, maintains a suite of strong relationships, they are implementing a relationship-oriented approach. On the opposite side of the spectrum, a suite of weak relationships would indicate a transactional strategy. Thus, for the participating insurance carrier, it is possible, given the overall network shift, the network is moving from a hybrid to relationship-oriented approach towards a transactional approach. Yet, to prove this, relationships need to be measured.

This work explores the applicability of creating a relationship index to quantify relationships. To accomplish this task, this work focuses on a graph theoretic approach. First, relationship attributes are modeled as vertices in a fully connected directed graph. Modelling the attributes in this way allows for the permanent function of the resulting matrix to be calculated (Kulkarni, 2005; Muduli et al., 2013). Conceptually, this model accomplishes five tasks outlined by Kulkarni (2005) and Muduli et al. (2013). First, it identifies the important attributes driving relationships. Second, it weights those attributes relative to one another. Third, it quantifies the attributes. Fourth, it populates the matrix representing the graph. Fifth, the permanent function is used to calculate an index. Yet, because this work deals with business relationships, there may be various definitions of what drives relationship growth (Naudé and Buttle, 2000). Therefore, the drivers identified and their relative weights should be tested, which was the basis for the surveys outlined in Sections 5.2.1 and 5.2.2. Both surveys are provided in Appendix A. The participating group insurance carrier offered us the opportunity for their sales representatives to be surveyed in order to identify the top drivers of their broker and employer relationships. Additionally, they allowed for us to distribute a second survey in order to weight those drivers against one another. Due to time constraints and scope, the final steps of measuring the attribute values and calculating the index could not be accomplished and is listed as future work. However, despite the limitations, the sales representatives provided insight into the broker and employer relationships.

5.2.1 Relationship Attribute Prioritisation Results

To understand the relationship drivers, the first step requires knowledge about the importance of each driver. For the participating insurance carrier, there were constraints on the amount of time and sales representatives they could volunteer to accomplish this task. As a compromise, instead of providing their resources with a survey attempting to weight all of the researched relationship drivers, they were provided with a preliminary survey asking them to rank sort a list of narrowed down attributes described in Section 4.2.1 of Chapter 4. The goal of this survey was to analyse the ranks of the attributes to understand the implications of limiting attributes for the second task of weighting each attribute.

Limiting attributes in the second survey, has the potential to create information loss in the index. In their work on manufacturing, Singh and Singru (2013) implemented the permanent function to identify manufacturing process relationships, and discussed how a lack of a directed edge would contribute to missing terms in the permanent function leading to information loss. For this work to compromise on shorter surveys, the attributes list for weighting was narrowed to three. Since the original list of attributes was seven, four vertices in the relationship attribute graph had their edges removed for measurement. This would result in information loss in the relationship index should it be calculated. To provide insight, the first survey, ranking all attributes by importance, provides qualitative information on the severity of information loss. For example, if all attributes displayed similar scores in survey one, reducing the number of attributes would have a larger information loss. This magnitude of loss represents varying perspectives the participating sales representatives have of which attributes are most important. Therefore, should the need arise, the participating insurance carrier could be advised to adapt future work to expand the research. The remainder of the section outlines the survey results including aggregate observations as well as a perspective into various demographic splits.

Overall, participation in the first survey was suitable for analysis with response rates of 81.05 percent and 77.89 percent for broker related and employer related questions respectively. Two demographic variables were tracked within the surveys. The first variable represented their geographic location within the United States. The second variable represents their job title. There are different types of job functions within the sales representative job family; however, each one works with brokers and employers to maintain and sell business. As a result, these 95 participants are representative of the various job titles. Also, to provide an accurate representation of the population in the sample with respect to the ratios of the various job titles to one another, the entire office at each location was solicited for responses. In general, the sales offices for the participating group insurance carrier maintain a similar amount of sales representatives from each position across the United States locations. After the deadline for closing of survey, the results were reviewed and cleaned. However, before cleaning the data, 91 responses were collected.

Next, the data was cleaned from the original response count and divided into the two relationships studied, brokers and employers. Both broker and employer relationships needed to be surveyed because it cannot be assumed the relationships will value the same drivers. Naude and Buttle (2000) concluded that various definitions for relationships exist, which drove the decision to survey the relationships in this work separately. Upon completion of reviewing broker results for incomplete responses, 14 responses needed to be discarded leaving 77 responses out of 95 possible yielding a response rate of 81.05 percent. Responses by field office were similar with each office representing between 22 and 28 percent of the responses; 0 percent declined to provide their office location. The real job titles of the sales representatives were renamed to "position *n*", where *n* is an integer, to avoid confusion about the individual role of the sales agents. The real names for the job titles are specific to the participating group insurance carrier, and, therefore, would be unclear to a person with no knowledge about the participant's sales organisation. Responses by job title followed the same proportion as the population with position 1 being the largest, position 3 the second largest, and position 2 the smallest; 3.9 percent of the respondents declined to provide their job title. A summary of these results is recorded in Table 5.3.

Response Profile		Location Profile		Job Title Profile		
Category	Value	Location	Participation (%)	Job Title	Sample Survey	Population
Sample Surveyed	95	office 1	22.08%	position 1	41.56%	45.66%
Responses	91	office 2	24.68%	position 2	23.38%	16.53%
Incomplete Responses	14	office 3	27.27%	position 3	31.17%	37.82%
Valid Responses	77	office 4	25.97%	undisclosed	3.90%	0.00%
Response Rate	81.05%	undisclosed	0.00%			

Table 5.3 Survey One Response Summary for Broker Related Questions

Summarises the broker responses by response rate, location participation, and job title participation, which is compared to the total population of all sales representatives employed by the participating group insurance carrier.

For the employer related responses, three fewer sales representatives answered the survey. Because the survey was voluntary and confidential, sales representatives had the power to decline any question they wished not to answer. Additionally, their identity was not recorded. As a result, of the 91 responses originally noted, 17 were discarded due to having incomplete data yielding 74 valid responses, a response rate of 77.89 percent. Yielding three fewer responses for employers than brokers did shift the office and job title profiles slightly. However, location profile remained similar ranging from 20 to 30 percent by office. From a job title perspective, the sample distribution by job title remained aligned with the population. Table 5.4 summarises the employer related responses. After reviewing demographic and response characteristics results were reviewed for both brokers and employers.

Response Profile		Location Profile		Job Title Profile		
Category	Value	Location	Participation (%)	Job Title	Sample Survey	Population
Sample Surveyed	95	office 1	20.27%	position 1	43.24%	45.66%
Responses	91	office 2	24.32%	position 2	18.92%	16.53%
Incomplete Responses	17	office 3	29.73%	position 3	33.78%	37.82%
Valid Responses	74	office 4	25.68%	undisclosed	4.05%	0.00%
Response Rate	77.89%	undisclosed	0.00%			

Table 5.4 Survey One Response Summary for Employer Related Questions

Summarises the employer responses by response rate, location participation, and job title participation, which is compared to the total population of all sales representatives employed by the participating group insurance carrier.

For broker results, there is evidence of clear prioritisation of attributes. In other words, sales representatives believe the brokers to value certain attributes over others. In aggregate, the ranking of attributes are displayed in Table 5.5, but *satisfaction*, *joint problem solving*, and *profit* rank as the top three with scores of 5.23, 4.82, and 4.47 respectively.

ALL	
Relationship Driver	Rank Score
Satisfaction	5.23
Joint Problem Solving	4.82
Profit	4.47
Trust	4.19
Commitment	3.56
Investments	3.00
Power	2.73

Table 5.5 Survey One Attribute Rankings for Brokers

Broker relationship driver ranking survey results at the aggregate level.

Trust, ranked fourth, scored above four at 4.19. Despite a clear ranking at the aggregate level, variance in ranking exists, when reviewing results at the location and job title levels. By office, *joint problem solving* and *satisfaction* appear in the top 3 for all four offices, but do not share the same same rank position. Additionally, offices fluctuate between *trust* and *profit* as a top three rank. In all but office 1, the top four attributes are *joint problem solving*, *satisfaction* , *profit*, and *trust*. Office 1 ranks *commitment* higher than *trust* for the top four ranks. Table 5.6 summarises office level rankings of the relationship drivers.

