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Social structure and tertius iungens across the phases of entrepreneurial activity:

A social network analysis of the Johannesburg Jewish community

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ABSTRACT

The Jewish community in South Africa is considered to be highly entrepreneurial and has positively impacted national economic growth and employment. Currently, the South African economy is faced with unemployment and low economic growth and requires positive change. The Jewish community is an example of an ethnic group rich in social capital with a well-established social network. Bearing this in mind, it is important to map the social network, understand its structural and behavioural characteristics and learn from it, in order to improve the general South African economy.

Social network data within the Johannesburg Jewish community was collected with an electronic survey instrument and analysed in both a social network analysis (SNA) tool and a statistical package. The data contained 107 unique responses, which ultimately led to the development of a network which contained 871 meaningful ties. The network's structural characteristics (degree and betweenness centrality) were computed using the SNA tool and augmented with both the respondent's network orientation and entrepreneurial activity.

The study demonstrated that members of the Jewish ethnic network, entrepreneurs and non-entrepreneurs equally, are likely to connect unconnected people (tertius iungens orientation) as opposed to exploiting their separation for entrepreneurial benefits (tertius gaudens orientation). Moreover, the ability of "central" members to control information flow, by virtue of their position within the network (betweenness centrality), does not differ between entrepreneurs and non-entrepreneurs. Lastly, entrepreneurs who are motivated to start or who are planning to start a venture, tend to have a greater number of connections or a higher degree centrality when compared to non-entrepreneurs and established entrepreneurs.

KEYWORDS

Ethnic

Social Network Analysis

Tertius Iungens

Entrepreneurship

Social Structure

DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Gregory Fine

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07/11/2016

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1.1 Research Title

Social structure and tertius iungens across the phases of entrepreneurial activity: A social network analysis of the Johannesburg Jewish community.

1.2 Research Problem

South Africa has relatively low levels of entrepreneurial activity when compared to many other countries. According to the GEMS survey conducted by Herrington (2015), South Africa ranks 38 out of 60 countries with regard to Total Early-Stage Entrepreneurial Activity or TEA. TEA is defined by the Global Entrepreneurship Monitor as a measure of the proportion of the adult population who have started a business (nascent) or those who are in the process of starting a business (Herrington, Kew, & Kew, 2014). Additionally, South Africa has one of the highest levels of unemployment and income inequality. Entrepreneurial activity is widely accepted as a key contributor to economic performance as it creates new knowledge through the creation of new products and processes which are derived from risk taking and innovation (Audretsch, Bönte, & Keilbach, 2008). Entrepreneurial activity is widely accepted as a key driver for the creation of employment opportunities, a necessary factor for reducing income inequality.

Interestingly, despite the low levels of entrepreneurial activity in South Africa many ethnic communities such as the Jewish, Greek and Muslim communities are perceived to have significantly higher levels of entrepreneurial activity when compared to the general population. These differences are important to understand as a better understanding of their social structure and networking orientation may provide key insights for business and government alike.

The current literature supports the idea that ethnic and immigrant communities tend to generate high levels of business activity when compared to their non-ethnic counterparts. Indeed Zhou (2014) declares that ethnic communities rely on entrepreneurship as a key driver for upward social mobility. In contrast, Howard and Zimmer (1986) maintain that a socio-cultural approach to explaining high rates of entrepreneurship is problematic, as many ethnic group's entrepreneurial activities are situational and not intrinsic. The high levels of entrepreneurial activity are better explained by examining entrepreneurs within the context of their social structure and not using culture as an isolated dimension to explain their success

(Howard & Catherine, 1986). Being embedded within a social structure provides entrepreneurs with novel opportunities and resources they can access and acquire (Ozdemir, Moran, Zhong, & Bliemel, 2016), and as a result increase their likelihood of entrepreneurial activity (Jack & Anderson, 2002). Entrepreneurs rely on their social networks to access support, resources and identify supply and distribution opportunities (Greve & Salaff, 2003). Furthermore, it has been shown that improved business performance correlates positively with social networking (Pollack, Coy, Green, & Davis, 2015).

Despite the relative importance of social networks in the development of entrepreneurial activity, much of the current research seems to focus on how social structures and networking orientation influence entrepreneurial outcomes. In contrast, few researchers have tested whether or not social structure and networking behaviour differs for different phases of entrepreneurial activity (Hoang & Antoncic, 2003). Interestingly, the measurement of social structure through the methods of social network analysis, are not commonly used in the entrepreneurship and sociology literature. In fact, despite the significant increase in the roles virtual social networks like Facebook and LinkedIn plays in the lives of entrepreneurs, very few entrepreneurship researchers embark on social network analysis (SNA) and it remains in the domain of mathematics and computer science. This study uses SNA in order to objectively quantify the studied ethnic social network in terms of its social structure and graphically visualise the network. Moreover, without SNA, the social structure which is said to be a key driver in entrepreneurial activity (Hoang & Antoncic, 2003) would not be quantifiable.

Indeed, the current research does not explicitly address the role common ethnicity plays in influencing the social structure and behaviour. Jack (2010), presents a summary of 71 North American and European journal articles relating to social networks and entrepreneurship for the period between 1995 and 2005 and none of the journals addresses the role common ethnicity within networks plays in entrepreneurship. To address the gap in the literature, it was decided to test whether or not the social structure and social networking orientation differ between the various phases of entrepreneurial activity within the context of what is deemed to be a highly entrepreneurial ethnic group, the Johannesburg Jewish Community. By addressing this gap the research aims to provide insight into how social structure and networking orientation manifests itself within entrepreneurial groups, particularly within the entrepreneurially thriving Jewish community.

Moreover, the theory relating ethnic social networks and entrepreneurial activity is limited and a better understanding would contribute to the literature from an academic perspective. A

common ethnicity within a cohesive network implies that all actors are likely to share a common set of values and norms, which is not unlike a corporate with a strong organisational culture.

These findings will hopefully provide insight into how business can stimulate entrepreneurial activity within their organisations, by attempting to incorporate the networking orientation and social structures present within successful ethnic minority groups into their organisations. These organisations can replicate the cohesive nature of ethnic enclaves and simultaneously influence the corporate culture to foster a sense of shared identity, which is thought to be responsible for creating levels of embedded trust (Ellis, 2011) and economic efficiency (Uzzi, 1997). These actions, hopefully, will result in high levels of entrepreneurial activity and consequently productive economic activity.

1.3 Research Context

The Jewish ethnic group, based in South Africa, was selected for this study. It is of interest because of its history of entrepreneurial activity and its prominence in Business within the general South African economy. The Jewish community in South Africa, which originated mainly from Europe, has had disproportionately high levels of entrepreneurial activity throughout the community's history from as early as 1866 with Sir Bernard Oppenheimer to some of today's entrepreneurs such as the Levy brothers of Blue Label Telecoms. The Jewish community has started many of today’s largest companies which all play a significant role in employment and economic growth.

Some of the well-known entrepreneurs are: Brian Joffe (Bidvest), Adrian Gore (Discovery), Stephen Koseff (Investec), Ian Fuhr (Sorbet), Bertie Lubner (PG Glass), Eric Sampson (Macsteel), Sol Kerzner (Sun International), Eric Ellerine (Ellerines), Brett and Mark Levy (Blue Label Telecom), Donald Gordon (Liberty Life), Eddie Keizan (Tiger Wheel and Tyre), Dawn Nathan-Jones (Imperial Car Rental), Ivan Glasenberg (Glencore Xtrata), Raymond Ackerman (Pick n Pay), Ivor Ichikowitz (Defence Industry and Core Group) and Ivan Saltzman (Dis-Chem) (Diamond, 2015, p. 8) to name but a few of the more recent Jewish Entrepreneurs.

Despite these famous icons, the Jewish community currently amounts to less than 0.1% of the total South African population, and as seen above, many of South Africa's largest companies were establish by Jewish entrepreneurs. It is within this context that the study aims

to gain insight into how social structure of this Jewish network and networking orientation of its members, differs across the various phases of entrepreneurial activity.

1.4 Research Objectives

The objectives of this research are three-fold:

1) The study aims to identify how the social structure differs between the different phases of entrepreneurial activity. Specifically, the research will explore how social structure, as measured by degree and betweenness centrality, vary between non-entrepreneurs, motivational or planning entrepreneurs and established entrepreneurs.

2) To identify the networking orientation of social actors at various stages of entrepreneurial activity. In other words, measure the extent to which social actors at various stages of entrepreneurial activity are likely to connect unconnected actors (tertius iungens orientation or the third who joins) as opposed to exploiting unconnected actors (tertius gaudens or the third who enjoys).

3) The research is intended to provide future researchers with a base on which to conduct similar comparative studies based on different ethnic networks.

1.5 Summary

This chapter introduces the research problem which relates to how businesses and countries alike can increase their entrepreneurial activity. They can learn from entrepreneurially successful ethnic social networks with regard to their social structure and networking orientation and how these characteristics change with entrepreneurial activity. Stemming from this research question the chapter identifies two key research objectives, the first being to understand how social structure and networking orientation differs by the phases of entrepreneurial activity and secondly to provide a base on which future comparative studies can be developed. The current social network and entrepreneurial literature does not explicitly address ethnicity and research in this regard will contribute to the base of literature.

This chapter also introduces the context in which this study is conducted. The context is that of the Johannesburg Jewish community, which is considered by many South Africans to be highly entrepreneurial and indeed shares common ethnicity, norms and values by virtue of shared religious beliefs and cultural links.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Chapter Introduction

This chapter will initially outline the theory relating to social network analysis (SNA), describe the theoretical foundations thereof and will briefly outline some of the key methodological approaches used in SNA. The chapter then discusses how social networks relate to entrepreneurship from the perspective of an entrepreneur within a culturally homogenous or ethnic network.

2.2 Entrepreneurship and Social Networks

Entrepreneurship was originally explored in terms of its economic impact by the famous economist Joseph Schumpeter. Schumpeter (1947) described an entrepreneurs function as "getting a new thing done" (pg. 153). The “new” refers to innovation or creative destruction and precludes simply managing an entity (Schumpeter, 1947). The rest of the term explicitly differentiates an entrepreneur from an inventor who simply invents but does not activate their invention to improve the economy (Schumpeter, 1947). This definition is particularly useful in the context of this research as it is the entrepreneurs positive impact on the economy which is a key component of the research problem discussed in chapter one.

Subsequently authors such as Aldrich and Zimmer (1986) highlight that entrepreneurs cannot be studied or considered in isolation, but rather need to be considered as part of the social network in which they operate (pg. 17). Additionally, Uzzi (1997) argues that economic exchange, a fundamental aspect of entrepreneurial activity, is embedded within social networks. Ozdemir et al. (2016) argues that entrepreneurship is inextricably linked to social networks as they are fundamental in allowing entrepreneurs to “reach and acquire valuable resources” (pg. 73).

Entrepreneurial activity, in the context of this research, is used in its most general form. It relates to the phases of establishing a firm and creating self-employment. Establishment of a firm, a proxy for entrepreneurial activity, is described according key phases which differ slightly from author to author. Greve and Salaff (2003) classify the phases as follows: (1) the motivation phase which describes how actors discuss ideas for a business venture and how they could convert it into a business; (2) the planning phase which describes the step where actors move from business concept to established

business; lastly, (3) the establishment phase in which entrepreneurs either take over an existing business and run it or start their own firm (pg. 3). Equally, Kwon & Arenius (2010) refer to the motivational and planning phases as “perceiving opportunities and investing” (pg.327).

The GEM report, by Herrington et al. (2014), describes five phases entrepreneurial activity, which overlap Greve and Salaff’s (2003) phases. Herrington et al. (2014) introduce the potential entrepreneur, which precedes Greve and Salaff's (2003) motivation phase. Herington et al. (2014) also splits the establishment phase into (1) new entrepreneurs and (2) established business owners. In summary, these phases of entrepreneurial activity can be generalised into two categories, namely: pre-establishment and post- establishment. Pre-establishment describes all the entrepreneurial activities that precede the establishment of business comprising of Greve and Salaff's (2003) motivational and planning phase. The post-establishment phase describes the events post new business commencement and comprises of Greve and Salaff's (2003) establishment phase. In addition to the above phases, the non-entrepreneurial phase which refers to actors which are not entrepreneurial at all and are currently employed and not looking to start their own business could also be considered.

A summary of the different key terms and their respective authors is shown in the table below:

Table 1 Comparison: Entrepreneurial Phases

	(Herrington et al., 2014)	(Greve & Salaff, 2003)	(Kwon & Arenius, 2010)
Pre-establishment	Potential, Intentional, Nascent	Motivational & Planning	Perceiving & Investing
Post establishment	Owner-managed New & Owner Managed Established	Established New, Establish Long	

2.3 Social Network Analysis -Theoretical Foundations

Social networks have become pervasive in society with the advent of Facebook, Twitter and LinkedIn. These networks, in particular LinkedIn, are used by entrepreneurs to establish business contacts to support their entrepreneurial endeavours. Indeed, the

study of physical social networks and their role in entrepreneurial activity date back to the seminal work of Granovetter's (1973) "Strength of Weak Ties" in which Granovetter argues that entrepreneurs, through predominately weak relations in their networks, can access new information and resources. Moreover, Nahapiet and Ghoshal (1998) describe how structural, relational and cognitive capital all play a role in facilitating the "creation and exchange of knowledge" (pg. 243). These three components are a subset of social capital, which is considered a "valuable resource that is embedded in a network of relationships" (pg. 1324) (Khayesi, George, & Antonakis, 2014).

Moreover, structural capital refers to the patterns of connections and communication paths between social actors (Nahapiet & Ghoshal, 1998). The relational capital on the other hand, can be thought of as the personal or emotional commitment (Pollack et al., 2015) which actors share with each other in the network, and the intensity thereof. The relational capital promotes trust, obligations and normative behaviour for all actors. (Nahapiet & Ghoshal, 1998; Pollack et al., 2015). Lastly, cognitive capital is described by Nahapiet and Ghoshal (1998) as the shared narrative, language and codes, which the network has, or in other words the networks cultural component. Gedajlovic, Honig, Moore, Payne, & Wright (2013) describe cognitive capital as a set of shared values. The idea that entrepreneurs can use their networks and their associated social capital to identify opportunities and acquire resources to create economic value is widely discussed in the literature (Granovetter, 2005; Khayesi et al., 2014).

With the proliferation of web-based social networks and their ability to provide detailed insight for marketers and other researchers alike, their analysis has become necessary and hence many social network analysis (SNA) tools are being developed and refined on a regular basis. These SNA software tools make it possible to empirically analyse the underlying social structure within both virtual and physical networks. Moreover, when the social structure is considered within the context of the underlying societal culture the entrepreneurial ecosystem, responsible for generating entrepreneurial activity, is better understood (Spigel, 2015).

The social structure and cultural context (cognitive capital) influence how entrepreneurs access resources, opportunities and how they conduct themselves within the relational web of social actors. The cultural and behavioural attributes typically affect network governance (Hoang & Antoncic, 2003), which relates to how actors behave towards each other, and which behaviours are acceptable to the network and which are not. The social

network structure is defined as the "the pattern of direct and indirect ties between actors" (Hoang & Antoncic, 2003, p. 170). The social structure refers to how entrepreneurs are positioned relative to other actors (positional), how they are related (relational) and how many actors are within the entrepreneur's network boundary (size) (Hoang & Antoncic, 2003).