Office 1		Office 2		Office 3		Office 4	
Relationship Driver	Rank Score	Relationship Driver	Rank Score	Relationship Driver	Rank Score	Relationship Driver	Rank Score
Satisfaction	4.94	Satisfaction	5.11	Satisfaction	5.48	Joint Problem Solving	5.40
Profit	4.94	Joint Problem Solving	5.11	Profit	5.05	Satisfaction	5.35
Joint Problem Solving	4.47	Trust	4.42	Joint Problem Solving	4.29	Trust	4.30
Commitment	4.29	Profit	4.32	Trust	4.14	Profit	3.60
Trust	3.88	Commitment	3.89	Investments	3.10	Commitment	3.20
Investments	3.29	Power	2.63	Commitment	3.00	Investments	3.10
Power	2.18	Investments	2.53	Power	2.95	Power	3.05

Table 5.6 Survey One Attribute Rankings for Brokers by Location

Broker relationship driver ranking survey results at the location level.

For position level details, only *joint problem solving* ranked in the top three for positions 1 through 3. *Satisfaction* appears in the top three for position 1 and position 3, but appears fourth in position 2. Furthermore, *satisfaction*, *trust*, *joint problem solving*, and *profit* appear in the top four for positions 1 through 3; however, the rankings vary.

The undisclosed responses had some overlap with the other positions; however, because of the small amount of responses in without position provided, its results should not affect overall conclusions for the entire set of responses. Table 5.7 summarises the position level rankings for broker relationships.

Position 1		Position 2		Position 3		Undisclosed	
Relationship Driver	Rank Score	Relationship Driver	Rank Score	Relationship Driver	Rank Score	Relationship Driver	Rank Score
Satisfaction	5.91	Trust	4.56	Satisfaction	5.25	Joint Problem Solving	6.33
Profit	4.94	Joint Problem Solving	4.44	Joint Problem Solving	4.88	Trust	4.67
Joint Problem Solving	4.84	Profit	4.33	Trust	4.46	Commitment	4.33
Trust	3.75	Satisfaction	4.22	Profit	4.21	Satisfaction	4.00
Commitment	3.34	Commitment	4.06	Commitment	3.38	Investments	3.67
Investments	2.88	Investments	3.56	Power	3.17	Power	2.67
Power	2.34	Power	2.83	Investments	2.67	Profit	2.33

Table 5.7 Survey One Attribute Rankings for Brokers by Job Title

Broker relationship driver ranking survey results at the job title level.

For employer results, similar to the broker results, the attributes had a clear prioritisation in the ranking; however, the mix of attributes in the top ranks were different from broker results. In aggregate, sales representatives believe employers value, from most important to least, *joint problem solving*, *satisfaction*, *trust* as the top three ranks with scores of 5.57, 5.30, and 4.34 respectively. *Commitment*, ranked fourth, also scored above four at 4.16. In contrast with broker results, there was a steeper drop-off in scores between the top four ranks and the bottom three. For employer results, none of the bottom three attributes received a score of three or higher; whereas the fifth and sixth ranked attribute in the broker results achieved a score of three or higher. The ranks of employer results and the relationship attributes are summarised in Table 5.8.

ALL	
Relationship Driver	Rank Score
Joint Problem Solving	5.57
Satisfaction	5.30
Trust	4.34
Commitment	4.16
Investments	2.97
Power	2.93
Profit	2.73

Table 5.8 Survey One Attribute Rankings for Employers

Employer relationship driver ranking survey results at the aggregate level.

At the location level, results were more stable than the broker results. *Joint problem solving* and *satisfaction* ranked as the top two attributes for all four offices. *Trust* and *commitment* ranked in ranked third or fourth in all offices but office 1, which ranked *profit* over *commitment*. This stability between the top four and bottom three attributes exists at the job title level as well. For all positions including 'undisclosed', *joint problem solving*, *commitment*, *satisfaction*, and *trust* ranked in the top four, and *investments*, *power*, and *profit* ranked in the bottom three. However, similar to broker results the sample of sales representatives that did not provide their job title is small relative to the larger sample and will not be used to drive discussion and conclusions. Tables 5.9 and 5.10 summarise the location and job title results respectively.

Office 1		Office 2		Office 3		Office 4	
Relationship Driver	Rank Score	Relationship Driver	Rank Score	Relationship Driver	Rank Score	Relationship Driver	Rank Score
Satisfaction	5.53	Joint Problem Solving	6.00	Joint Problem Solving	5.45	Joint Problem Solving	6.05
Joint Problem Solving	4.60	Satisfaction	4.78	Satisfaction	5.36	Satisfaction	5.53
Trust	4.40	Trust	4.17	Trust	4.59	Commitment	4.32
Profit	4.20	Commitment	4.17	Commitment	4.14	Trust	4.16
Commitment	4.00	Investments	3.22	Investments	3.18	Power	3.11
Investments	2.87	Power	3.11	Power	3.00	Investments	2.58
Power	2.40	Profit	2.56	Profit	2.27	Profit	2.26

Table 5.9 Survey One Attribute Rankings for Employers by Location

Employer relationship driver ranking survey results at the location level.

Position 1		Position 2		Position 3		Undisclosed	
Relationship Driver	Rank Score	Relationship Driver	Rank Score	Relationship Driver	Rank Score	Relationship Driver	Rank Score
Satisfaction	5.75	Joint Problem Solving	5.00	Joint Problem Solving	6.00	Joint Problem Solving	5.67
Joint Problem Solving	5.47	Trust	4.71	Satisfaction	5.40	Commitment	5.33
Trust	4.28	Satisfaction	4.43	Commitment	4.72	Trust	4.67
Commitment	3.66	Commitment	4.07	Trust	4.16	Satisfaction	3.67
Investments	3.09	Profit	3.64	Power	2.88	Investments	3.67
Profit	2.91	Power	3.36	Investments	2.84	Profit	2.67
Power	2.84	Investments	2.79	Profit	2.00	Power	2.33

Table 5.10 Survey One Attribute Rankings for Employers by Job Title

Employer relationship driver ranking survey results at the job title level.

5.2.2 Relationship Attribute Weighting Results

Once the relationship drivers are ranked, the second step both identifies the top drivers and weights their relative importance. To reduce the burden on the sales representatives, per the considerations of time constraints from the participating group insurance carrier, only the top three attributes from the aggregate results were chosen for the second survey. For brokers, the top three attributes were *satisfaction, joint problem solving,* and *profit*; for employers, *joint problem solving, satisfaction,* and *trust* ranked as the top three attributes. These attributes were then formulated into a survey on a scale from 0 to 10 with pairs of attributes on opposite sides of the scale. For example, the broker attribute of *satisfaction* and *joint problem solving* represent the 0 and 10 values in one question. The sales representatives would then select 10 if *joint problem solving* was extremely more valued than *satisfaction*. If they selected 0, then the opposite would be true. The numerical value selected represents the importance value, which could then be input into the matrix representing the attribute graph using the methods employed by Kulkarni (2005) and Muduli et al. (2013) to build indices. With the survey limited to three attributes, it shortened the demand on the sales representatives to six total questions, in addition to the demographic questions, three for brokers and three for employers. From there, the opposite direction of the relationships could be calculated by taking the weight of a survey question and subtracting the weight from 10 (Kulkarni, 2005). This produces 12 total weights, six for brokers and six for employers.

While survey response declined from the first survey ranking the attributes, survey participation were suitable for analysis. The time frame between the initial distribution of survey one and survey two was one month. During that time, there were no changes in staffing of sales representative; therefore, the same 357 sales representatives represented the population. Furthermore, the same four locations comprising of a 95 sales representative sample remained consistent, and was surveyed during this second survey. However, due to other responsibilities of the sales representatives and the short window of surveys, it was expected participation would decline relative to the first survey. For the second survey, 65 responses were collected.

Similar to the attribute ranking survey, the attribute weighting survey responses were cleansed of incomplete responses and analysed between broker relationships and employer relationships. Table 5.11 and Table 5.12 summarise the participation for the attribute weighting survey for brokers and employers respectively.

Response Profile		Location Profile		Job Title Profile		
Category	Value	Location	Participation (%)	Job Title	Sample Survey	Population
Sample Surveyed	95	office 1	27.42%	position 1	43.55%	45.66%
Responses	65	office 2	22.58%	position 2	17.74%	16.53%
Incomplete Responses	3	office 3	25.81%	position 3	33.87%	37.82%
Valid Responses	62	office 4	24.19%	undisclosed	4.84%	0.00%
Response Rate	65.26%	undisclosed	0.00%			

Table 5.11 Survey Two Response Summary for Broker Related Questions

Summarises the relationship driver weighting survey broker responses by response rate, location participation, and job title participation, which is compared to the total population of all sales representatives employed by the participating group insurance carrier.