Network structures are typically studied at varying levels of abstraction, and the highest level includes the entire or complete network, for example, a village or organisation and the lowest level which includes an individual actor's relations, or personal network (Butts, 2008; Marsden, 1990). These levels are commonly referred to as either the socio-centric level or the ego-centric level respectively (Marsden, 2002). The ego-centric level is typically used when it is not possible to define all members of the research population and as a consequence the research boundary is a function of the central actors set of relationships (Knoke, 2008; Scott, 2000). This level allows for the comparison of individual's actors' positions and relations to others i.e. their structural properties (Marsden, 1990).

Social structure is analysed and measured, through the methods of social network analysis or commonly referred to as SNA. SNA is a set of mathematical and visual methods, borrowed from graph theory, used to describe both the real world and virtual social structures (Scott, 2000). Social networks, in the context of this research, consist of social actors, their structural position relative to others and their relationships between each other (Butts, 2008; Scott, 2000). In general, social networks and their characteristics from an entrepreneurial perspective, are classified as either relational or structural (Semrau & Werner, 2014). The relational stream of research originated with Granovetter's (1973) work titled "Strength of Weak Ties" and the structural stream originated with Burt's (1992) work titled "Structural Holes: The Social Structure of Competition". Next, both the relational and structural aspects of networks are discussed.

2.4 Social Networks and Relations

The relational aspects as described by Nahapiet and Ghoshal (1998) as social capital, refer to the relative strength of a relation or tie between two or more network actors. The "strength of the tie is posited to be a function of the level, frequency, and emotional intensity of interactions between them (Granovetter, 1973)" (Ozdemir et al., 2016, p. 54). The relations have both magnitude and direction, where magnitude refers to the strength

of the relationship between the actors, and direction refers to either a one-sided or mutual relationship (Butts, 2008; Scott, 2000).

The figure below illustrates the most basic form of triadic structure which forms the base component of a social network (Scott, 2000). Figure 1 shows three actors (V_1, V_2, V_3) and a directional relation or tie (E_1) from V_2 to V_1 and a non-directional relation (E_2) between V_2 and V_3. To further illustrate this point V_1, V_2 and V_3 represent three different people or nodes. Node V_2 has a mutual relationship with V_3 and a one-sided relationship with V_1. V_1 has no relationship or tie with V_3. V_2 is in a structurally important position has it controls any information which flows between V_3 and V_1.

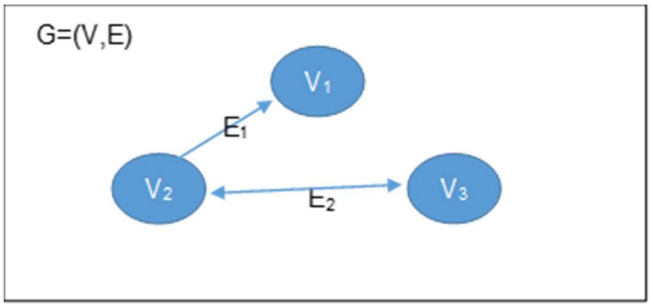


Figure 1 Basic Triadic Structure

Social networks provide actors and specifically entrepreneurs with access to social capital in the form of knowledge, information, clients, employees, as well as financial capital (R. Burt, 1992; Mayer, Harima, & Freiling, 2015; Semrau & Werner, 2014). Network resources are accessed through relationships between all its members. These relationships act as conduits for the flow of information and as a result encourage or discourage the perception of entrepreneurial opportunities and resources required to exploit them (Kwon & Arenius, 2010).

Moreover, the strength of the relationships determine how information diffuses through a network. Strong relations which typically consist of family and close friends, will likely pass on information which may be of relevance (Granovetter, 1973). Consequently, strong relations are likely to have access to the same information and therefore are not particularly useful from an entrepreneurs perspective, with respect to new or novel opportunities (Granovetter, 1973, 2005; Howard & Catherine, 1986). In contrast to the strong ties, weak ties are said to be a primary source of novel information, opportunities and resources (R. Burt, 1992; Granovetter, 1973). Weak ties are typically acquaintances

and are characterised by low intimacy, low levels of reciprocity, low emotional intensity and by a minimal time invested in building and developing the relationship (Granovetter, 1973).

As a refinement to Granovetter's argument relating "strength of ties", Burt (1992), argues that it is not the weak relationship which is responsible for promoting access to novel information, but rather the presence of a '*structural hole'* between weakly connected actors. A '*structural hole'* is a term used by Burt (1992) to describe the "separation between non-redundant contacts"(pg. 65). Non-redundant contacts refer to actors who are not connected to one another, either directly or indirectly, and therefore forging a connection between these contacts will likely yield new information and hence the information is not redundant. Despite Burt's (1992) argument, many authors have extensively focused on the relational aspect and have followed Granovetter's strength of ties argument. The strength of relationships or relational stream of literature has, however, progressed since Granovetter's original work.

In contrast to the weak tie argument put forward by both Granovetter and Burt, Brüderl (1998) concluded based on a study with 1700 firms that strong ties played a more important role in business survival and growth when compared to weak ties. This finding seems to be supported by Arregle et al. (2015), who also finds that business growth initially decreases with increasing proportions of strong ties and then as percentages exceed 80%, business growth starts, which implies strong ties are required for positive business growth.

More recently, authors such as Davidsson and Honig (2003), Greve and Salaff (2003) and Arregle et al. (2015) argue that strength of ties and their relative importance seems to differ by entrepreneurial phases. Strong ties, in the form of family and close friends, play a vital role in supporting the early entrepreneurial phases by providing entrepreneurs with essential resources and motivation (Arregle et al., 2015; Greve & Salaff, 2003). These ties, however, can also inhibit progress in later phases as they can be a source of conflict when trying to access resources (Arregle et al., 2015). Consistent with both Granovetter (1973) and Burt's (1992) arguments, weak ties are most likely used when entrepreneurs move into the planning phase (Arregle et al., 2015; Greve & Salaff, 2003). It is in the planning phase that entrepreneurs expand their networks beyond close friends and family to increase access to non-redundant resources and information (Arregle et al., 2015; Greve & Salaff, 2003) consistent with both Granovetter (1973) and Burt (1992).

While there seems to be a consensus that entrepreneurs leverage their ties of varying strength according to entrepreneurial phase (Greve & Salaff, 2003), little mention of the quantity or quality of the resources available to the entrepreneur. It can be argued that the amount and quality of resource and opportunities which are accessible to the entrepreneur are related to the size and density of their ego-centric networks (Khayesi et al., 2014) as well as their relative position (centrality) within the network and not necessarily to the strength of the tie.

Moreover, Tan, Zhang, and Wang (2015) established a relationship between innovation, business performance, network density and structural centrality. Similarly, Khayesi et al. (2014) and Semrau and Werner (2014) also discuss the entrepreneurial benefits which structural capital brings to the entrepreneur. Granovetter, the pioneer of relational capital, in his later work also described the benefits of structural capital (Granovetter, 2005).

The relational attributes or relational capital within networks tend to focus on the quality, and types of ties and resources available to an entrepreneur, however, they are insufficient in predicting entrepreneurial activity on their own, as they do not account for the entrepreneurs reach and relative advantage within the network as does structural capital. Moreover, the relational attributes are but only one dimension of the social capital (Nahapiet & Ghoshal, 1998) used by entrepreneurs to access and exchange information. Furthermore, Gedajlovic et al. (2013) argue that structural capital precedes relational capital.

The position occupied by an ego within a network relative to other actors, and moderated by the size or density of that network (Tan et al., 2015), influences that ego's ability to identify opportunities and access resources, hence is relevant for entrepreneurial activity (R. Burt, 1992). The ideas behind network structure or structural capital, are introduced next.

2.5 Social Networks and Structure

Network structure can be measured mathematically unlike relational network characteristics. Structural metrics, initially borne out of graph theory, are useful for mathematically describing and comparing social networks. These parameters provide objective insights into how easily actors can access information and resources (Hoang & Antoncic, 2003) and furthermore, they provide measures of the relative importance of

actors concerning their ability to control the flow of information throughout the network (Freeman, 1979).

The most commonly used structural metrics are those which describe the positional properties of an actor in relation to other actors and these metrics are grouped together under the term network centrality, initially conceptualised by Freeman (1979). Network centrality, at the ego-centric level, relates to how information is "coordinated or controlled" (pg. 410) (betweenness centrality*)* by an actor (Marsden, 2002) and how readily accessible the resources are (degree centrality) (Hoang & Antoncic, 2003). Marsden (2002), subsequently concluded that Freeman's (1979) socio-centric measures of degree and betweenness centrality are indeed suitable measures for most ego-centric studies. These metrics are explained next.

2.5.1 Degree Centrality

The degree centrality metric is the most basic of centrality metrics (Butts, 2008; O'Malley & Marsden, 2008) and measures the number of alters which are directly connected to the Ego. "Degree centrality taps the ability of actors to ''reach'' other actors in their network through intermediaries" (Hoang & Antoncic, 2003, p. 171). Degree centrality is another way of quantifying an actor's ego-centric network size. Network size measures the number of connections or degrees an entrepreneur has and hence their network size is likely to be positively related to the amount or resources and opportunities available and hence positively impacts entrepreneurial activity. This logic, however, should be moderated as it is easy to grow ones "number of social ties at will" (pg. 2) and it is, therefore, simplistic to conclude that the growth of an entrepreneurs network will yield entrepreneurial activity (Pollack et al., 2015). The growth of an entrepreneur's network needs to be grown through the addition of real and meaningful relations or ties, which are developed over time and through investment in cultivating meaningful relationships (Semrau & Werner, 2014).

Degree centrality or C_D for a particular Ego p_i, is mathematically defined as follows:

$$C_D(p_i) = \sum_{k=i}^{N} a(p_i, p_k)$$

Where $a(p_i, p_k) = 1$ if a direct connection exists between the actor i and actor k and 0, where no connection exists (Marsden, 2002). The higher the degree, the higher the number of connections an ego has. Degree is also used to calculate an egos density $C_D{}'$,

which is simply the sum of egos degree as a proportion of the total number of possible degrees:

$$C_D{}'(p_i) = \frac{\sum_{k=i}^{N} a(p_i, p_k)}{\frac{N(N-1)}{2}}$$

Where $\frac{N(N-1)}{2}$ is the maximum number of possible connections in an undirected network (Scott, 2000).

Degree centrality is graphically explained in the socio-gram below, see Figure 2. In this socio-gram, node N5 and N1 has the highest degree of centrality equating to 6 direct connections. These connections are N0, N6, N7, N8 and N0, N4, N3, N2 respectively. Node N0, on the other hand, has the lowest degree centrality equal to two, as its only connected to N1 and N5. Degree centrality for an ego is directly related to those egos ego-centric density. In other words, the higher the number of connections an ego has (degree), the greater that ego's density is. More formally

$$\mathrm{D}(p_i) = \frac{C_D(p_i)}{n-1}$$

Where $\mathrm{D}(p_i)$ is the density of ego, and $C_D(p_i)$ is the degree centrality of Ego p_i, and n is the total number of nodes in the egos ego-centric network. This formula was adapted from Scott (2000, p. 77).

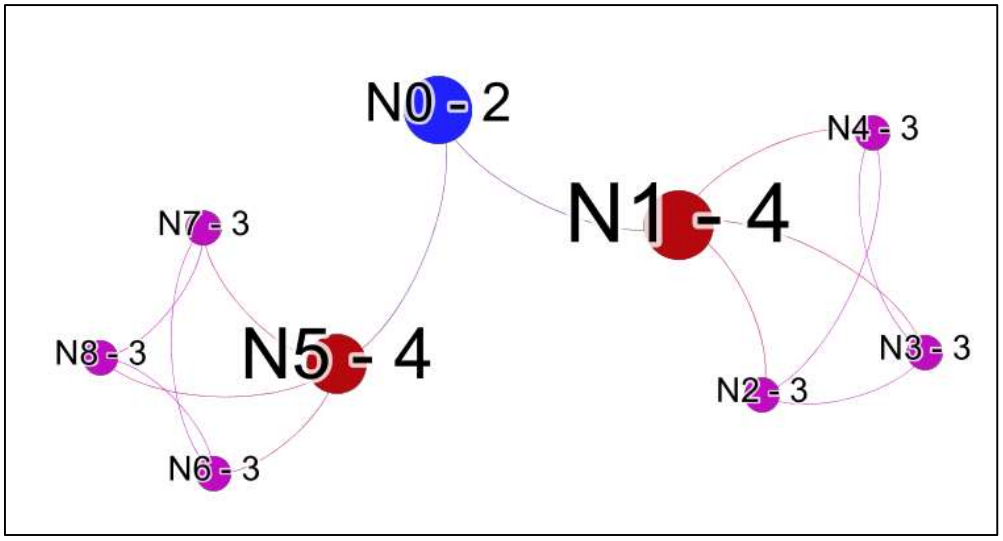


Figure 2 Degree Centrality Example

Density, closely related to degree, is a key metric often used to understand social networks regarding their cohesiveness and collective social capital (R. S. Burt, 2000; Coleman, 1988). Moreover, cohesive networks rich in collective social capital promote efficient and effective information flow and simultaneously promotes normative behaviour (Latora, Nicosia, & Panzarasa, 2013; Tan et al., 2015). Indeed, social networks whose actors have a strong sense of shared identity, normative values and a homogenous culture, as is the case with an ethnic network tend to be cohesive and dense (Latora et al., 2013; Tan et al., 2015). Therefore, it can be argued that a reinforcing cycle seems to exist, i.e. cohesive networks promote normative behaviour and ethnic networks are fostering social cohesion.

Although density, degree centrality and network size arguably influence the quantity of resources available to the entrepreneur or actor, they say little of how an actor or entrepreneur can obtain an entrepreneurial advantage of others who equally have similar densities and degree centralities. In Figure 2, whilst node N1 and N5 have the highest degree centrality, node N0, with the lowest degree centralities is in fact the most important node in the network from a communications perspective. Node N0 has the sole ability to control and coordinate the flow of information and resources between the majority of other nodes in the network, i.e. it lies on the shortest path between the majority of nodes. This position is identified by the metric known as betweenness centrality and is essential for describing a nodes positional advantage.

2.5.2 Network Position and Betweenness Centrality

Actors are embedded within social structures, and their position within these structures in relation to others determines their ability to either control information and resources to broker deals between actors (R. Burt, 1992) or capacity to connect otherwise unconnected actors. These network positions, in particular, the brokerage positions between non-redundant actors are measured by betweenness centrality and are commonly referred to as “structural holes” (R. Burt, 1992, p. 65)

The betweenness centrality metric describes the extent to which an individual node “bridges” or lies on the greatest number of shortest paths between two otherwise disconnected components of a network (Butts, 2008; Marsden, 2002). In other words, betweenness centrality describes the relative ability of a network actor to control and

coordinate the flow of information between disconnected parts of a network. Nodes with a high betweenness levels relative to others are influential in networks, as they are in a position to 1) either act as gatekeepers and maintain control and influence the flow of information and resources to extract personal and exclusive economic benefit (R. Burt, 2015; Freeman, 1979; Kalish, 2008; Scott, 2000). Or 2) they can promote network closure or the connection between otherwise separated components (R. S. Burt, 2000; Coleman, 1988; Ozdemir et al., 2016), which will ultimately reduce their betweenness.