Response Profile		Location Profile		Job Title Profile		
Category	Value	Location	Participation (%)	Job Title	Sample Survey	Population
Sample Surveyed	95	office 1	29.51%	position 1	45.90%	45.66%
Responses	65	office 2	21.31%	position 2	14.75%	16.53%
Incomplete Responses	4	office 3	26.23%	position 3	34.43%	37.82%
Valid Responses	61	office 4	22.95%	undisclosed	4.92%	0.00%
Response Rate	64.21%	undisclosed	0.00%			

Table 5.12 Survey Two Response Summary for Employer Related Questions

Summarises the relationship driver weighting survey employer responses by response rate, location participation, and job title participation, which is compared to the total population of all sales representatives employed by the participating group insurance carrier.

For Brokers, of the 65 collected responses 62 responses were valid yielding a response rate of 65.26 percent, which is down from the 81.05 percent response rate from the attribute ranking survey. Despite the decrease, location level participation rates maintain an equal participation split ranging from 22.58 percent to 27.42 percent. Similarly, the participation by job title maintained a profile in alignment with the overall population. Thus results are comprised of a comparable mix of perspectives representative of the attribute ranking survey and the population as a whole. For employers, of the 65 collected responses, 61 were determined to be complete, yielding a response rate of 64.21 percent, which was down from the 77.89 percent observed from the attribute ranking survey. Similar to the broker results, despite the decrease in response, participation rates by location remained split relatively evenly with the smallest rate being 21.31 percent and the largest rate being 29.51 percent. Additionally, the participation by job title profile aligns with the population. Both factors, support results consistent and representative with the population of sales representatives at the participating insurance carrier.

For the attribute weighting broker results, responses were consistent for a majority of the attributes. When looking at the aggregate responses, the top three rows in Table 5.13 represent the weights surveyed, while the bottom three are derived using the 10 - w approach outlined in Figure 4.6.

All	
Relationship Driver Comparison	Weight
Satisfaction V Joint Problem Solving	4.90
Satisfaction V Profit	5.44
Joint Problem Solving V Profit	6.02
Joint Problem Solving V Satisfaction	5.10
Profit V Satisfaction	4.56
Profit V Joint Problem Solving	3.98

Table 5.13 Survey Two Attribute Weightings for Brokers

Broker relationship driver weighting survey results at the aggregate level.

Essentially, because the weight surveyed was on a scale from 0 to 10, the inverse of the weight measured may be subtracted from 10, a method employed by Kulkarni (2005) and Muduli et al. (2013). Additionally, the results from survey one indicate for brokers the top three ranking was *satisfaction*, *joint problem solving*, and *profit*. Therefore, if *satisfaction* was ranked higher; in theory, it should have a weight of equal importance, five, or greater, with a max of 10. However, for broker results *satisfaction* versus *joint problem solving* scored a weight of 4.9. Yet, the remaining attributes remained consistent with survey one. *Satisfaction* weighted more important than *profit* with a score of 5.44; similarly, *joint problem solving* scored a weight of 6.02. With 6.02 scoring as the highest weight and a score of five weighting the attributes equally, there is not a strong preference on which attributes strongly drive the relationship, but rather they have an equal impact. When reviewing the results by office location, variation in results exists, but weights to not display a wide gap. For *satisfaction* versus *joint problem solving* the lowest weight for an office was 4.36 and the highest was 5.38. This gap in particular helps explain why *satisfaction* scored lower in the aggregate than *joint problem solving*, since two offices scored lower than a five. Additionally, this gap was the largest between the set of attributes by office at a value of 0.01 and 0.02. Therefore, there is a relative consistency between the office scores and the aggregate. In other words, the offices did not score drastically different and their aggregate value resulted in a middle ground. Table 5.14 reflects the remaining weight scores by office.

Office 1		Office 2		Office 3		Office 4	
Relationship Driver Comparison	Weight	Relationship Driver Comparison	Weight	Relationship Driver Comparison	Weight	Relationship Driver Comparison	Weight
Satisfaction V Joint Problem Solving	5.06	Satisfaction V Joint Problem Solving	4.36	Satisfaction V Joint Problem Solving	5.38	Satisfaction V Joint Problem Solving	4.73
Satisfaction V Profit	5.47	Satisfaction V Profit	5.14	Satisfaction V Profit	5.94	Satisfaction V Profit	5.13
Joint Problem Solving V Profit	6.35	Joint Problem Solving V Profit	6.21	Joint Problem Solving V Profit	5.94	Joint Problem Solving V Profit	5.53
Joint Problem Solving V Satisfaction	4.94	Joint Problem Solving V Satisfaction	5.64	Joint Problem Solving V Satisfaction	4.63	Joint Problem Solving V Satisfaction	5.27
Profit V Satisfaction	4.53	Profit V Satisfaction	4.86	Profit V Satisfaction	4.06	Profit V Satisfaction	4.87
Profit V Joint Problem Solving	3.65	Profit V Joint Problem Solving	3.79	Profit V Joint Problem Solving	4.06	Profit V Joint Problem Solving	4.47

Table 5.14 Survey Two Attribute Weightings for Brokers by Location

Broker relationship driver weighting survey results at the location level.

By job title, results show a similar consistency, for *satisfaction* versus *joint problem solving* positions two and three, which accounted for half of the surveyed sample, drove the weight being below five; however, position one scored close to five at 5.11. Again, gaps between min and max weights by position were fairly close with a variance of less than a score of one. For example, the max variance between positions occurred at *satisfaction* versus *profit* with a gap of 0.86. Thus, there were no strong opinions as to one attribute being extremely more important over another in driving the relationship, but rather, the attributes are seen as being fairly equal. Table 5.15 displays the results by job title.

Position 1		Position 2		Position 3		Undisclosed	
Relationship Driver Comparison	Weight	Relationship Driver Comparison	Weight	Relationship Driver Comparison	Weight	Relationship Driver Comparison	Weight
Satisfaction V Joint Problem Solving	5.11	Satisfaction V Joint Problem Solving	4.45	Satisfaction V Joint Problem Solving	4.95	Satisfaction V Joint Problem Solving	4.33
Satisfaction V Profit	5.81	Satisfaction V Profit	5.73	Satisfaction V Profit	4.95	Satisfaction V Profit	4.33
Joint Problem Solving V Profit	6.33	Joint Problem Solving V Profit	5.82	Joint Problem Solving V Profit	5.86	Joint Problem Solving V Profit	5.00
Joint Problem Solving V Satisfaction	4.89	Joint Problem Solving V Satisfaction	5.55	Joint Problem Solving V Satisfaction	5.05	Joint Problem Solving V Satisfaction	5.67
Profit V Satisfaction	4.19	Profit V Satisfaction	4.27	Profit V Satisfaction	5.05	Profit V Satisfaction	5.67
Profit V Joint Problem Solving	3.67	Profit V Joint Problem Solving	4.18	Profit V Joint Problem Solving	4.14	Profit V Joint Problem Solving	5.00

Table 5.15 Survey Two Attribute Weightings for Brokers by Job Title

Broker relationship driver weighting survey results at the job title level.

For employer based attribute weighting results, attribute weights scored similarly to brokers, in that they scored close to a five, meaning they were valued equally. The top three attributes for employers were *joint problem solving*, *satisfaction*, and *trust*. *Joint problem solving* versus *satisfaction* scored a 5.44. *Joint problem solving* scored a weight of 5.16. Finally, *satisfaction* versus *trust* scored a weight of 5.05. Therefore, the highest weight was less than six, which is still within the realm of scoring equally. However, in the aggregate, unlike the broker results, the top three attribute comparisons scored above a five in alignment with the rankings observed in the first survey. Table 5.16 displays the aggregate scores for employers.

All	
Relationship Driver Comparison	Weight
Joint Problem Solving V Satisfaction	5.44
Joint Problem Solving V Trust	5.16
Satisfaction V Trust	5.05
Satisfaction V Joint Problem Solving	4.56
Trust V Joint Problem Solving	4.84
Trust V Satisfaction	4.95

Table 5.16 Survey Two Attribute Weightings for Employers

Employer relationship driver weighting survey results at the aggregate level.

Furthermore, at the location and job title levels, while there is some variance, the gap in scores is small. By location, depicted in Table 5.17, the widest gap in scores occurred in the *satisfaction* versus *trust* relationships with a variance of 1.65 and the lowest gap variance of 0.80.

Office 1		Office 2		Office 3		Office 4	
Relationship Driver Comparison	Weight	Relationship Driver Comparison	Weight	Relationship Driver Comparison	Weight	Relationship Driver Comparison	Weight
Joint Problem Solving V Satisfaction	5.22	Joint Problem Solving V Satisfaction	5.92	Joint Problem Solving V Satisfaction	5.13	Joint Problem Solving V Satisfaction	5.64
Joint Problem Solving V Trust	5.67	Joint Problem Solving V Trust	4.62	Joint Problem Solving V Trust	5.56	Joint Problem Solving V Trust	4.57
Satisfaction V Trust	5.72	Satisfaction V Trust	4.08	Satisfaction V Trust	5.13	Satisfaction V Trust	5.00
Satisfaction V Joint Problem Solving	4.78	Satisfaction V Joint Problem Solving	4.08	Satisfaction V Joint Problem Solving	4.88	Satisfaction V Joint Problem Solving	4.36
Trust V Joint Problem Solving	4.33	Trust V Joint Problem Solving	5.38	Trust V Joint Problem Solving	4.44	Trust V Joint Problem Solving	5.43
Trust V Satisfaction	4.28	Trust V Satisfaction	5.92	Trust V Satisfaction	4.88	Trust V Satisfaction	5.00

Table 5.17 Survey Two Attribute Weightings for Employers by Location

Employer relationship driver weighting survey results at the location level.

Therefore, there is a little more gap in answers by office than the broker counterparts; however, the overall score falls between four and six, which is close to the equal mark indicating a relatively stable opinion by office that the attributes are relatively of equal importance in driving the relationships. By job title, a similar result is shown in Table 5.18. None of the attribute weightings scored below a four or above a six; therefore, the results in total suggest an equal weighting of importance by position. One attribute comparison, *satisfaction* versus *trust* did have a gap in answers of 1.03 between the job titles, but is similar to other results. Thus, for employers, while some variation by location and job title exists, it is not enough to sway the aggregate result from having a result of attributes scoring within an equal importance rating.

Position 1		Position 2		Position 3		Undisclosed	
Relationship Driver Comparison	Weight	Relationship Driver Comparison	Weight	Relationship Driver Comparison	Weight	Relationship Driver Comparison	Weight
Joint Problem Solving V Satisfaction	5.43	Joint Problem Solving V Satisfaction	5.33	Joint Problem Solving V Satisfaction	5.38	Joint Problem Solving V Satisfaction	6.33
Joint Problem Solving V Trust	5.32	Joint Problem Solving V Trust	5.11	Joint Problem Solving V Trust	4.95	Joint Problem Solving V Trust	5.33
Satisfaction V Trust	5.43	Satisfaction V Trust	5.56	Satisfaction V Trust	4.52	Satisfaction V Trust	3.67
Satisfaction V Joint Problem Solving	4.57	Satisfaction V Joint Problem Solving	4.67	Satisfaction V Joint Problem Solving	4.62	Satisfaction V Joint Problem Solving	3.67
Trust V Joint Problem Solving	4.68	Trust V Joint Problem Solving	4.89	Trust V Joint Problem Solving	5.05	Trust V Joint Problem Solving	4.67
Trust V Satisfaction	4.57	Trust V Satisfaction	4.44	Trust V Satisfaction	5.48	Trust V Satisfaction	6.33

Table 5.18 Survey Two Attribute Weightings for Employers by Job Title

Employer relationship driver weighting survey results at the job title level.

Chapter 6: Discussion

The aim of this work is to understand the network of brokers and employers with whom a group insurance carrier interacts and the drivers behind change in the network over time. From a business relationship perspective, there are three different approaches a sales representative could take to manage their personal network of relationships, namely transaction, relationship-oriented, or a hybrid approach (Baker, 1990; Uzzi, 1997). Furthermore, through their work Baker (1990) and Uzzi (1997) discovered most companies adopt a hybrid approach, and posit it is because the advantages of the relationship-oriented approach and transactional approach counteract the disadvantages present within each approach. Uzzi (1997) goes on to theorise a point of optimal balance between relationship types. In order to reach this optimal point, companies need to understand both their current state of relationship strategies and what drives their relationships from one approach to another. However, business relationship networks are dynamic over time, which are subject to, for example, critical incidents (Anderson et al., 1994) or continual mutual reciprocity (Holm, 1999; Uzzi's, 1997). These factors change the participants' perspective of one another with respect to network position or value (Abrahamsen et al., 2012). As a result, there is a need to understand and measure those relationship drivers, which the measurement of quality explored in this work works to resolve.

By understanding and measuring how the relationship drivers influence sales representative, broker, and employer decisions, a group insurance carrier may build strategies on how to develop those important relationship attributes. This effort will not only grow relationships, transforming relationships into the relationship-oriented strategy, but will help identify which relationships are transactional as well. This work synthesised a set of relationship drivers over seven sources, as shown in Table 4.3. Using this list of attributes, sales representatives were asked to rank and weight the attributes by importance. Using the weights of importance, the attributes can be modeled into a graph and create an index using the methods of Kulkarni (2005) and Muduli et al. (2013) to develop a potential relationship quality index. This index could then be used to identify the relationship strategies employed and monitor areas where change is occuring in the network. The following sections outline the results within this framework by commenting on the state of relationship strategies employed by the group insurance carrier and begin the work on understanding the relationship drivers and their relative importance.

6.1 Observed Relationship Strategies and Network Evolution

To understand the relationship strategy utilised by the participating group insurance carrier, this work modeled the participant's sales network of sales representatives, brokers, and employers as an undirected graph. Degree was used to understand the number of relationships a sales representative manages. The gamma index explains the broker penetration level of the sales representative. Broker penetration represents the number of employers through a particular broker to which the sales representative sells insurance relative to the total number of employers with which that broker maintains relationships. These two measures together allow for the relationship strategy to be identified based on their description in the literature. Transactional relationships tend to have less social relationship influence and may not repeat business with more emphasis on the cost of doing business (Baker, 1990; Uzzi, 1997); whereas, the relationship-oriented ties have a stronger bond of partnership, reciprocity, and knowledge transfer (Baker, 1990; Uzzi, 1997). Additionally, the volumes between the number of relationships are different, where transactional relationships tend to be greater in number than the relationship-oriented relationships (Baker, 1990; Uzzi, 1997). The hybrid approach combines the transactional with the relationship-oriented and has the benefits of both counteracting the deficits (Baker, 1990; Uzzi, 1997). Additionally, the hybrid approach is typically the dominant strategy utilised by companies (Baker, 1990; Uzzi, 1997). Additionally, Baker (1990) used the idea that if a company used a particular investment bank for a majority of their contracts, they were likely a relationship-oriented tie. Similar to Baker's (1990) approach, this work applies the degree and gamma index from graph theory to measure the volume of companies with which a single company partners, and the amount of contracts they sell through each partner respectively. Therefore, since both Baker (1990) and this work investigate how many partners a company has and how many contracts are sold through each partner, this work may use degree and gamma index to ascertain which relationships are transactional and which are relationship-oriented. As a result, Baker (1990) informally uses degree and gamma index concepts to conduct his work; however, this research provides a formal methodology for measuring these properties in a network reflecting hundreds of thousands of relationships.

Focusing on the findings, the results presented in Chapter 5 Section 5.1 describe a network of sales representatives utilising multiples strategies. Beginning with the first year of the study, 2011, the mean of the degree, found in Table 5.1, is between 50 and 51 relationships managed; however, the standard deviation was large rounded to 50 relationships. As a result, the sales representative distribution itself is not concentrated around the mean, but presents a rather wide distribution. Therefore, there are sales representatives with varying levels of low degree and high degree. The gamma index in 2011, found in Table 5.2, had a mean nearing 0.79 with a standard deviation of around 0.12, which relative to degree is smaller; however, rather large considering the floor and ceiling for that year was 0.5 and 1.0 respectively. Therefore, similar to degree, the gamma index had a rather wide distribution of values. When plotting degree versus gamma, as in Graph 5.1, the distribution of strategies becomes apparent. There is a grouping of sales representatives with a degree higher than 0.9, but managing less than 100 relationships identifying with the low degree high gamma corner explained in Figure 4.1. These sales representatives map to a relationship-oriented strategy. There is some evidence of transactional relationships, with degrees between 100 and 200, but maintaining a gamma index between 0.6 and 0.7. Additionally, there are extreme transactional relationships with degree below 100 relationships and gamma index values less than 0.6. Hybrid relationships as well with a concentration of sales representatives with a gamma index between 0.7 and 0.9, with varying degrees. Should there have been one or two strategies represented there would have been more aggressive concentration of sales representatives rather than the wider distribution. As a result, the participating group insurance carrier as a whole entity represents a hybrid approach; however, this point in time view in 2011 does not explain the evolution seen in networks overtime.