Betweenness is calculated by measuring the extent to which a node lies on the shortest paths between all other nodes on the network(Butts, 2008), see the equation below which mathematically describes for betweenness for the actor *(i)*, (Marsden, 2002; Müller-Prothmann, 2007).

$$B(i) = \sum_{j,k} \frac{g_{ijk}}{g_{jk}}$$

where gjk is the shortest paths from node j to node k (j,k ≠ i), and gjk is the number of shortest paths from node j to node k passing through node i (Chung, Hossain, & Davis, 2005)

The concept of betweenness is explained in the socio-gram labelled Figure 3 below. Node N0 has the highest betweenness centrality score, relative to all other nodes in the network. This implies that node N0 has the ability to control and coordinate (Latora et al., 2013; Marsden, 2002) the flow of information between N1 and N5. This implies a "structural hole" exists between nodes N1 and N5 and as a consequence all the communication between all the nodes in the left clique (N6, N7, N8) and those in the right clique (N2, N3, N4) have to pass through N0.

Node N0 spans a ‘structural hole' and is therefore a gatekeeper or a broker (Müller-Prothmann, 2007). Node N0 controls the flow of information, opportunities and resources (for entrepreneurial activity) between otherwise disconnected or non-redundant members (R. Burt, 1992; Tan et al., 2015).

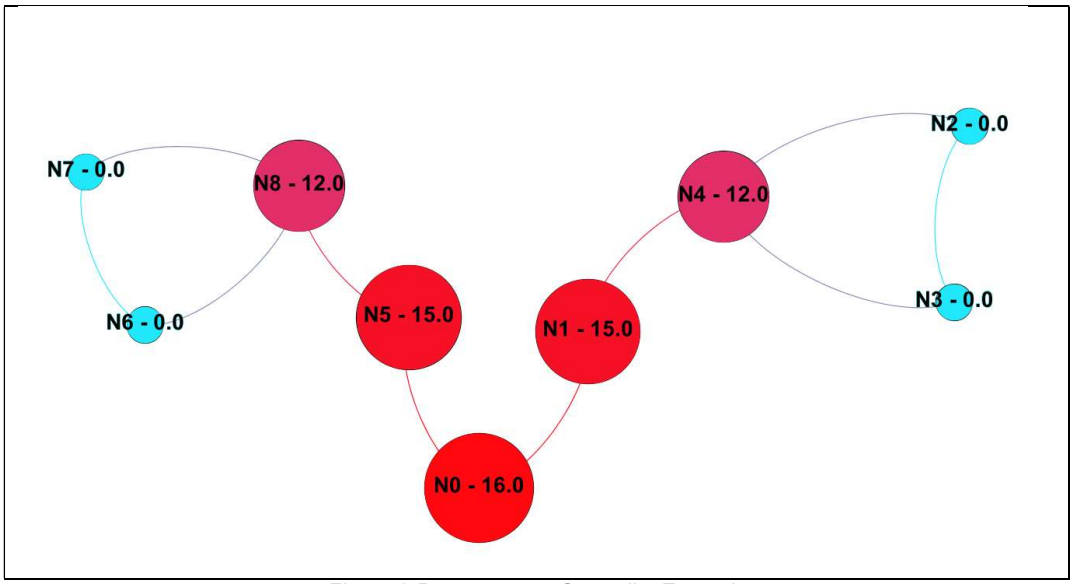


Figure 3 Betweenness Centrality Example

Ego's positioned across the majority of shortest paths between pairs within networks will tend to span scores of structural holes relative to other actors in the network and will as a consequence, have a high measure of betweenness centrality (R. Burt, 2015). Ego's which occupy these positions are gatekeepers of information, opportunity and resource, and hence they are well positioned to extract entrepreneurial benefit through the brokering of desired resource and opportunity (R. Burt, 1992; Ebbers, 2014; Granovetter, 2005; Tan et al., 2015).

The number of entrepreneurial opportunities cannot only be explained by high measures of betweenness centrality. It is therefore recommended that both the measures of degree centrality as discussed above, specifically relating to ego-centric density, and betweenness centrality are simultaneously considered (Ebbers, 2014; Hoang & Antoncic, 2003; Tan et al., 2015). Ego's which have a high betweenness centrality and a low network density, are likely to span more structural holes and hence have greater access to information, opportunities and resources which can be exploited for the egos benefit. Actors with high betweenness centrality and a high network density will likely have access to fewer structural holes, and hence access fewer unique information opportunities and resources (Obstfeld, 2005; Tan et al., 2015). It can, therefore, be argued that an ego which has a low degree centrality or density and a high betweenness centrality, is more likely to engage in an entrepreneurial activity (EA), given the number of structural holes present in their ego networks, when compared to someone with the different structural properties.

This argument would, therefore, have implications for ethnically homogenous networks, as they would tend to exist within ethnic enclaves and as a result exhibit, high densities and social cohesion (Latora, Nicosia, & Panzarasa, 2013) as many actors are connected to one another. The high levels of social cohesion present in these networks would likely offer egos with few non-redundant connections and hence few opportunities to access unique information and resources (R. Burt, 1992).

The high density and social cohesion also has the effect of reducing the number of structural holes present within these networks, and thereby reducing the opportunity to play a brokering or gatekeeper role (Tan et al., 2015). This logic implies that cohesive and dense networks have few opportunities for entrepreneurs to exploit from a structural position and hence these networks are likely to have low entrepreneurial activity. The notion of cohesive networks and reduced entrepreneurial opportunities is corroborated in much of the literature by way of explaining reduced diversity and redundancy of ties (R. Burt, 1992; Latora et al., 2013; Ozdemir et al., 2016; Tan et al., 2015).

Despite this conclusion, there are many ethnic networks which are small, dense and cohesive and are considered to be highly entrepreneurial. Some examples of such networks are the Chinese in Prato, Italy (Lan & Zhu, 2014), the Jewish population in Johannesburg South Africa (Diamond, 2015) and the Korean immigrants in Los Angeles, USA (Audretsch et al., 2008), to name but a few. These examples seem to imply that there must be other social network variables which influence entrepreneurial activity. Culture is one such variable, which is commonly reported to influence entrepreneurial activity (Arregle et al., 2015; Kwon & Arenius, 2010; Spigel, 2015; Tan et al., 2015). The role which culture plays within social networks is discussed next.

2.6 Ethnicity and Culture embedded within Networks

Ethnic social networks comprise of co-ethnics who are "culturally similar" and share a common language, religion and have a common connection to their country of origin (Greve & Salaff, 2003). Co-ethnics often simultaneously belong to several overlapping social networks which differ in their purposes such as religion, social and business while simultaneously sharing a common ethnicity and culture (Greve & Salaff, 2003). The theory based on ethnic entrepreneurial networks is extensive and it is well documented that many ethnic networks around the world are highly entrepreneurial and successful.

Ethnic networks are often comprised of diaspora entrepreneurs; a term used to describe groups of entrepreneurs operating outside of their countries of origin. Mayer et al. (2015), however, makes an important contribution, by distinguishing diaspora entrepreneurs from ethnic entrepreneurs, by the time they have been resident in their host country. This statement is important as not all ethnic networks are comprised of diaspora entrepreneurs and in fact, many ethnic entrepreneurs have been living in their host countries for several generations (Mayer et al., 2015). Interestingly, many ethnic networks operate largely independent of their host countries and in become embedded within a geographic area or what is referred to as an ethnic enclave.

Indeed, an essential characteristic of ethnic social networks is that they often are embedded within a geographically bound enclave. These enclaves give rise to so-called ethnic economies which encompass schools, restaurants, places of worship and shops which provide products and services to the ethnic community and as a result encourage the co-location of fellow ethnics (Salaff, Xu, & Ping, 2003). In fact, it is within these enclaves that persons of common ethnicity share a common identity, culture, a set shared norms and values and are often bonded together to form networks (Portes & Sensenbrenner, 1993) which are structurally dense and cohesive (Khayesi et al., 2014).

Zhou (2014), makes an important distinction between entrepreneurs which operate predominantly within the enclave and those entrepreneurs which operate between the enclave and the host country. These two types of entrepreneurs are classified as “Enclave entrepreneurs” (pg.1041) or “Middlemen minorities” (Zhou, 2014, p. 1041) respectively. The distinction put forward by Mayer et al. (2015), would likely correspond with that of Zhou (2014). Zhou (2014) declares that diaspora entrepreneurs, which are classified as first generation immigrants would likely operate predominantly within the enclave and those which are greater than one or two generations would work between the enclave and the host country. Moreover, entrepreneurs may not have a choice to operate as "Middlemen minorities", as doing so would imply that they face little or no discrimination from the host country (Portes & Sensenbrenner, 1993).

Moreover, Portes & Sensenbrenner (1993), describe ethnic networks as either forced together, as a result of discrimination from the host society or bound together by choice influenced by the quality of resources and supportive institutions or what is referred to as the enclave ecosystem. These two antecedents of ethnic network formation, discrimination from the host society or choice, produce two distinct types of relational

social capital, namely "bounded solidarity" and "enforceable trust" (Portes & Sensenbrenner, 1993, p. 1325) respectively.

Networks which are bounded in solidarity, tend to conduct economic transactions only with co-ethnics irrespective of whether or not the transaction is economically efficient (Portes & Sensenbrenner, 1993). These actions are motivated by self-preservation and survival as a collective and are therefore not entrepreneurial by choice (Portes & Sensenbrenner, 1993). The focus of this group would be on self-employment and employment of fellow co-ethnic members, as a means to create economic independence (Zhou, 2014).

In contrast, networks which are bound together through choice influenced by shared values, cultures and norms are characterised by "enforceable trust" (Portes & Sensenbrenner, 1993, p. 1325). These networks are likely to promote reliable sources of information and high levels of support among network actors (Ozdemir et al., 2016). In fact, enforceable trust reduces the time required to perform transactions and improves the flexibility of economic transactions by reducing the need for onerous contracts (Portes & Sensenbrenner, 1993; Uzzi, 1997). Interestingly, Gedajlovic, Honig, Moore, Payne and Wright (2013) make reference to trust and shared values as being part of both “relational” and “cognitive” (pg.459) social capital. Moreover, Gedajlovic et al. (2013) concludes that shared and common values are an essential characteristic of ethnic networks (Cognitive social capital), and a precursor to the trust, norms and obligations (relational social capital) which are preceded by structural social capital.

The social capital embedded within ethnic networks is unique to the particular network and is collective (Tan et al., 2015) as it "inheres in the structure of relations between actors, and among actors" (Coleman, 1988, p. 98). This collective social capital acts as a form of network governance and are responsible for ensuring actors behave per the networks shared norms and values (Coleman, 1988; Hoang & Antoncic, 2003; Tan et al., 2015). Enforceable trust is possible as a result of a high network cohesion which allows for information to travel through multiple actors rapidly thus reducing information asymmetry and deliberate distortion which compromises common values (Tan et al., 2015).

It can therefore be argued, that cohesive and dense ethnics networks are likely to promote relational capital and hence promotes enforceable trust which benefits

entrepreneurial efficiency. Moreover, if the network possesses a culture of entrepreneurship and behaves entrepreneurially, then the network is likely to support high levels of entrepreneurial activity. It must, however, be noted that the individual actor's behaviour within these networks can significantly moderate or influence the entrepreneurial outcome (Kwon & Arenius, 2010; Spigel, 2015). Individual's personal attributes contribute to entrepreneurial opportunity identification (Kwon & Arenius, 2010) and hence entrepreneurial activity.

2.7 Personal Attributes within Networks

Individual actors, which are embedded within an ethnic network by choice, are likely to have a high degree of commitment towards that network. Likewise, Pollack et al. (2015) describe this commitment as the affective commitment which is considered to be a predictor of top-line growth or a proxy for entrepreneurial success. Actors who are voluntary members of ethnic networks are reliant on the networks for culture, religion and their associated entrepreneurial ecosystems (Spigel, 2015) and social capital in general. Members who choose to belong to these networks are likely to invest time in building their network relationships and will probably derive satisfaction from them (Pollack et al., 2015). This behaviour and satisfaction are influenced by feelings of belonging fostered by "shared identity" (pg.748), shared values and sense of responsibility toward that network (Latora et al., 2013). Indeed the roles that individuals play in promoting relational social capital responsible for entrepreneurship needs to be better understood (Gedajlovic et al., 2013).

In building and developing relationships within a network, individual actors or egos will spend time strengthening their relations with existing alters, establishing new relations with other alters and connecting previously unconnected alters (network closure). This networking orientation is largely dependent on an individual ego's psychological characteristic (Kalish, 2008) and their structural position (R. Burt, 1992) within the network. Ego's involved in actively networking and connecting other actors are responsible for increasing network density and promoting network closure (Coleman, 1988).

Network closure promotes collective social capital, or what is often referred to as "bonding capital" (Gedajlovic et al., 2013, p. 458). This network closure enhances trust (Ebbers, 2014; Tan et al., 2015), reduces the cost of performing economic transactions

and reduces information asymmetry (Uzzi, 1997), arguably key ingredients for improving entrepreneurial activity. In direct contrast to this argument, Gedajlovic et al. (2013) argues that network closure can indeed stifle innovation (pg.467) which is widely accepted as key ingredients for entrepreneurial activity. Gedajlovic et al. (2013) in fact, go so far as to caution against excessive bonding as it can have a "dark side" (pg.450) and negatively influence entrepreneurial activity.

Moreover, it is the ego's relational orientation or the manner in which they create and access relations which may also influence the entrepreneur's level of success and entrepreneurial activity (Ebbers, 2014; Pollack et al., 2015). This logic demonstrates that it is not sufficient to just grow your network and spend time developing relationships, but to rather establish a symbiotic relationship with network actors and establish a level of commitment and investment with the network actors (Pollack et al., 2015).

Contrary to the behaviour of connecting actors, some egos may deliberately choose to maintain ‘structural holes' between otherwise unconnected alters. This behaviour allows the ego to exploit information asymmetry to gain an entrepreneurial advantage. They prefer to keep control over the ‘structural holes' and use their position of power to control the flow of information and achieve competitive advantage over other network members for entrepreneurial self-interest (R. Burt, 1992; R. S. Burt, 2000; Ebbers, 2014; Kalish, 2008; Simmel & Wolff, 1950). Indeed, they act as gatekeepers or brokers between the otherwise unconnected actors. The act of maintaining structural holes reinforces bridging social capital which serves to promote network efficiency and reduce the risk of creating redundant connections (R. Burt, 1992; Gedajlovic et al., 2013)

In summary, individual actors are structurally embedded within a social network and it is within these networks, where he can as an individual decide how to build his relational social capital. In other words, different actors can choose whether or not to connect unconnected people. The connecting of unconnected individuals is commonly referred to as the creating of "bonding" social capital, whereas the act of maintaining a degree of "connectedness" is what leads to the formation of "structural holes" and what is known as "bridging" capital. Moreover, the behaviour of gatekeepers and brokers in maintaining bridging capital are said to have a t*ertius gaudens* orientation or TGO and those who connect, or reinforce bonding social capital are said to have a *tertius iungens* orientation or a TIO.