As time passes, networks will change as connections between actors are formed or dissolved, and the participant's network is no exception. Anderson et al. (1994) explore case studies that generate critical incidents for a business relationship, which arise from a need to solve business problems. For example, the printing company studied needed to find a new partner to satisfy customer needs, when the current supplier changed paper that adapted their product outside the boundaries of the customers needs. Ultimately, these decisions lead to a new relationship forming and decay in their prior connection (Anderson et al., 1994). This impact changed the structure of their network as a new node entered and an edge was formed between the printing company and new paper supplier. Similarly, in the group insurance carrier sales network, connections are generated as products are sold to employers or dissolved as employers terminate their insurance product. One of the levers outside of relationships that impact these decisions is the price of the product, which several sales representatives mentioned through the free form response questions five and seven in the attribute selection survey. The questions may be found in Appendix A. For example, one sales representative responded saying "pricing/rates always #1", which translates to price is the first priority in a decision of which insurance company from which to purchase products. However, competitive price is only a contributing factor, and is a prominent characteristic more common among transactional relationships (Baker, 1990). Other sales representatives in the survey responses referenced attributes related to ease of doing business, such as efficient product administration, quick responses, feeling understood, et cetera. These factors correlate with the relationship itself, which was a point of emphasis studied in this work. While this work did not track the reason for why each change occurred in the participating group insurance carrier's network, it does explore the overall network change from 2011 to 2016.

Over the period studied, the participating group insurance carrier sales network shifted to a more condensed transactional state. In 2011, the degree versus gamma index scatter plot displayed a wide distribution of varying relationship strategies. However, by 2016, the network condenses. Degree over the study period increased. This increase indicates a growing network, which is good from the perspective of the group insurance carrier because it generated more business each year. Although, it is an indicator of becoming more transactional, if the gamma index also decreases. The mean degree, found in Table 5.1, in 2011 fell between 50 and 51 relationships per sales representative. By 2016, the degree was near 76 relationships per sales representative; the peak mean occurs in 2015 at 78 relationships. During that time, the standard deviation also grew from 50 relationships in 2011 to 83 relationships in 2016, thus the concentration of degree around the mean never existed and the distribution of relationship counts continued to remain spread out. As an aside, there was the slight decrease between 2015 and 2016, which could indicate another shift in the network starting to evolve; however, more data is needed to support this notion. Yet, in discussions with various sales leaders at the participating insurance company, they mentioned this observation, which they labelled as "broker consolidation". "Broker consolidation" may be defined as the phenomenon where multiple brokers merge into one, which would cause a decrease in the number of broker relationships available. While there is no evidence in this work to support these observations, this work could be adapted to study that phenomena by expanding the timeline and providing a more narrowed focus on the brokers. Thus, in general, this work describes a growing amount of relationships, which coupled with a decreasing gamma indicates a shift to a more transactional strategy. The gamma index from 2011 to 2016, found in Table 5.2, did in fact decrease by 0.2 from between 0.78 and 0.79 in 2011 to a rounded 0.58. Additionally, while the minimum value fluctuates over that time it remains around 0.5. Therefore, the gamma index over that time moves significantly towards the minimum value. Another point to review is the standard deviation, which decreases over that same timespan as well indicating a shift to a more concentrated amount of relationships near the mean. In terms of the business network, this translates to sales representatives losing ground in broker penetration. The percentage of employers per broker the sales representative is selling products to relative to the total possible employers is decreasing. The scatter plots of degree versus gamma index depict this transition in Graphs 5.1 through 5.6. While there is clear evolution each year, by 2014, the scatter plot begins to clearly show a new strategy distribution, with a majority of sales representatives with gamma index values less than 0.7. By 2016, the shift is exacerbated to a gamma index of less than 0.6, and a much taller peak of degree representing the transactional nature, higher volume of relationships but lower amounts of business conducted. However, this work has its limitations.

Data and perspective are two areas of focus where this work could see improvements. Chapter 4 detailed various data sources used to generate the networks. One source, Group Market Share, does not track and provide how long a sold insurance product remains with a company before it terminates. Therefore, once a record exists in this work, it does not leave. This limitation could contribute to part of the drastic shift observed in the gamma index as relationships would be terminating. However, there is no data to inform this model when relationships terminate. Additionally, this work reviews only one of the many products sold by the participant. Therefore, while this particular product sees a shift towards a more transactional approach, despite maintaining some hybrid and relationship-oriented ties, it is possible the other products show other behaviours. Should other behaviours exist, it would inform the participant of their overall strategy and impact to their financial results and sales experience. The desired perspective would be to have a holistic view that consolidates all products by an employer. Presently, it is not possible, as the Group Market Share data does not provide this view for insurance products sold to competing carriers of the participating group insurance carrier. Furthermore, the sales representative network as a whole and the gamma index simplifies to a sales representative view within this work's findings. A deeper investigation into each sales representative's individual network that identifies the gamma index and degree values by broker would describe the key relationships driving the change. Additionally, if a broker works with multiple sales representatives at the participating group insurance carrier, then the network measures may indicate a need to change strategy. If one sales representative is more successful than the other at working with that particular broker, it may be beneficial for that sales representative to take over the entirety of the relationship. However, despite these limitations, this research does successfully track network changes at the broader perspective indicating changes in the individual relationships. These changes in the network may be explained by the relationship indices explored in the second part of this work.

6.2 Modelling Relationship Driver Importance

To understand the changes observed in the overall group insurance carrier's sales network, this work began the steps necessary to create relationship indices to track broker and employer relationships. Kulkarni (2005) and Muduli et al. (2013) propose such a method to create an index, where attributes are modeled as nodes in a fully connected directed graph and the edges represent the relative importance between the nodes. Through the course of this work, sources were reviewed on business relationships to identify the attributes driving relationship growth between two partners. Derived from seven sources containing 12 attributes, seven attributes, as shown in Table 4.3, were ascertained to be the primary attributes to be tested in the group insurance carrier sales network. These attributes would generate the matrix needed to calculate the relationship indices for brokers and employers. The relationships by nature are different, in that employers are consumers of insurance products by using the broker as an intermediary to narrow the list of possible carriers and products that will work best for the employer. Through the course of two surveys, designed to limit the amount of work sales representatives needed to put forth, this work generated importance values for the top three attributes for each relationship type, *satisfaction*, *joint problem solving*, and *profit* for brokers and *joint problem solving*, *satisfaction*, and *trust* for employers.

The initial findings support differing relationship priorities by relationship type. The goal of the first survey was to have sales representatives clearly rank the attributes by their desired importance. This allowed for a more strategic selection of attributes to be surveyed for importance in terms of the model used. Measuring all attributes would have been too extensive for the pilot terms agreed to upon with the participant. Through this approach, the broker and employer relationship rankings displayed differing preferences with attributes. Sales representatives ranked the attributes with their broker relationships in the order of *satisfaction*, *joint problem solving*, *profit*, *trust*, *commitment*, *investments*, and *power*. Within this ranking, sales representatives valued the monetary gains in the broker relationships, represented by the *profit* attribute, more than the employer relationships. Sales representatives ranked their seven relationship attributes with employers as follows: *joint problem solving*, *satisfaction*, *trust*, *commitment*, *investments*, *power*, and *profit*. The sales representative perspective that brokers value *profit* over other attributes falls within expected priorities. Brokers generate income through the sales of insurance products in the form of a commission by meeting the needs of employers through the optimal match to a group insurance carrier.

Because the employer consumes the products themselves and the products do not determine business success for the employers; whereas, the brokers need the income for business success, *profit* is valued in the broker relationships. However, *joint problem solving* and *satisfaction* appear at the top of the list for both brokers and employers. Therefore, if a group insurance carrier does not offer quality service and products to support the needs of an employer or as issues arise and the carrier is unresponsive, the relationship will not work. Sales representatives alluded to these points in free form answers to questions five and seven of the first survey located in Appendix A. For example, one sales representative stated a need, "timely (within 24 hours) and accurate responses to inquiries is high on the list of client priorities. Also, follow up when a request is complete". Another sales representative simply stated a need for "ease of administration/service/simplicity" when working with employers. A third sales representative felt that an "employer 'trusts' their [group insurance carrier] team". Despite the similarities in these top two attributes, there is enough evidence that these broker and employer relationship indices should be constructed separately and align with the perspective of Naude and Buttle (2000) that there are different ideas about what drives relationships. Furthermore, this perspective not only applies to the difference between brokers and employers. There could be additional variation within the broker index and employer index due to other factors.