2.7.1 Brokerage and Tertius Gaudens Orientation (TGO)

Actors which span ‘structural holes’ and exploit their “relatively superior position for purely egoistic interests” (pg.154) are described as tertius gaudens or “literally the third, who enjoys” (Simmel & Wolff, 1950). Actors spanning ‘structural holes' have the first sight of opportunities and the ability access them as a result of their relatively powerful positions and thus are likely to exploit these positions for an entrepreneurial benefit (Kalish, 2008). A tertius gaudens orientation (TGO) is exploitative and manipulative (Tan et al., 2015) and enables actors to leverage a competitive advantage and access novel information (Latora et al., 2013). This behaviour, however, is unlikely to continue in the long run, particularly if the networks in which they are structurally embedded are cohesive (Ozdemir et al., 2016; Tan et al., 2015).

Burt’s (1992) argument is problematic in this regard, as he claims that the presence of ‘structural holes’ leads to a competitive advantage through brokerage between unconnected alters (R. S. Burt, 2000). However, he fails to mention that this is short lived in cohesive networks, given their sanctioning power as described by Tan et al. (2015) and Coleman (Coleman, 1988). Cohesive and dense networks tend to minimise the opportunity for brokerage, as this behaviour is often considered detrimental to the network as a whole (Tan et al., 2015). Latora et al. (2013) argue that cohesive networks "are conducive toward the maintenance of the status quo rather than the exploration of novel paths leading to divergent solutions" (pg.748). The implication is that cohesive networks may well suffer from groupthink and are thus unable to think innovatively (Kwon & Arenius, 2010), arguably compromising their entrepreneurial ability. Gedajlovic et al. (2013), supports this and additionally cautions against the risk of excessive bonding or network closure, and the resultant reduction of innovation.

It then begs the question as to whether or not cohesive social networks promote entrepreneurial activity in the long run and if so, is the concept of a highly entrepreneurial cohesive network a paradox?

2.7.2 Network Closure and *Tertius Iungens* orientation

In Contrast to TGO, actors may elect to bridge the structural holes they span as opposed to exploiting them for entrepreneurial advantage. This action forms triads by connecting non-redundant ties together, and these actors are consequently referred to as *tertius iungens, or the third, who joins* (Obstfeld, 2005). A tertius iungens orientation (TIO), promotes the flow of information and resource throughout the network, reinforcing network closure, enforceable trust and relational social capital (Ebbers, 2014; Gedajlovic et al., 2013; Ozdemir et al., 2016; Tan et al., 2015). Ethnic networks depend on network closure to ensure their cultural values and norms are protected and preserved, given that these networks are often within host societies exhibiting very different behavioural norms and values (Coleman, 1988).

Ebbers (2014), in contrast to the TGO argument, argues that a high TIO and the resulting network closure positively correlates to the identification of business opportunities and hence entrepreneurial activity. Obstfeld (2005), support Ebbers (2014) through his emphasis that closure or bridging of the structural hole, does not preclude the *tertius* from reaping the benefits as is portrayed in the TGO argument. Actors with a high TIO, which find themselves spanning structural holes will promote network closure and reduce the presence of structural holes within networks (R. S. Burt, 2000; Coleman, 1988; Tan et al., 2015). The reduction of structural holes will cause a reduction of actor's betweenness centrality and an increase in their relational capital, which rich in enforceable trust.

Figure 4 illustrates a structural hole between nodes N5 and N1. This hole implies that N5 and N1 cannot communicate or interact with each other unless N0 plays a brokerage role and maintains their separation. Should N0 play a brokerage role and display a TGO orientation and maintain their active separation, N0 will have the highest betweenness centrality at a score of 16 and maintain positional control.

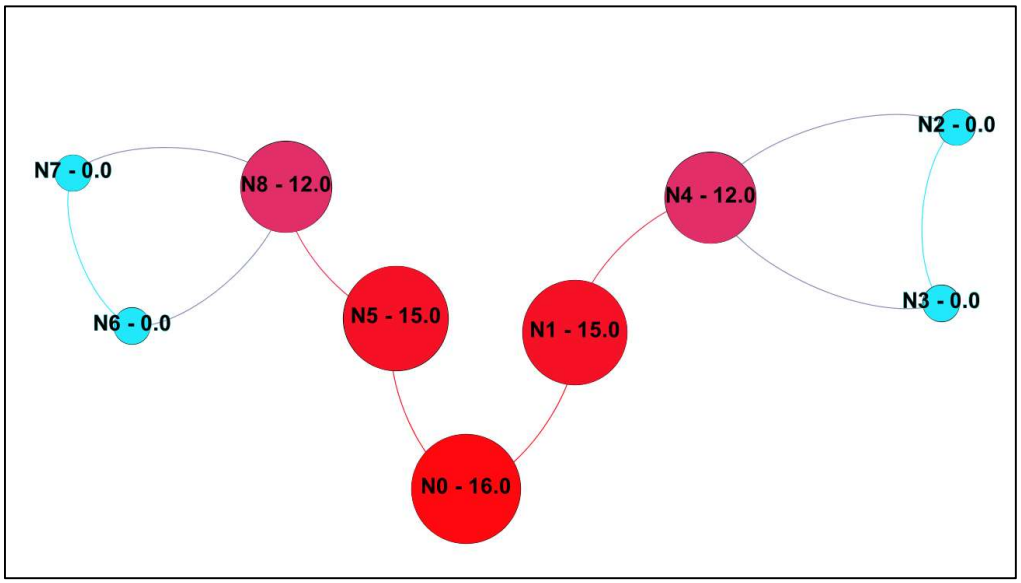


Figure 4 Structural Hole Between N5 and N1

If on the other hand N0 connects N1 and N5 through a mutual introduction (TIO), the betweenness centrality for node N0 will decrease to zero and its relative power will be given up. See Figure 5 below which depicts network closure and the resulting reduction in betweenness centrality from 16 to 0.

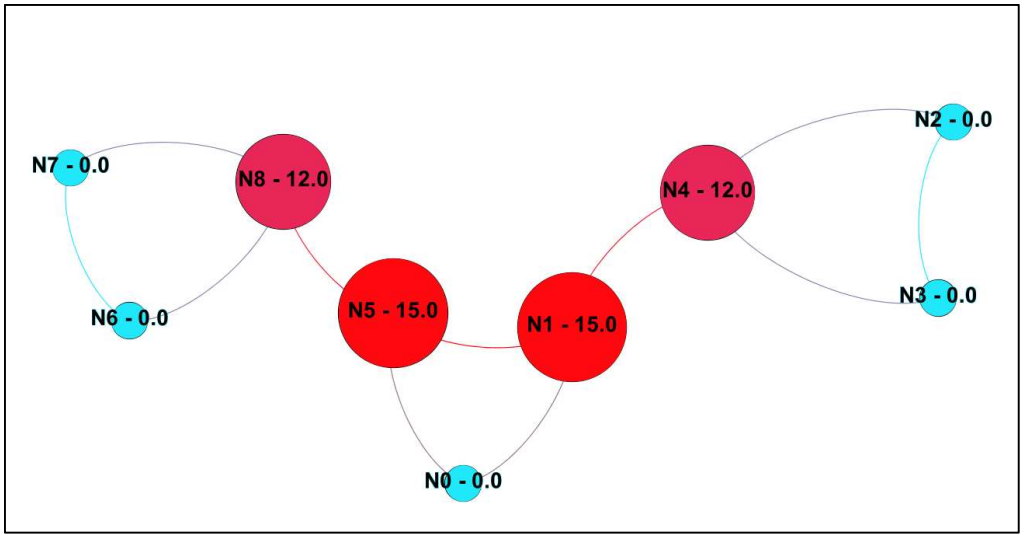


Figure 5 Network Closure and Reduced Betweenness Centrality

Actors who act selflessly display a tertius iungens orientation (TIO) and this promotes structural embeddedness (Ozdemir et al., 2016) or structural capital, which entrepreneurs can leverage to access the resources they require for entrepreneurial activity (Ebbers, 2014). They are also likely to build collective social capital, described as relational capital, which is reciprocal in nature, and can be used in the future (Tan et al., 2015). This collective social capital will also reduce the cost of economic transactions by promoting high levels of trust between actors and hence reduces the need for onerous contracts and associated economic costs (Uzzi, 1997).

In addition to a positive correlation to entrepreneurial activity, high TIO has also been found to correlate with high levels of innovation (Obstfeld, 2005) which may also predict entrepreneurial activity. It is, however, important to consider the context in which the behaviour occurs, for example, dense and cohesive networks particularly those which enjoy a shared identity (Khayesi et al., 2014) promote network closure, support a TIO and actively discourage a TGO (Tan et al., 2015). Likewise, a cohesive network in which its actors have a high level of TIO will promote network closure and increase network density which results in a self a reinforcing cycle, as depicted in the figure below.

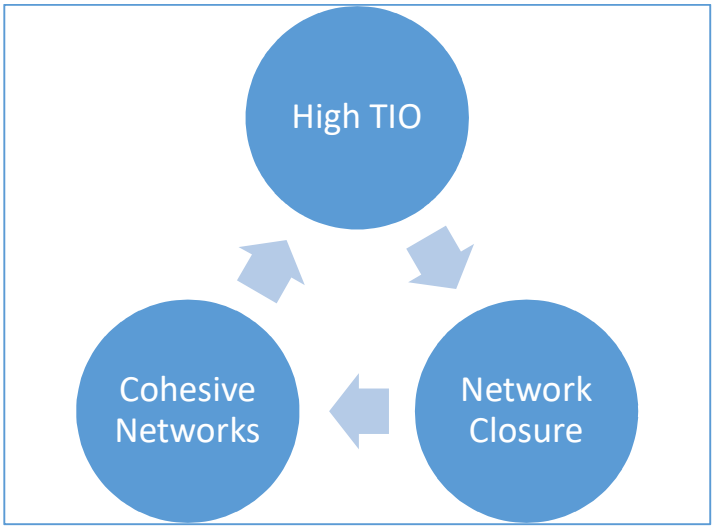


Figure 6 Reinforcing Cycle of TIO

Consequently, the debate between brokerage vs. cohesive networks, or bridging vs. bonding, seems to be inconclusive and should not be viewed as a binary choice but rather a mixture of both (Ozdemir et al., 2016). It must be noted that the composition of the networks in most of the prior research are not homogenous nor are they ethnically bound and this then begs the question as to whether or not the findings in the previous

literature are indeed valid for the above-said networks. This result seems to indicate a gap in the research with regards to how TIO within in ethnically bound networks influences entrepreneurial activity.

2.8 Chapter Summary

This chapter describes how the social structure and networking orientation of actors within social networks correlate with entrepreneurial activity. Moreover, the role of network structure as measured by the variables of betweenness and degree centrality do not seem to be conclusive in their relationship with entrepreneurial activity. The role these variables play in promoting entrepreneurial activity is explored in the context of network density and cohesiveness. The orientation of network actors towards either connecting disconnected actors (TIO), or maintaining the disconnection for brokerage purposes (TGO) was explored and it was concluded that there is little consensus on their respective benefits in promoting entrepreneurial activity. The TIO orientation, however, is reinforced in cohesive and ethnic networks and TGO may not be supported as it is being deemed to undermine the networks common values particularly when the network is cohesive and a TGO is undesirable.

Additionally, the above structural, behavioural and cultural elements can be thought of as collective social capital, which in certain combinations can correlate with entrepreneurial activity (Nahapiet & Ghoshal, 1998). Structural capital refers to the patterns of relations between network actors, and this, in turn influences the level of cohesion and hence creates the trust (Gedajlovic et al., 2013) and bonding capital. The trust and bonding capital lead to the formation of cognitive capital which promotes unity and shared values (Gedajlovic et al., 2013). This sequence is arguably overlapping and most likely oversimplified and non-linear, but nonetheless, seems to corroborate the overwhelming majority of literature.

The chapter concludes that the vast majority of literature is inconclusive concerning the relationship between entrepreneurial benefits, network structure and networking orientation. The role which network homogeneity, shared identity or ethnicity plays in shaping these benefits is also not explored in the literature. This study will attempt to bridge this gap by empirically analysing how network structure and networking orientation or behaviour change with the phases of entrepreneurial activity, within an ethnically homogenous and cohesive network.

3 CHAPTER 3: RESEARCH HYPOTHESES

3.1 Introduction

The literature review above highlights the link between social structure, a tertius iungens orientation and entrepreneurial activity. The vast majority of the current literature, within the sociology and entrepreneurial domain, does not address the underlying composition of the networks under study. In particular, they do not consider the role ethnic networks play in relation to entrepreneurial activity, social structure and tertius iungens networking behaviour.

Consequently, this research aims to improve the understanding of how social structure and *tertius Iungens* orientation (TIO) differ across the different phases of entrepreneurial activity in the context of an ethnic network.

3.2 Research Questions and Hypothesis

3.2.1 Research Question 1

Given that ethnic networks are considered to be cohesive and dense (Khayesi et al., 2014), it can be argued that ethnic networks encourage network closure and hence are likely to have above average levels of TIO. The research is inconclusive regarding the relationship between TIO and entrepreneurial activity within a cohesive network. This, therefore, suggests the following question:

Question 1: How does TIO differ between the phases of entrepreneurial activity?

H_0 = No difference in the mean TIO score between non-entrepreneurs (NE), motivation or planning entrepreneurs (MP) and established entrepreneurs (EE).

H_1 = There is a difference in the mean TIO score between non-entrepreneurs (NE), motivation or planning entrepreneurs (MP) or established entrepreneurs (EE).

3.2.2 Research Question 2

Structural holes are considered to be a significant source of competitive advantage for entrepreneurs as they are able to control the flow of information and exploit this (Tan et al., 2015) for entrepreneurial gain (R. Burt, 1992). The number of structural holes is said to be moderated by network density (Tan et al., 2015) or the actor's degree centrality.

Given that this study takes place within an ethnic network, which is arguably a dense and cohesive network, it is interesting to understand whether or not actors at different phases of entrepreneurial activity have differing network densities. This should further be viewed in the context that ethnic networks tend to promote network closure and increase density for all actors alike.

Question 2: Does the degree centrality differ between the phases of entrepreneurial activity?

H_0 = There is No difference in the mean degree centrality score between non-entrepreneurs (NE), motivation or planning entrepreneurs (MP) and established entrepreneurs (EE).

H_1 = There is a difference in the mean degree centrality score between non-entrepreneurs (NN), motivation or planning entrepreneurs (MP) or established entrepreneurs (EE).

3.2.3 Research Question 3

The relative betweenness centrality of an actor, in particular, that of an entrepreneur would indicate the presence of structural holes and their ability to exercise brokerage for entrepreneurial gain. This argument, however, needs to be tested in the context of a cohesive network as the current literature argues that cohesive networks are likely to actively discourage brokerage (Tan et al., 2015). Brokerage is often associated with extracting an entrepreneurial benefit (Latora et al., 2013; Ozdemir et al., 2016) for the ego alone, however, it is argued that this is difficult to practice in cohesive and dense networks (Tan et al., 2015).

Question 3: Does the betweenness centrality differ between the phases of entrepreneurial activity?

H_0 = There is No difference in the mean betweenness centrality score between non-entrepreneurs (NE), motivation or planning entrepreneurs (MP) and established entrepreneurs (EE).

H_1 = There is a difference in the mean betweenness centrality score between non-entrepreneurs (NE), motivation or planning entrepreneurs (MP) or established entrepreneurs (EE).

4 CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

This section describes the types of data collected, the manner in which it was collected and how it was prepared and analysed for the purposes of answering the above-mentioned research questions. The research questions required both personal and social network data to be collected and analysed using a combination of social network analysis and statistical testing. This section will describe the design of the research, which relates to the type of research conducted, followed by a brief overview of the relevant population, unit of analysis and sample. The section will then present a detailed explanation on how the data was collected, enhanced and prepared.

4.2 Design

In order to answer the above-mentioned research questions and achieve the research objectives, a quantitative research design was selected. A quantitative design was selected as opposed to a qualitative or mixed-method, as social networking analysis requires a quantitative method to enable the construction of a relatively large social network (Jack, 2010) and additionally compute the relative structural statistics. A mixed-method would be useful to describe both the context in which the network occurs and the structure of the network itself (Edwards, 2010). This study, however, does not attempt to describe the context of the network in depth and hence the quantitative design was adequate.

The research was descriptive in nature as it describes observed phenomena and answers questions such as: What is the level of social structure and TIO between various phases of entrepreneurial activity (Saunders & Lewis, 2012)? Furthermore, Saunders and Lewis (2012) explains that a quantitative design involves the collecting of data which is measurable and quantifiable (p. 111). The research time-horizon was cross-sectional in nature and was conducted at a point in time (Saunders & Lewis, 2012). In contrast, a longitudinal study would have required significantly more research time and additionally may not have contributed significantly more to answering the current research question.

In order to analyse the differences in social structure and TIO between the different phases of entrepreneurial activity within an ethnic context, a two-part survey was conducted: Part (1) obtained demographic and behavioural data such as TIO and entrepreneurial activity; Part (B)

obtained social network data in the form of nodes (actors) and ties (relations). This was used to construct the social network and ultimately perform a social network analysis.

The social network, constructed with survey data obtained in part B, was examined by the researcher who is an active member of the sample population. The researcher added missing ties between nodes in the network which were deemed to be objective, based on the researchers ethnographic understanding of the community. Subsequently two independent persons, who are well connected in the community and are therefore considered by the researcher as "domain experts", were used to examine the constructed network and add ties where they were previously unknown or make changes to ties added by the researcher or other "domain expert". The use of the domain expert was to ensure objectivity and accuracy of the sample network.

Subsequent to the survey and enhancement of the social network, both sets of data were augmented and analysed using social network analysis. The network structure was mathematically described and the properties of the respondents were visualised in the context of the social network. The data was then extracted from the social network analysis tool Gephi 0.9.1 and imported into IBM SPSS Statistics 24 for statistical comparative analysis.

This supported a deductive approach, which allowed for the analysis to be compared with that of the current theory and research questions (Saunders & Lewis, 2012) as described in the literature review above. The link between structural features, entrepreneurial activity and TIO were compared to the literature and where inconsistencies were identified, an inductive approach was applied to explain the observed phenomena (Saunders & Lewis, 2012).

4.3 Population

The population relevant to this research is that of the Jewish group based in Johannesburg, South Africa. The population was restricted to those of a working age, i.e. above 18, as the research relates to entrepreneurial activity, which is a function of an individual's ability to generate business opportunities. The latest statistics indicate that the Jewish Population in Johannesburg is approximately 50,000 according to the South African Jewish Board of deputies (2016). It is, however, unclear how many of these persons are of a working age. The total population of interest could therefore not be quantified. It is also interesting to note that the Jewish population in Johannesburg is concentrated in the north of Johannesburg and covers approximately 10km^2. This gives an approximate density 5000 people per square km.

4.4 Unit of Analysis

Social Networks are generally analysed from either an “Ego-centric” or a “Whole-network” perspective (Butts, 2008). The "Ego-centric" perspective is focused on particular actors or egos and their personal network of relations. This is as opposed to the "whole-network" perspective which focuses on the entire network and is not concerned with the individual's personal networks. The "whole-network", in the context of this research, refers to the Johannesburg Jewish network, which is significantly larger than an individual's personal or ego-centric network.

This study is focused on the structure of individual actor's personal networks or ego centric networks, their TIO within these networks and how structure and TIO differ with differing phases of entrepreneurial activity. This study, therefore, defines its unit of analysis as the individual actor or node within the network.

4.5 Sampling method and size

The Jewish population is comprised of many smaller overlapping networks, which are multiplex in nature (Butts, 2008; Edwards, 2010). The multiplex nature of networks means that any individual actor or set of actors can typically be embedded within several networks simultaneously. Multiplex or overlapping networks are typically form from a combination of friendship, family, work, religious or interest based networks. Given this "multiplexity", a non-probability random snowball sampling method was used to capture as large a proportion of the population as possible. Here, probability sampling was not possible as no complete sample frame of all working age Johannesburg Jews was available. Different non-probability sampling methods, such as convenience sampling and quota sampling would not have captured the required diversity for the network.

The snowball sampling method was initiated with an initial set of focal actors who were selected to be as diverse as possible. They were then requested to pass on the survey to their connections. This process was repeated until no new responses were recorded (Hanneman & Riddle, 2005). This method proved to be useful when trying to isolate actors with specific properties (Hanneman & Riddle, 2005), such as Johannesburg Jews, in the context of this research. The snowball sampling technique resulted in endogenously or relationally defined the boundary of analysis as it includes members of the population who are related to each

other as the sampling progressed through the respondents' relations, in other words the survey ‘snowballs' through the respondents relations (Butts, 2008; Knoke, 2008; Scott, 2000).

The initial set of respondents who were selected to initiate the snowball sampling method were chosen from distinctly different networks so as to avoid capturing a skewed sample of the population. These initial respondents were selected from the following groups of contacts: (1) the researcher’s friends; (2) friends of the researcher’s family; (3) two separate religious congregations (Chabad of Savoy and Great Park Synagogues) and (4) the researchers’ work colleagues. This separation was an attempt to improve the diversity and reduce the statistical bias inherent in the snowball sampling method (Wegner, 2012). This initial selection of respondents also attempted to reduce the risk of overstating the target samples “connectedness” (Hanneman & Riddle, 2005). It must be noted that by virtue of the researcher belonging to the network under study, and through the use of snowball sampling, the researcher was an active participant in the research.

4.6 Data Collection

4.6.1 Survey Instrument

In order to collect the data for this study, a survey instrument was used. An electronic survey was considered to be the most efficient instrument to collect as many responses as possible in order to construct a social network of a meaningful size. Additionally, given the complex nature of social network data, electronic surveys greatly reduce the time required to gather and capture relational data from both the respondents and researcher’s perspective. The electronic survey was developed on the Typeform Platform, located at www.typeform.com. The survey, in the form of a hyperlink: https://gregoryfine.typeform.com/to/N6k4I5, was sent to all respondents by a combination of email and instant messaging software. The data collected for this study was divided into two categories: (1) Personal data, with the main components being the TIO construct, and entrepreneurial activity and (2) relational or social network data.

A pilot study was initially conducted to test the following aspects: (1) relational data could be easily collected and prepared for analysis; (2) ensure that the survey could be completed in a reasonable time; (3) to validate and identify the most suitable SNA tools for analysis and (4) to refine questions. The survey was initially piloted with members of the Gordon Institute of Business Science 2015/2016 MBA group immediately on commencement of the ethics approval process. The results of the pilot study prompted the selection of the SNA tool called

Gephi and the reduction and simplification of the survey, which resulted in the average completion time being reduced from 9:09[1] minutes to 5:44[2] minutes, see Appendix 1.

After the completion of the pilot study, the survey was then emailed to all Johannesburg-based Jewish persons whose contact details were available to the researcher and to all the members of two Johannesburg Synagogues via synagogue management. All respondents were required to accept the letter of consent, as seen in Appendix 1, before completing the survey. The recipients of the survey were also encouraged to forward the survey on to all other Johannesburg-based Jewish persons whom they could readily access. The recipients were reminded several times and this ultimately led to 300 unique visits and a final response of 117 persons.

The variation between the final set of results and the unique visits is most likely due to the fact that many people (unique visits) attempted to complete the survey and abandoned it before completion. The reason for abandonment was either due to technical difficulties or an unwillingness to invest additional time to complete the survey. The final response rate was therefore, estimated to be below 30% given that the survey was sent to at least 400 persons. See screenshots of the electronic survey in the Appendix 1.

Personal Data

The first part of the survey focused on the collecting of personal information pertaining to the respondents. The four key pieces of data, collected are as follows:

1) The respondent's name and surname, which was required for the social network analysis.
2) The respondent's demographic data, which was collected in case it was required for control purposes.
3) The respondent's entrepreneurial activity (independent variable), to establish the most likely phase of entrepreneurial activity to which the respondent participates in.

---

[1] Average Completion rate for MBA Pilot

[2] Average Completion rate for Primary Study

The respondent's entrepreneurial activity was determined by their response to the following question (multiple responses were accepted): "Which of the following options best describes your current work situation?"

a. I am unemployed
b. I am employed and report to an employer
c. I actively look for business opportunities that I can develop
d. I have identified a business opportunity on which I plan to act
e. I am in the process of starting up my own business
f. I am running my own business
g. Other

These choices were based on the phases of entrepreneurial activity as described in the literature review. These questions were based on the GEMS report (Herrington et al., 2014) and the work done by Greve and Salaff (2003). The responses are grouped into three phases:

- Phase 1 – Non-entrepreneurial (N)
  - Options (a or b)
- Phase 2 –Motivational or Planning (MP)
  - Options (a or b) and (c or d or e or g)
- Phase 3 – Established (E)
  - Option (f or g)

4) The respondents tertius iungens orientation or TIO (dependant variable) score as part of a six question construct.

The respondent tertius iungens orientation (TIO) was determined by asking the respondent to score the following statements on a Likert scale of 1-7, where 1 indicates they strongly disagree with the statement and 7 indicates they strongly agree with the statement. The TIO construct was originally developed by Obstfeld (2005) and then subsequently refined by Ebbers (2014). The final construct was adapted from both studies. The final set of questions which made up the construct are displayed below:

a. I often try and introduce people to each other, who might have common business-related interests.
b. I often try to describe business opportunities in a way that will appeal to people with diverse interests.
c. I often see business opportunities for business collaboration between people.
d. I often try to point out the common ground between people who have different perspectives on business related issues.
e. I often try to connect people if I think that they would benefit by being acquainted (from a business perspective).
f. I often try to connect people who are dealing with similar business related issues.

4.6.2 Social Network Data (Dependent Variables)

The second part of the survey was used to collect the respondent's relational data, which was used to construct the social network. The relational data refers to a list of five alters to which the ego is connected, as well as how each of those alters are in turn connected to each other. The relational data was collected in two steps. Step one involved collecting up to five alters to which the ego "has discussed important matters with" and Step two required the ego describe the relationships between all the actors. Additional information, such as content and strength of the relationship was also collected.

The survey questions, used for the purposes of collecting the relational data, were based on the General Social Survey (GSS), an ego-centric study conducted by Burt (1984). The GSS was used to collect empirical data for sociologists on the American population. The GSS survey made use of the “name generator” method (p.296) for collecting the respondents alters (R. Burt, 1984). The “name generator method” in the GSS required respondents to recall from memory up to five persons to which they were connected. Many recent studies have also made use of this method, for example (Arregle et al., 2015; Chung et al., 2005; Davis & Davis, 2005; Ebbers, 2014; Obstfeld, 2005).

In contrast, the “Roster” method requires respondents to select their alters from a pre-defined roster or list, as opposed to recalling them from memory (Butts, 2008, p. 20). Although this method avoids memory recall challenges, it requires the entire list of the population under study to be available which poses confidentiality risks and additionally can become rather

cumbersome when large populations are studied (Butts, 2008). The “roster” method was therefore not suitable for this study as the population could not be enumerated and listed and hence the “name generator” method was used in this study and is described next.

Name Generator Data (Step 1)

The “name generator” method used in this research limited the number of alters a respondent was required to recall to five, as did Burt in the GSS survey. This data was collected using the same electronic survey used to collect the personal data as described above. The survey required the respondents to answer the following questions:

1. Looking back over the last six months, name five people in Johannesburg Jewish Community with whom you have discussed important matters with?
2. What do you mainly discuss with the people you listed above? Please select appropriate choices. (Business, Social, Business and Social)

The answers to question 1 were retained and used in the following questions.

Relational Data (Step 2)

3. Please categorise your relationship with each of the people you named above?
    a. Family
    b. Co-worker
    c. Friend
    d. Mentor/Advisor
    e. Acquaintance
4. Please describe the type of relationship that exists between the people listed in the previous question?
    a. Very Close
    b. Close
    c. Acquaintance
    d. No Relationship

The matrix below describes all possible relationships between all five people.

Table 2 Example of Relationship Matrix for Name Generator

	Person 1	Person 2	Person 3	Person 4	Person 5
Person 1		1&2	1&3	1&4	1&5
Person 2			2&3	2&4	2&5
Person 3				3&4	3&5
Person 4					4&5
Person 5					

The questions were structured from a- j, see samples of two questions below:

1. Please describe the type of relationship between Person 1 & Person 2
2. Please describe the type of relationship between Person 5 & Person 5

4.7 Data Enhancement

The social network data collected by survey instrument restricted respondents to naming a maximum of five alters and their respective relations for the purposes of managing and respecting the respondents time and ensuring reasonable completion rates. This restriction, however, resulted in a partially complete social network as some relations were not captured during the survey process. On completion of the survey instrument, an additional step was required to ensure the social network was as complete as possible.

In order to complete the network data collected in the survey above, the data was presented in an adjacency matrix as displayed in Figure 24 in Appendix 2. The adjacency matrix contained the same number of columns and rows, which equated to all the names of persons mentioned in the survey (both respondents and their relations) and equated to 520 unique nodes. The relations between these nodes were extracted from the survey and displayed in the matrix as either a “0” for all weak ties or “1” for family, friends, close and very close ties. The remaining ties were left blank. The final number of meaningful ties, coded as “1”, amounted to 818. The matrix was symmetrical about the diagonal as the relations are bi-directional.

The adjacency matrix was then examined and, using the following steps, it was enhanced to better reflect the reality of the network given the limitations imposed on the initial collection within the survey. The process of enhancement is described next.