When building the broker and relationship indices, demographic information should be considered as an impact to generate variations of each index. The participating group insurance carrier operates throughout all 50 states of the United States, and therefore covers a vast array of variables, which could impact how relationships are formed and strengthened. While, this work does not investigate those variables, differences were observed within the process. For example, through conversations with the managers of the four locations surveyed in this work, they each had varying philosophies on how they manage their sales representatives and customer relationships. Furthermore, when looking at the survey results by location, there were variations to the rankings amongst the relatively similar perspectives. Therefore, when building the index, there could be a need to develop different indices based on the rankings of attributes generated. For example within the employer results in Table 5.9, Office one ranked *profit* as the fourth characteristic; whereas, every other location ranked *profit* as the seventh characteristic. Additionally, when reviewing results by position, rankings also varied. There were three types of sales representatives surveyed and each one has different roles in working with employers and brokers, and, as a result, may have a different idea of how relationships grow. In conclusion, there is enough diversity in the rankings of attributes by location and job title to support the similar notion in Naude and Buttle (2000) that there are varying ideas of the relationship growth. However, as an initial step to this work, the aggregate results were carried through to generate the relationship importance values, which are inputs into the relationship indices.

Overall, sales representatives scored the importances of the attributes to be of similar importance. Across the broker and employer surveys, despite the various attribute rankings, sales representatives gave only one comparison between to relationship attributes a value of six out of 10. A value of five represents attributes having equal importance and a value of 10 measuring one attribute having exceptionally more importance than another, per the methods of Kulkarni (2005) and Muduli et al. (2013). Because these attributes are ranked as primarily being equal, the group insurance carrier should communicate these results as such to their sales representatives. Additionally, as sales representatives are struggling, discussions should be had as to their focus on which attributes they are working towards with the brokers and employers. If the sales representatives are not working with the top three ranked attributes for each relationship, they should change their strategy and focus on the attributes applied. Additionally, future work would use the scores outlined in Tables 5.13 and 5.16 for the broker and employer relationships respectively. At this stage, in order to finish construction of an initial index, metrics for the attributes themselves must be measured, and, once complete, the matrix may be built and permanent function calculated to achieve a result (Kulkarni, 2005; Muduli et al., 2013).

Similar to the network structure research in Section 6.1, the methods used to review the relationships have their limitations. The primary limitation is the one-way perspective of the surveys. This work asks sales representatives their perspective of their partnering brokers and employers. However, to truly understand all of the network dynamics, the perspective of the brokers and employers is necessary. Abrahamsen et al. (2012) explain how network position of an actor within a network is determined by other actors within the network reflecting their perception of that actor’s value and position, and, through shared understanding that the partnership is valuable, the partnership will continue. Therefore, while this work collects one perspective about the attribute priorities, it misses the other perspective. As a result, if the missing perspective does not align with the surveyed one, then the relationships will struggle because the sales representatives are not focusing on the relationship attributes having the most impact to the brokers and employers.

In addition to adding the perspective of the employers and brokers, the pilot within this study should be expanded. By only having four locations participate in the survey, only 26.6 percent of the sales representatives shared their perspective. Adding a few more field offices would generate more substantial results to be sure there are varying perspectives by location and position. Additionally, since three attributes were used in the attribute weighting survey and the results of the attributes displayed similarly equal importance, it would be an enhancement to include more attributes. Thus, the index would become more refined, as it would have more information. Furthermore, it would test the equality of the importance values received. Since there were clear rankings from the first survey, if the second portion of this work were expanded to include more attributes and the sales representatives continued to rank the attributes as equal importance, work would need to be done to understand why the perspectives of the sales representatives changed from the first survey. For example in Table 5.5, the attribute *power* yielded a score of 2.73 and was ranked seventh; whereas, *satisfaction* scored 5.23 and was ranked first. If *power* was added to the second survey and found to be of equal importance to *satisfaction*, more work would need to be done to understand how the rank score was significantly lower in the first process, but determined to be equal in the second process. However, the current results are acceptable, since the rank scores of the three attributes in Tables 5.5 and 5.8 for brokers and employers respectively fall close together with scores between 4.34 and 5.57. Despite the limitations however, there is value to communicate with the sales representatives by explaining the attribute results and how they impact the relationships.

Chapter 7: Conclusions

The participating group insurance carrier maintained a hybrid approach to its sales network over the course of the study; however, there was a shift in relationships becoming more transactional. To further understand the shift in the participant's network, the relationships themselves needed to be investigated. Through this work, it was found that broker and employer relationships have different relationship priorities. Within these prioritisations, the sales representatives generally rank the importance of the top relationship attributes relatively as equal to one another; however, slight variations exist by geographic location and job title. Observing variation and differing prioritisations is common and appears within the relationship quality literature (Naudé and Buttle, 2000). However, more work needs to be completed on these two pillars of work to build a deeper understanding.

From the broader network perspective, degree and gamma index articulate the relationship strategy utilised by the sales representatives further developing the current literature in a new way. The degree (Freeman, 1978) and gamma index (Gorman and Malecki, 2000) address the two measurements, namely volume of relationships and the volume of business taking place within each relationship, necessary to determine the relationship types (Baker, 1990; Uzzi, 1997), as described in Section 4.1. Additionally, in contrast with Baker's (1990) methods of identifying relationships, this work's findings display how hundreds of thousands of relationships may be categorised effectively through the degree and gamma index approach. However, this work only provides the limited perspective of one product sold by the company and a summarised view of the sales representative.

To further the understanding of their network structure, the participating group insurance carrier should pursue additional pieces of work. First, they should conduct a product comparison to advance the categorisation of strengths and weaknesses of each sales representative's network. Second, they should adapt the network by creating gamma indices and refining the degree to be focused on the broker. As discussed in Chapter 6 Section 6.1, the participant sells many insurance products, and time prevented the scope of this work from evaluating all of the products. This work recommends that the group insurance carrier begin constructing a profile for each sales representative for all products. Within their profile, each product would categorise if they are a transactional, relationship-oriented, or hybrid strategy. Additionally, this work looks at the aggregate degree and gamma index of a sales representative in order to view and categorise all sales representatives as a whole. As part of the recommended profile, this focus should be narrowed. The degree should be redefined to represent the number of broker relationships and a gamma index should be computed for each broker.

By constructing a profile for every sales representative, each broker could be identified for each product as one of the three relationship strategies. Through this profile, the sales representative would begin to manage their relationships as a portfolio, which would allow them to adapt and develop strategies around their changing network (Eilles et al., 2003). For example, if a sales representative sells two products through a broker and one is determined to be relationship-oriented and the other transactional, they could work with the broker to build trust in the transactional relationship through more relationship investment and evolve it to a relationship-oriented focus. Similarly, this work found a shifting focus to transactional relationships. Sales representatives would utilise this profile to understand which broker relationships decayed over time and investigate the cause. Perhaps the brokers have developed a different perspective of the sales representative's network position relative to competing sales representatives, which caused the relationship to decay (Abrahamsen et al., 2012). To attempt to change the broker's perception, the sales representative engages in discussion with the broker to understand the decline in terms of the relationship attribute drivers. A future item to test is the decay of the developed relationship indices correlating with a decline in business between a sales representative and broker. Perhaps relationship attribute prioritisation is misaligned with the prioritisation studied here.

To enhance the second portion of this work, brokers and employers should be solicited for their opinions on the attribute prioritisations and importance. Currently, the work collects the sales representatives' perspective of relationship attribute importance, and at this stage this research does not calculate the index. However, both perspectives are needed to truly understand the important relationships. If the index was calculated solely from the findings within this work, it has the potential to misrepresent the reality of the network. It is possible the brokers and employers within the network may not share the same prioritisation of the relationship attributes. If there is a misalignment of attribute prioritisation, it could lead to relationship decay (Abrahamsen et al., 2012). This could be a contributing cause to the shift observed at the network level because sales representatives may be focusing on the aspects of the relationship deemed unimportant by the brokers. By expanding the pilot in this work, the participating group insurance carrier would gain insight as to whether their sales representatives share the same perspective as their broker and employer partners. If perspectives of the brokers and employers vary similar to the sales representatives in this work, then varying indices may be constructed or a general aggregate approach taken. For example, if the perspectives vary by geographic region it may be imperative to build different indices to reflect the variable differences. However, if one broker's or employer's perspective varies drastically from the aggregate group, a holistic index may be developed and the outlier handled accordingly. On the one hand, if the outlier does not bring in high volumes of profitable business relative to peers, the transactional approach would be optimal to reduce wasted investment on behalf of the sales representative. On the other hand, if that broker or employer is highly profitable, then they should be handled outside the context of the proposed methods in this work and treated as a special case. Furthermore, once the second perspective is obtained and reconciled to the first, the indices should be built.

While this work implements a strategy to obtain the relationship importance values, the attributes themselves need to be measured. The method used by Kulkarni (2005) and Muduli et al. (2013) adapted in this work must not only understand the relative importance values of one attribute versus all the others, but understand the attribute as well. Therefore, the recommendation for the participant is to evaluate ways to measure the prioritised relationship attributes. For example, the broker relationship attributes were *satisfaction*, *joint problem solving*, and *profit*. The participant should review customer satisfaction scores, employer complaints, and compensation paid to brokers as options to generate a measurement representing the attribute in the proposed model to develop the index. Once the indices are built and the sales representative profiles built as recommended, the wider research problem may be addressed.

Ultimately, the goal of understanding a company's network dynamics and how they change is to move their network to an optimal relationship strategy. As discussed, the most common relationship approach observed is hybrid (Baker, 1990; Uzzi, 1997).

The hybrid approach appears dominantly because of its ability to yield the benefits of loyalty and mutual commitment from the relationship-oriented approach with the competitive pricing and innovation knowledge supplied by the transactional approach (Baker, 1990; Uzzi, 1997). Uzzi (1997) theorises an optimal point of having just enough relationship-oriented ties that yields a maximum benefit, without the network becoming both overembedded and insulated to the benefits of transactional ties, which can lead to negative economic success of the company. Therefore, once the participating insurance company has full command of the perspectives within their network and how those perceptions are distributed within their network of sales representatives, broker partners, and employers, they can begin to investigate their optimal distribution of relationship-oriented and transactional relationships that yields a hybrid strategy achieving the best economic results.

In conclusion, this work applies graph theory in a new way to understand a group insurance carrier's sales distribution network. This work's methodology introduces degree and gamma index as a means of categorising a relationship as one of the three relationship types. This process enriches the current body of literature by offering a more effective way to understand networks with a large number of relationships, specifically hundreds of thousands in the context of this work's findings. Furthermore, this work applies a method for quantifying relationships using graph theory within the group insurance carrier's network, a new industry within which to apply this existing method. While this work ultimately did not calculate the relationship indices necessary for the participant to understand how their network changes, it provided the initial matrix of relationship attribute importances necessary to build the index. Should the participating group insurance carrier continue to evolve this work's findings by addressing the limitations noted, they will gain a better understanding on the changes within their network and how they can take action to address deficiencies.

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Glossary

Broker - intermediary that works with an employer to find an insurance carrier that meets the employer's needs.

Carrier - see insurance carrier.

Employee Benefits (Benefits) - an insurance products, paid time off, or any other non-salary based benefit offered to an employee via their employer.

Employee - a person who works for a business in exchange for income, benefits, or both.

Employer - a business with employees. Also referred to as a customer or client.

Group Insurance Carrier - an insurance carrier who sells their products to a group of people as a unit, i.e. an employer, instead selling directly to a single person.

Insurance Carrier (Carrier) - a company that sells insurance products.

Sales Representative - an employee employed by a carrier responsible through generating revenue by working with a broker to sell insurance products to an employer. Also referred to as an agent or sales agent.

Appendix A: Surveys

Survey One: Attribute Selection

Broker & Employer Relationship Study

Volunter Participation Aggreement

3rd August 2018

Measuring Insurance Distribution Networks Via a Broker

You are being invited to participate in a research study about Unum US's employer and broker relationships. This study is being conducted by Kyle Nowak and Dr. Christophe Meudec, from the department of Computing and Networking at Institute of Technology Carlow. This study is one of the requirements to obtain a Master of Science by Research via a thesis. Unum Group in collaboration with IT Carlow funds this research.

You were selected as a participant in this study because of your exposure to/understanding of Unum US's relationships with brokers & employers.

The questionnaire will take 5-7 minutes to complete. The information you provide will indicate the top drivers of relationship growth for both brokers and employers and can be associated with quantitative data sets within Unum US. The information collected may not benefit you directly, but the information learned in this study should provide more general benefits.

While this is an anonymous web survey with no collection of contact information or IP address, absolute anonymity cannot be guaranteed. Your answers will be kept confidential. Results will be collected and presented in aggregate. Individuals from Unum Group and the Institutional Review Board may inspect these records. Should the data be published, no individual information will be disclosed.

Your participation in this study is voluntary. You are free to decline to answer any question you do not wish to answer for any reason.

If you have any questions about the study, please contact Kyle Nowak, , or Christophe Meudec,

IT Carlow's Research Ethics Committee has reviewed and approved my request to conduct this project. If you have any concerns about your rights in this study, please contact the Chair of the Research Ethics Committee, Ivan Sheeran, Ivan.sheeran@itcarlow.ie.

* 1. I accept the statements above and agree to participate in this survey.

○ I accept.

Next

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Broker & Employer Relationship Study

Survey - Office Location

2. Select the field office from which you work.

- Washington D.C.
- Southern California (San Diego & Los Angeles)
- Chicago
- Atlanta

3. Select the response that best matches your role.

- Core Rep
- Specialty Rep
- Client Manager

Prev Next

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Broker & Employer Relationship Study

Survey - Brokers

4. Each of the following statements can be considered important in a broker's decision to continue choosing Unum as a partner.

Given your experience working with brokers, order the statements from 1 to 7 with 1 having the greatest impact in a broker's decision to choose Unum and 7 having the least impact.

- Unum acts to support long-term needs and accurately represents its products and services.
- Unum regularly meets or exceeds their expectations on products and services.
- Unum actively and continually participates in the relationship with positive attitudes.
- Unum works to understand their issues and works with them to find a solution.
- Unum willingly provides resources outside of purchased products and services.
- Unum makes them feel like equal partners in the relationship.
- Unum provides products and services from which they benefit financially.

5. If you think there are additional factors, not captured above, that affect a broker's decision to continue choosing Unum as a partner, please explain.

Prev Next

Broker & Employer Relationship Study

Survey - Employers

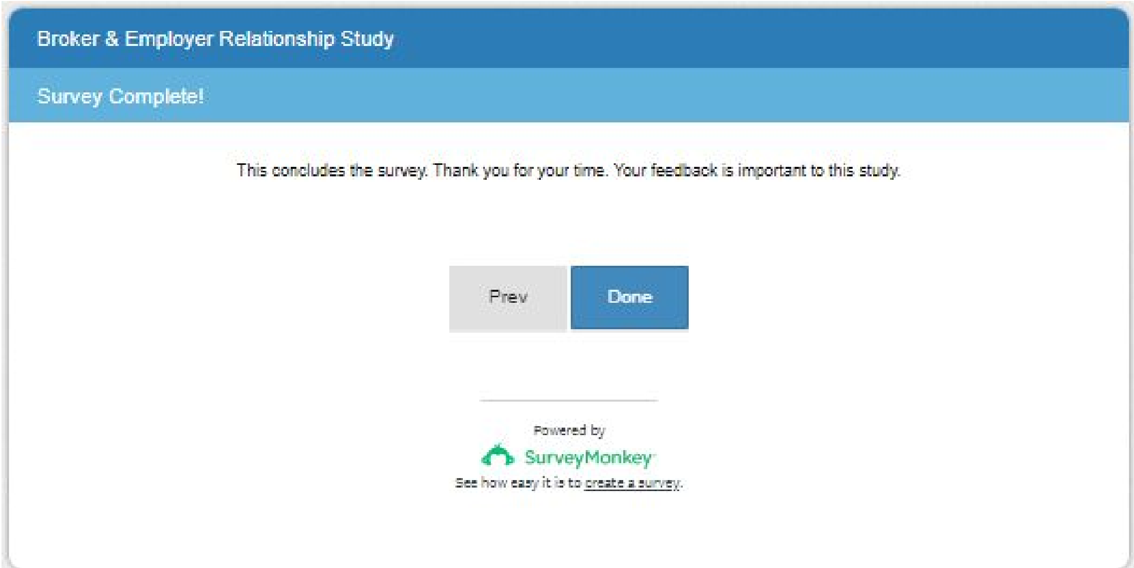
6. Each of the following statements can be considered important in an employer's decision to continue choosing Unum as a partner.