1) The researcher initially examined the adjacency matrix and inserted “1’s” where a strong relation could objectively be identified in the previously marked blank cells. These cells were also colour coded to identify them as being added.
2) This matrix was then subsequently shown to one of the two knowledgeable informants who agreed to assist in verifying the data contained in the matrix.
3) The informant was then asked to check the relationships in the matrix which were coloured and change any of the ones to zeroes if they felt that strong relations did not exist between the two persons
4) The informant was then asked to change any of the blank cells to a “1” if they felt that a strong relationship existed. This cell was also coloured.
5) The second informant then repeated the above process.

This process resulted in an additional 53 meaningful relations being added to the original list, increasing the total to 871 meaningful relations and thereby increasing the original list by 6%. Both informants were requested to sign confidentiality agreements and to state that they would objectively and honestly complete the task. These documents are available on the electronic data disk supplied to GIBS University.

4.8 Data Preparation

The data collected was then structured, cleaned, coded and formatted to ensure it could be imported into the Social Network Visualisation tool to called Gephi (Ver. 0.91). The output of Gephi would then serve as the input into the statistical analysis tool, SPSS (Ver.24). The data preparations proceeded in accordance with the following steps.

1) Removal of incomplete responses.
2) Coding of all survey response variables.
3) Ensuring consistency in responses obtained with respect to names and surnames (spelling and formatting).
4) Re-formatting of data into adjacency list and preparing for Gephi import.
5) Preparing Gephi output for SPSS import.

These steps are described in further detail below.

Step 1 – Removal of Incomplete Responses

Incomplete responses were discarded from the original data set. The missing data came from the relational data section in the survey. Feedback relating to incomplete data was voluntarily obtained from some of the respondents. The respondents indicated that they either did not have enough time to complete the survey or they were reluctant to provide details of their relations from a privacy perspective. Methods of imputation were not possible, as missing relational data could not be approximated or assumed.

Step 2 - Coding of Response Variables

Next, all questions requiring coding were coded within Microsoft Excel and their respective translation tables were obtained. The responses to age, gender and education were collected for the purposes of describing the demographics of the sample and for possible use as control variables should the need have arisen. See tables below for the respective codes used.

Table 3 Age Coding

Age	Code
40+	3
30-39	2
18-29	1

Table 4 Gender Coding

Gender	Code
Male	1
Female	0

Table 5 Highest Education Level Achieved Coding

Education Level	Code
Matric	1
Trade Certificate / Diploma	2
University Degree or Equivalent	3
Honours (Other)	3
Masters (Other)	3

Additionally, entrepreneurial activity (Question 7 of the survey) was also classified and coded in order to form three distinct entrepreneurial phases which were used as the independent group in the ANOVA. These served as the attribute for colour in the social network produced within Gephi.

The three phases were classified as 1) Non-entrepreneurial, 2) Motivational or Planning and 3) Established Entrepreneur. This classification was based on an adaptation of the entrepreneurial phases as described in the literature review above. If the respondent selected options belonging to more than one group, they were classified as "Motivational or Planning" in terms of Entrepreneurial Activity. "Other" responses were subjectively placed into the appropriate grouping. The questions were grouped and coded as follows:

Table 6 Entrepreneurial Activity Coding

Grouping				Code
Not Entrepreneurial	"I am Unemployed"	"I am Employed and Report to an Employer"		1
Established	"I am Running my own business"			2
Motivational or Planning	"I actively look for business opportunities I can develop"	"I have identified a business opportunity on which I plan to act"	"I am in the process of starting up my own business"	3

Furthermore, the relationships extracted from the survey were coded as either strong “1” or weak “2”. The final coding is displayed in the table below.

Table 7 Relationship Strength Coding

Tie	Code
No Relationship	0
Student	0
Client	0
Business Relationship	0
Acquaintance	0
Supplier	0
Close	1
Co-worker	1
Mentor / Advisor	1
boss	1
Very Close	1
Friend	1
Family	1

Step 3 – Name consistency and Unique List of Names

In order for the construction of the social network, it was important to ensure all the names and surnames identified in the survey were consistent in terms of their spelling. In other words, each unique name and surname required a unique ID. In many cases, the same name and/or surname were spelt differently as different respondents listed their relations. See the Illustrated example below:

Person A, listed the following relations: George Nagle, Peter Potgieter, Les Mattuson:

Person. B, listed the following relations: Terri Levin, Axel Rose, Leslie Matuson.

If only the first two relations for Person A and Person B are considered, it can be concluded that Person A has no common relations with Person B. This scenario, however, changes when the third relation is examined. Les Mattuson and Leslie Matuson are clearly the same person and therefore it can be concluded that Person A and Person B have a common relation. While this is possible to see and manually make the link, the computer software will not see the two names as being the same and will therefore conclude that there is no common relation.

Therefore, in order to utilise the Gephi software, the names had to be standardised. See the actual example extracted below where the left names were actual names cited by respondents and the names in the right column were rectified and standardised.

Les Mattuson	Les Mattuson
Les Matuson	Les Mattuson
Les Matuson	Les Mattuson
Les Matuson	Les Mattuson
Les matuson	Les Mattuson
Les Matuson	Les Mattuson
Leslie matuson	Les Mattuson
Leslie Matuson	Les Mattuson
Leslie Matuson	Les Mattuson

Figure 7 Name Standardisation Example

Step 4 – Format for import into Gephi

The final prepared data needed to be transformed into a format suitable for Gephi. Gephi required two files for import. 1) The unique list of names or nodes and their respective attributes such as TIO score and EA for analysis. 2) A list of all the edges or relationships between all the nodes contained in the node list. A sample of both the node data and edge data is displayed in Appendix 2.

Step 5 – Format for import into SPSS

Subsequent to calculating the network structural statistics in Gephi, a file was exported into Microsoft Excel with all the resulting metrics. This file contained several statistics, such as betweenness and Degree centrality, along with the personal data collected from the survey. This file was then imported into SPSS for statistical analysis. A sample of this data is displayed in Appendix 2.

4.9 Data Analysis

After the data was collected and prepared, the TIO construct was assessed for internal reliability and validity using the Cronbach alpha statistic. The Cronbach alpha statistic for TIO in a previous study was 0.869 with a 4-item scale (Ebbers, 2014) and 0.85 with a 6-item scale (Obstfeld, 2005). This study used the original 6-item scale used by Obstfeld and achieved Cronbach alpha statistic of 0.915, see results section. This score indicates a high degree of internal reliability, or in other words, each of the items measures the same thing or TIO. The

validity of the construct was originally tested and verified as valid by Obstfeld (2005) and Ebbers (2014).

Subsequent to confirming the reliability of the TIO construct, its mean score was calculated for each respondent. This TIO score, along with all the other personal and the relational data, was imported into Gephi, as described in the data preparation section above. Gephi was used to isolate the largest network component of Interest using the Giant Filter method. This ensured that all other small unconnected components were discarded as they could not be linked to the major network structure, and therefore their structure could not be computed. The network before and after the application of the filter is presented below in Figure 8 and Figure 9 respectively. The network data was reduced to 334 nodes from 520 (64% remained) and to 707 relations from 871 (81.17% relations remained). The resulting and remaining network was the final network used for analysis.

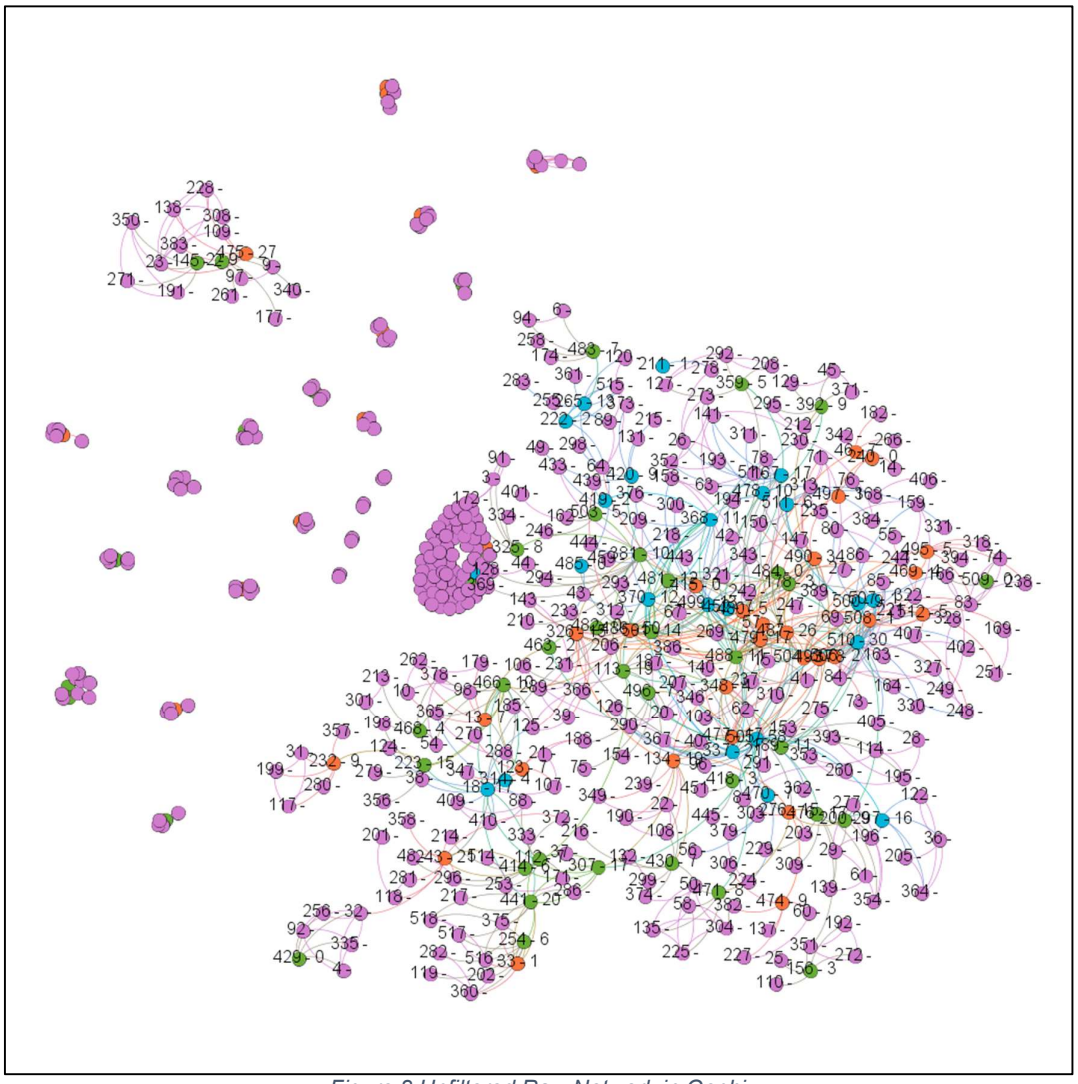


Figure 8 Unfiltered Raw Network in Gephi

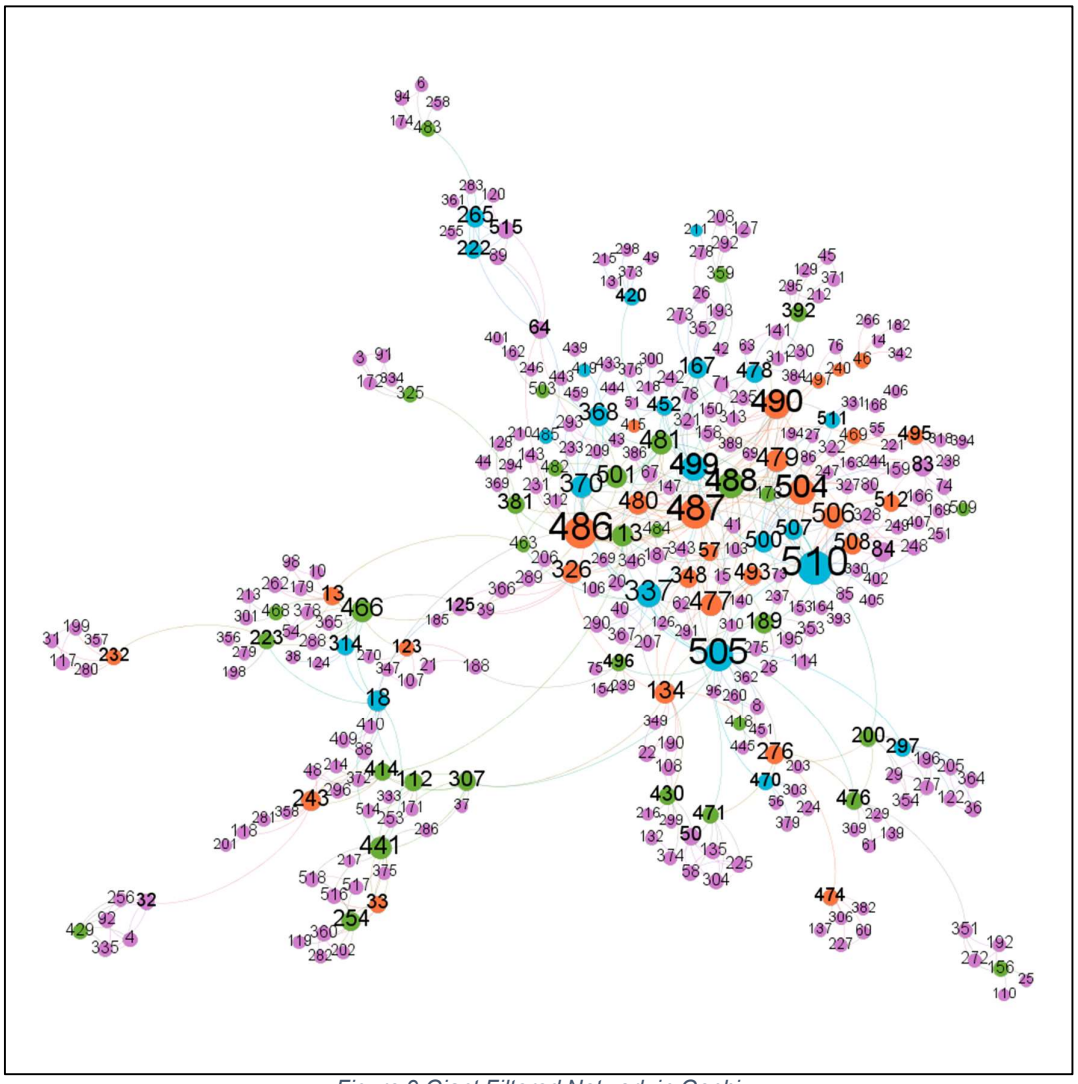


Figure 9 Giant Filtered Network in Gephi

Subsequent to the filter being applied, the network structure in terms of centrality, size and density was computed for each node. This data was then visualised in Gephi using three dimensions, namely colour to represent entrepreneurial activity (independent variable), node size to represent either betweenness or Degree centrality (dependent variable) and lastly node labels to represent TIO (dependent variable).

This data was then exported from Gephi and imported into SPSS where descriptive statistics and frequency plots were produced. In particular, degree and betweenness centrality were summarised by mean scores and frequency distributions. Subsequent to producing the descriptive statistics, the difference in mean scores for each of the dependent variables was compared across the three phases of entrepreneurial activity using a one-way ANOVA in the case where the assumption of homogeneity was acceptable, and Welch's test was used were homogeneity could not be assumed.