Given your experience working with employers, order the statements from 1 to 7 with 1 having the greatest impact in an employer's decision to choose Unum and 7 having the least impact.

- Unum acts to support long-term needs and accurately represents its products and services.
- Unum regularly meets or exceeds their expectations on products and services.
- Unum actively and continually participates in the relationship with positive attitudes.
- Unum works to understand their issues and works with them to find a solution.
- Unum willingly provides resources outside of purchased products and services.
- Unum makes them feel like equal partners in the relationship.
- Unum provides products and services from which they benefit financially.

7. If you think there are additional factors, not captured above, that affect an employer's decision to continue choosing Unum as a partner, please explain.

Prev Next


Broker & Employer Relationship Study
Survey Complete!
This concludes the survey. Thank you for your time. Your feedback is important to this study.
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Survey Two: Attribute Weighting

Broker & Employer Relationship Study - Attribute Weighting

Volunter Participation Aggreement

10th September 2018

Measuring Insurance Distribution Networks Via a Broker

You are being invited to participate in a research study about Unum US's employer and broker relationships. This study is being conducted by Kyle Nowak and Dr. Christophe Meudec, from the department of Computing and Networking at Institute of Technology Carlow. This study is one of the requirements to obtain a Master of Science by Research via a thesis. Unum Group in collaboration with IT Carlow funds this research.

You were selected as a participant in this study because of your exposure to/understanding of Unum US's relationships with brokers & employers.

The questionnaire will take 5-7 minutes to complete. The information you provide will indicate the top drivers of relationship growth for both brokers and employers and can be associated with quantitative data sets within Unum US. The information collected may not benefit you directly, but the information learned in this study should provide more general benefits.

While this is an anonymous web survey with no collection of contact information or IP address, absolute anonymity cannot be guaranteed. Your answers will be kept confidential. Results will be collected and presented in aggregate. Individuals from Unum Group and the Institutional Review Board may inspect these records. Should the data be published, no individual information will be disclosed.

Your participation in this study is voluntary. You are free to decline to answer any question you do not wish to answer for any reason.

If you have any questions about the study, please contact Kyle Nowak, , or Christophe Meudec,

IT Carlow's Research Ethics Committee has reviewed and approved my request to conduct this project. If you have any concerns about your rights in this study, please contact the Chair of the Research Ethics Committee, Ivan Sheeran, Ivan.sheeran@itcarlow.ie.

* 1. I accept the statements above and agree to participate in this survey.

○ I accept.

Next

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Broker & Employer Relationship Study - Attribute Weighting

Survey - Office Location

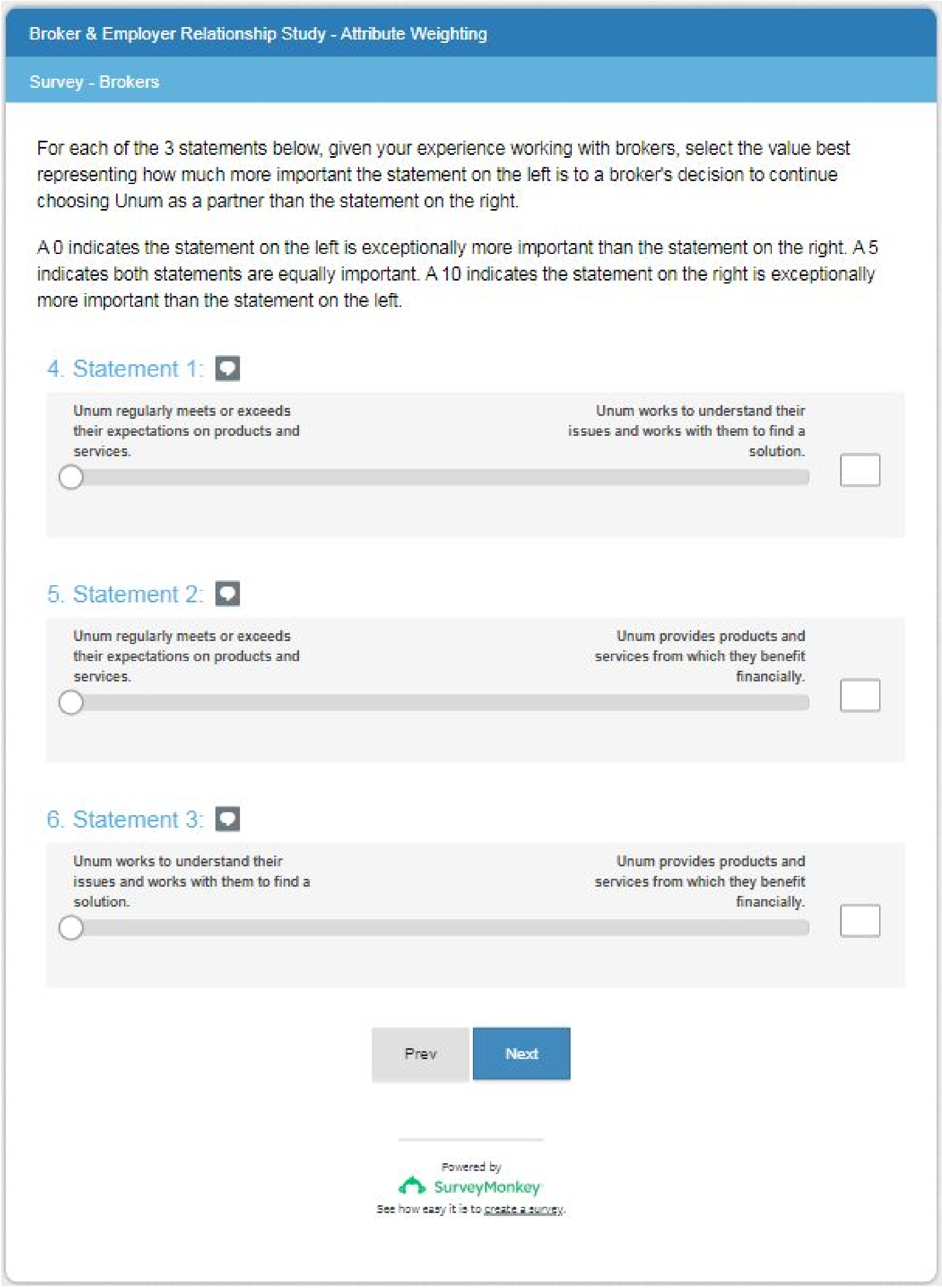
2. Select the field office from which you work.

- ◯ Washington D.C.
- ◯ Southern California (San Diego & Los Angeles)
- ◯ Chicago
- ◯ Atlanta

3. Select the response that best matches your role.

- ◯ Core Rep
- ◯ Specialty Rep
- ◯ Client Manager

Prev | Next



Broker & Employer Relationship Study - Attribute Weighting

Survey - Brokers

For each of the 3 statements below, given your experience working with brokers, select the value best representing how much more important the statement on the left is to a broker's decision to continue choosing Unum as a partner than the statement on the right.

A 0 indicates the statement on the left is exceptionally more important than the statement on the right. A 5 indicates both statements are equally important. A 10 indicates the statement on the right is exceptionally more important than the statement on the left.

4. Statement 1:

Unum regularly meets or exceeds their expectations on products and services.	Unum works to understand their issues and works with them to find a solution.

5. Statement 2:

Unum regularly meets or exceeds their expectations on products and services.	Unum provides products and services from which they benefit financially.

6. Statement 3:

Unum works to understand their issues and works with them to find a solution.	Unum provides products and services from which they benefit financially.

Prev Next

Broker & Employer Relationship Study - Attribute Weighting

Survey - Employers

For each of the 3 statements below, given your experience working with employers, select the value best representing how much more important the statement on the left is to an employer's decision to continue choosing Unum as a partner than the statement on the right.

A 0 indicates the statement on the left is exceptionally more important than the statement on the right. A 5 indicates both statements are equally important. A 10 indicates the statement on the right is exceptionally more important than the statement on the left.

7. Statement 1:

Unum works to understand their issues and works with them to find a solution.

Unum regularly meets or exceeds their expectations on products and services.

8. Statement 2:

Unum works to understand their issues and works with them to find a solution.

Unum acts to support long-term needs and accurately represents its products and services.

9. Statement 3:

Unum regularly meets or exceeds their expectations on products and services.

Unum acts to support long-term needs and accurately represents its products and services.

Prev Next

Broker & Employer Relationship Study - Attribute Weighting

Survey Complete!

This concludes the survey. Thank you for your time. Your feedback is important to this study.

Prev Done

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