The methodological process is usefully summarised in the figure below, which indicates the collection, preparation, augmentation and analysis phases respectively.

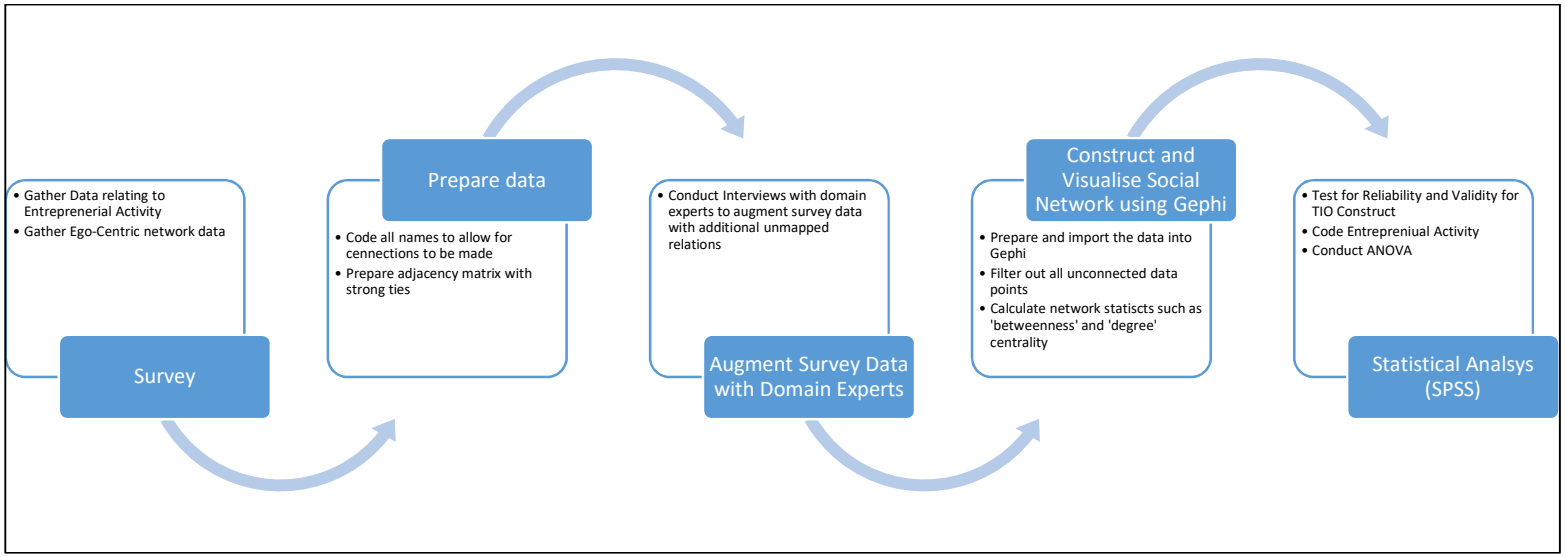


Figure 10 Methodological Process

4.10 Methodological Limitations

This research methodology has several limitations which consequently affect the applicability of the findings and results which follow. These limitations are discussed within three broad categories:(1) data collection method, (2) sample size, (3) subjectivity and key assumptions.

4.10.1 Data Collection Method

The survey method of collecting ego centric data as discussed previously made use of the snowball sampling method. This method, despite attempts to mitigate its shortcomings as described above, led to the collection of a disproportionate number of respondents to which the researcher is connected in one way or another. Additionally, many of the respondents did not "snowball" the survey and if they did, many did not complete the survey. As a consequence, the generalisability of the results to the greater Johannesburg Jewish ethnic population may be limited.

Furthermore, respondents were only asked to list five persons to whom they were related and additionally many refused to list any relationships citing privacy concerns. This limitation with respect to the number of relations the respondents has would likely lead to artificially low levels of egocentric network centrality (betweenness and degree centrality). This resulted in individual respondents having fewer mutual connections and hence understated levels of egocentric network centrality. These results may have skewed the network statistics for individuals at the various stages of entrepreneurial activity which may impact the overall findings.

4.10.2 Sample Size

The final sample size of the sample was 107 which, when divided into three groups of entrepreneurial phase resulted in relatively small groups and thus reduce the confidence which can be placed on the final results from a generalisability perspective. Furthermore, it was not possible to ascertain the correct statistical sample size, given that the total size of the relevant population (of working age) within the Johannesburg Jewish community could not be determined.

4.10.3 Subjectivity and Key Assumptions

In order to ensure that the final network was as complete and as accurate a representation of the 107 respondents network as possible, a manual intervention was required. This intervention asked of three independent persons, one of which was the author, to connect any missing connections observed in the network. These three persons are all part of the population, however, their interpretation of what is deemed a relevant relationship between unconnected persons is often subjective and it is this subjectivity which may have resulted in the creation of some unnatural or irrelevant relationships. This impact may not be severe as three independent persons were used to triangulate the information, but nonetheless is a limitation of the study.

5 CHAPTER 5: RESULTS

5.1 Introduction

The following chapter will present the results pertaining to the research questions and hypothesis outlined in Chapter 3. The first section will describe the data collected using both descriptive statistics as well as visualisations extracted from Gephi followed by the comparative statistics derived from the hypotheses.

5.2 Descriptive Statistics

5.2.1 Demographic Data

The final sample consisted on 107 final responses. The majority of respondents (73.8%) are in possession of a University degree with the remaining respondents having secondary education, diploma or trade. Figure 11 shows the frequency distribution of the education level representing the final sample followed by its data in Table 8 below.

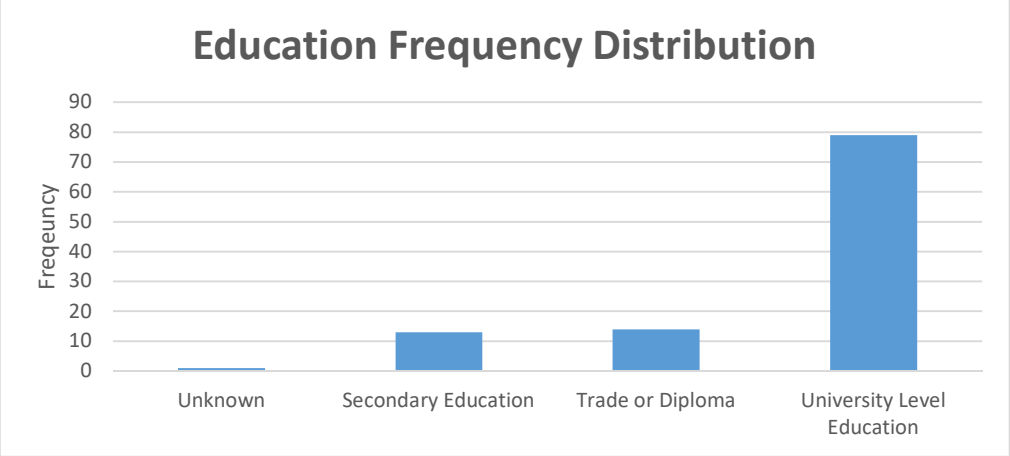


Figure 11 Education Frequency Distribution

Table 8 Education Level Frequency Summary

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Unknown	1	.9	.9	.9
	Secondary Education	13	12.1	12.1	13.1
	Trade or Diploma	14	13.1	13.1	26.2
	University Level Education	79	73.8	73.8	100.0
	Total	107	100.0	100.0	

5.2.2 Entrepreneurial Activity

The phases of entrepreneurial activity amongst the final sample is distributed relatively evenly between the established entrepreneur phase (EE) at 37.4% and the non-entrepreneur phase (NE) at 40.2%, with the motivational and planning phase (MP) at 22.4%. This data is categorical data and therefore no other statics were deemed necessary to display. See Figure 12 and Table 9 below.

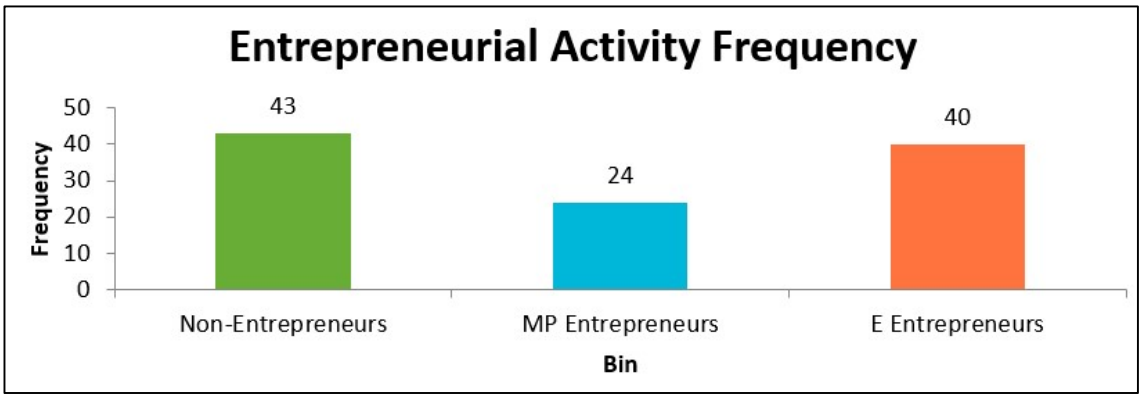


Figure 12 Entrepreneurial Activity Frequency

Table 9 Phases of Entrepreneurial Activity

Entrepreneurial Activity					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NE	43	40.2	40.2	40.2
	M&P	24	22.4	22.4	62.6
	EE	40	37.4	37.4	100.0
	Total	107	100.0	100.0	

5.2.3 TIO Score

The TIO score measured for each of the respondents is skewed positively to the higher end of the 7 interval Likert scale, denoting that majority (87.9%) of respondents have a TIO score above 4. The mode of the TIO score is 5.17, with 13% of respondents choosing this score. The distribution of scores can be seen below in Figure 13 and a detailed distribution of all the scores is displayed in Table 23 in Appendix 3. This result indicates that the overwhelming majority of respondents in the sample have a tertius Iungens orientation or a TIO.

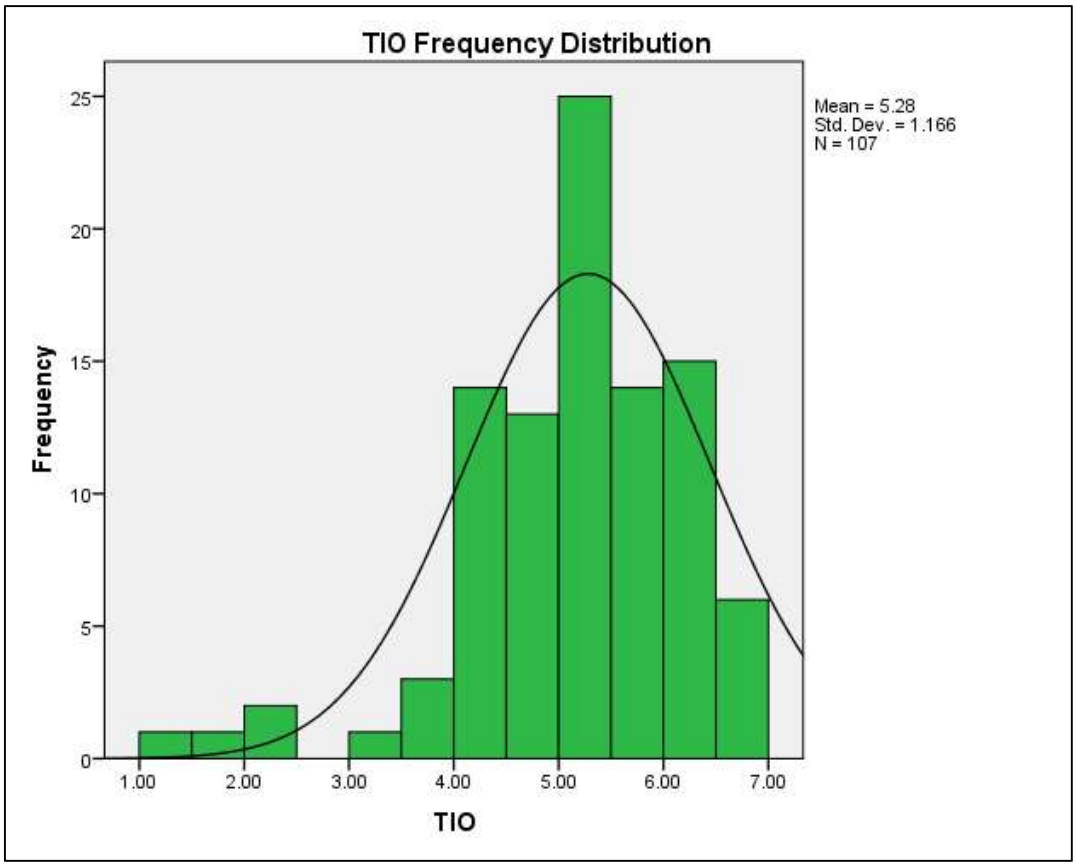


Figure 13 TIO Frequency Distribution

5.2.4 Degree Centrality Score

The number of connections or ‘degrees' each respondent has is concentrated between 5 to 8, with about 40% of all respondents having a degree of five. This is not surprising since all respondents were asked to list up to five people to whom they are connected. All respondents with degrees higher than five, approximately 62%, were as a result of other respondents nominating them as connections. The mean number of connections or degrees was 9.17 with a standard deviation of 5.69. The frequency distribution of the sample is shown in Figure 14 below and a detailed breakdown of individual responses is shown in Table 24 in Appendix 3.

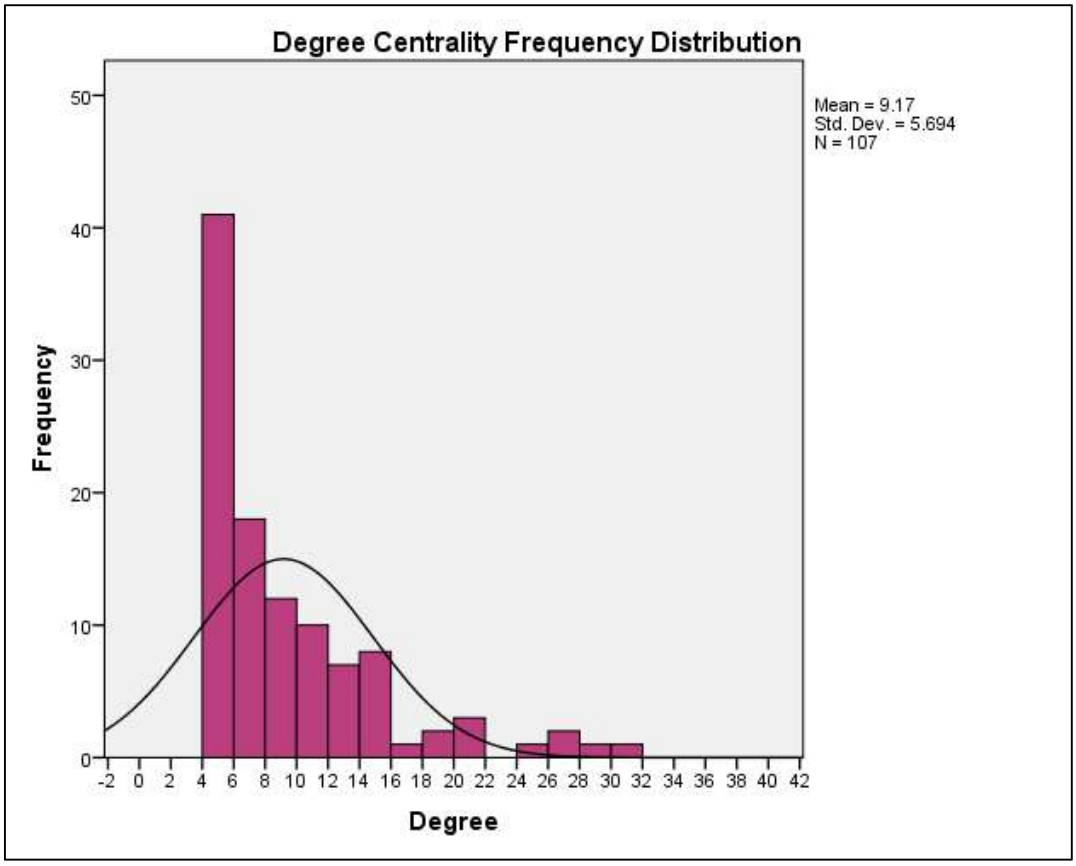


Figure 14 Degree Centrality Frequency Distribution

5.2.5 Betweenness Centrality Score

The betweenness centrality is skewed towards the lower side of the betweenness distribution. This demonstrates that the majority of respondents are well connected and few are in structurally powerful positions from a brokerage perspective. The mean betweenness centrality score is 9.25 with a standard deviation of 13.45. The distribution of scores is shown in Figure 15 below. A detailed breakdown of the betweeness centrality scores for each respondent is shown in Table 25 in Appendix 3.

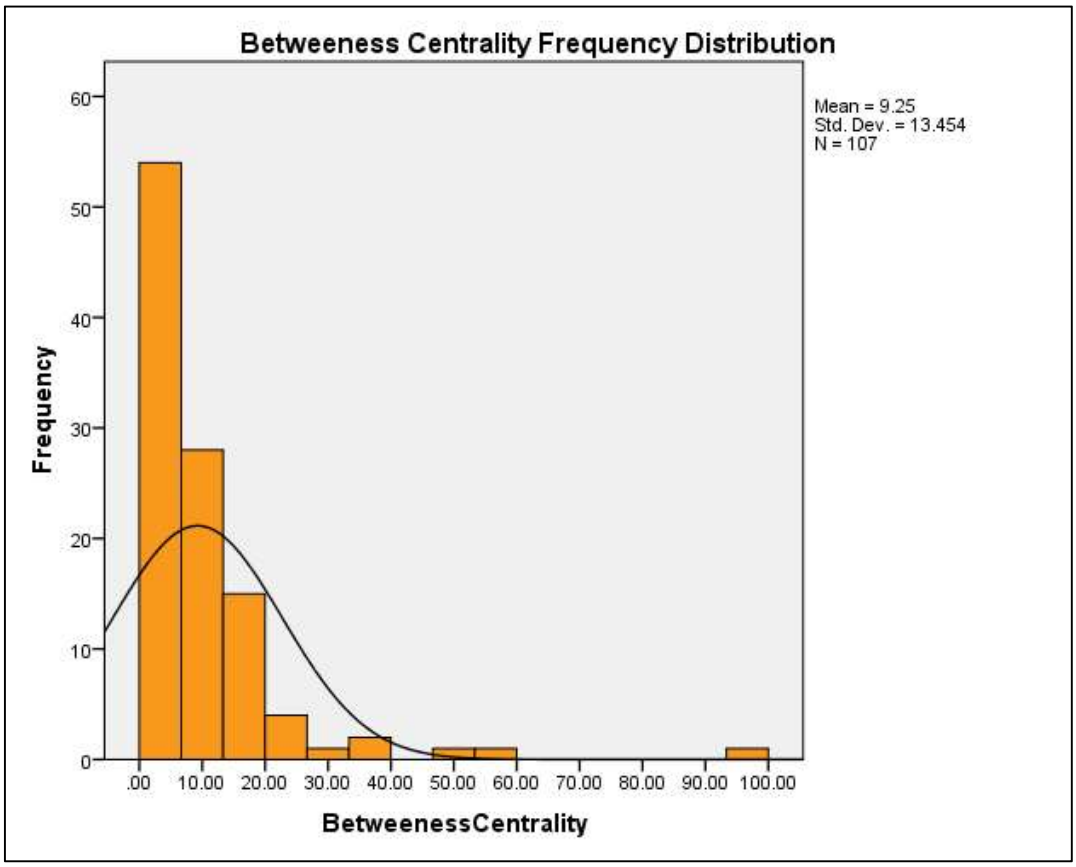


Figure 15 Betweenness Centrality Frequency Distribution

5.4 Comparative Statistics

The comparative statistics were computed using SPSS version 24, at a confidence interval of 95%.

5.4.1 Research Question 1

H_0: no difference in the mean TIO score between the three phases of entrepreneurial activity.

H_1: difference in the mean TIO score between at least one of the three phases of entrepreneurial activity.

TIO Construct Reliability

In order to use TIO construct in the comparative statistics, a test for reliability was conducted. The test used to assess internal reliability was the Cronbach's Alpha test for reliability. After running the test in SPSS the Cronbach's Alpha score was 0.914, indicating that the TIO construct has a high degree of internal reliability, see Table 10. This implies that all six questions are all measuring TIO. On inspection of the Item total scale in Table 11, it can be seen that the constructs reliability cannot be improved by removing any of the questions. A detailed output relating to the construct validity between each of the items is displayed in Appendix 3.

Table 10 Cronbach's Alpha Statistic for The TIO Construct

Reliability Statistics	
Cronbach's Alpha	N of Items
.914	6

Table 11 TIO Item-Total Statistics for TIO Construct

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q1	26.27	34.350	.767	.897
Q2	26.50	35.177	.724	.903
Q3	26.33	34.562	.751	.899
Q4	26.70	34.683	.760	.898
Q5	26.24	34.525	.783	.895
Q6	26.32	34.294	.760	.898

TIO and Entrepreneurial Phases Statistical Comparison

On examination of the descriptive statistical results and the internal reliability of the TIO construct, it can be shown that the mean TIO score is the highest in the motivational and planning phase (MP) at 5.4 and lowest in the non-entrepreneur phase (N) as 5.2, seen Table 12 below. This, however, may not be statistically significant and therefore either a one-way ANOVA or a Welch's test must be performed. A one-way ANOVA can be performed if the assumption of homogeneity is satisfied and the Welch's test if homogeneity is violated. The test for homogeneity was conducted using the Levene's test, see Table 13, which indicated that the assumption of homogeneity was not violated as the Levene's test yielded a p-value of 0.776 which is greater than 0.05 (Pallant, 2007).

Based on the assumption of homogeneity, a one-way ANOVA on the mean TIO score between the three entrepreneurial phases was performed. This test indicated that no significant difference between the groups mean TIO scores was present. The p-value of the ANOVA was 0.741, which is greater than 0.05, and therefore not significant at a 95% confidence interval. See Table 14. The null hypothesis therefore cannot be rejected indicating no statistical difference in the mean TIO score between the different phases of entrepreneurial activity. Moreover, TIO is independent of entrepreneurial phase (Wegner, 2012).

Table 12 TIO One-way ANOVA Descriptive Results

Descriptive Statistics								
TIO								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
NE	43	5.1979	1.12796	.17201	4.8508	5.5450	2.33	7.00
MP	24	5.4300	1.22430	.24991	4.9130	5.9470	1.00	7.00
EE	40	5.2798	1.19214	.18849	4.8985	5.6610	1.67	7.00
Total	107	5.2806	1.16622	.11274	5.0570	5.5041	1.00	7.00

Table 13 TIO Levene's Test

Test of Homogeneity of Variances			
TIO			
Levene Statistic	df1	df2	Sig.
.255	2	104	.776

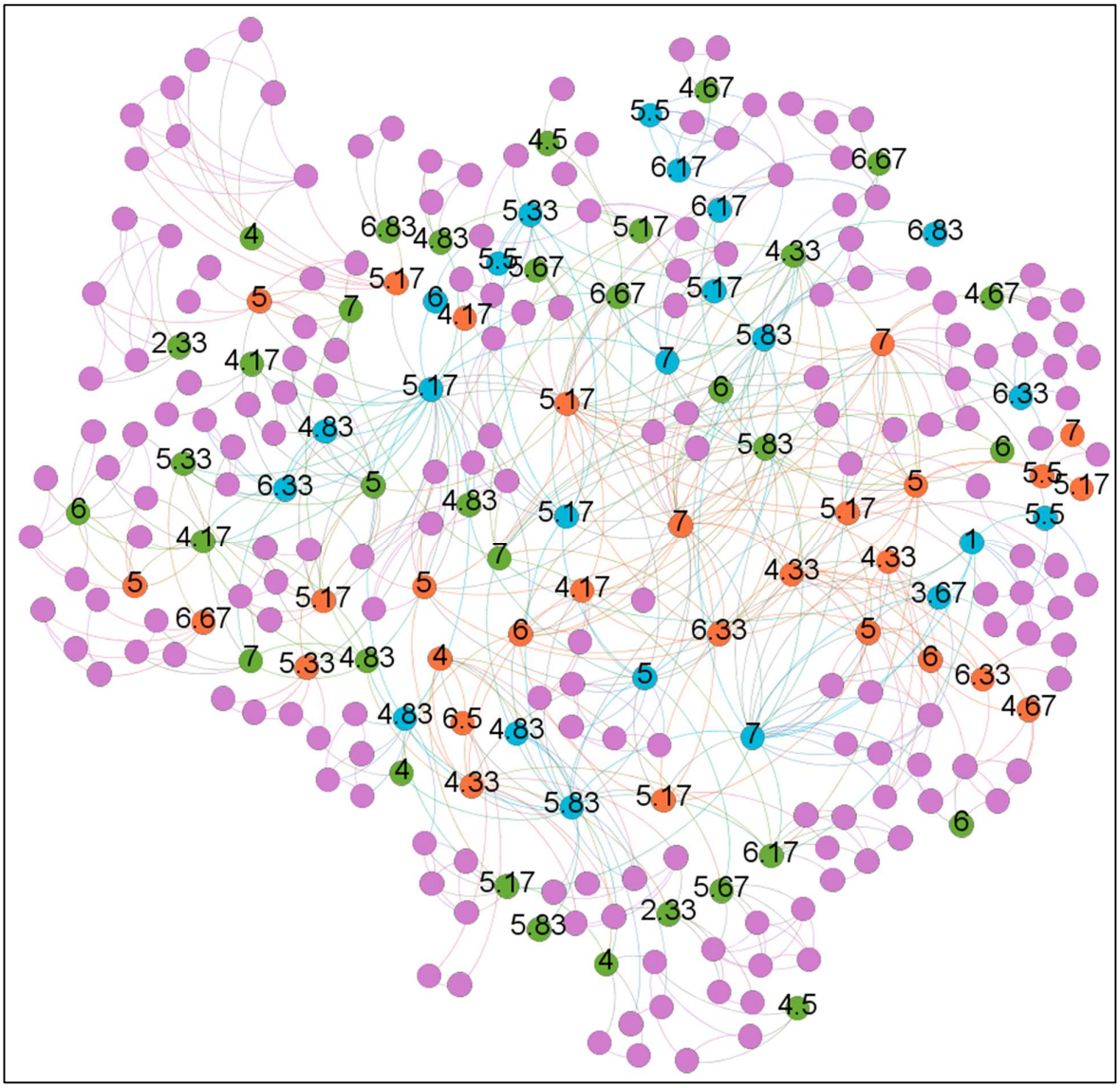
Table 14 TIO ANOVA

ANOVA					
TIO					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.830	2	.415	.301	.741
Within Groups	143.337	104	1.378		
Total	144.167	106			

TIO and Entrepreneurial Phases Social Network Visualisation

In order to graphically represent the network, Gephi was used. The Gephi visualisation as seen in Figure 16, displays all the actors or respondents which pertain to the study. The 107 respondents are coloured either green, orange, blue or mauve. These colours represent actors which are in either the non-entrepreneurial, the motivational or planning, the established phase or an unknown respectively. The mauve coloured nodes are terminal nodes which were nominated by one of the respondents. In other words, the mauve nodes are those nodes with which the respondents have a connection, but did not complete the survey. The black decimal numbers inside the nodes indicate that nodes TIO.

On examination of the visualisation, no clear pattern is observed and the TIO scores appear to be randomly distributed among the different colours or entrepreneurial activity phases within the network. This confirms the statistical results of the ANOVA, discussed above.



	Established Entrepreneur
	Motivational and Planning Entrepreneur
	Non-Entrepreneur
	Unknown

Figure 16 Network TIO and Entrepreneurial Groups

5.4.2 Research Question 2

H_0: no difference in the mean degree centrality score between the three phases of entrepreneurial activity.

H_1: There is a significant difference in the mean degree centrality score between at least one of the three phases of entrepreneurial activity.

Degree Centrality and Entrepreneurial Phases Statistical Comparison

The average or mean degree centrality between the three phases of entrepreneurial activity was analysed in SPSS and is presented below in Table 15. The descriptive analysis indicates the mean degree centrality score is the highest within the MP group at 11.63, and lowest in the NE group at 7.53. This indicates that actors in the non-entrepreneurial phase of activity appear to have the lowest number of connections or degree centrality. In contrast, the motivational and planning phase has the highest degree centrality. These results, however, may not be statistically significant and therefore statistical tests for difference were conducted.

In order to test if the differences in degree centrality are statistically significant, either a one-way ANOVA or a Welch's test must be performed. A one-way ANOVA can be performed if the assumption of homogeneity is satisfied and the Welch's test if homogeneity is violated. The test for homogeneity was conducted using the Levene's test, which indicated that the assumption of homogeneity was indeed violated as the Levene's test yielded a p-value of 0.008 (less than 0.05) as seen in Table 16 below (Pallant, 2007). This result indicates that equal variances cannot be assumed and therefore requires that the Welch test for equality of means be used instead of the one-way ANOVA.

The Welch test indicates that the mean degree centrality score differs significantly between at least one of the three phases of entrepreneurial activity, given a p-value of 0.016 (less than 0.05) and therefore significant at a 95% confidence interval. The alternate hypothesis is therefore accepted in favour of the null hypothesis. See Table 17 below. As a result of the homogeneity assumption being violated, a Games-Howell posthoc test was conducted in order to determine which group the difference in degree centrality is observed.

The results of the posthoc in Table 18 indicate that the difference in the mean degree centrality between the MP and the NE group is significant at a 95% confidence interval (p-value of 0.03).

There is no significant difference in the degree centrality between EE and the NE group (p-value 0.203) and the EE and the MP group (p-value 0.43). It can, therefore, be concluded that the difference in the number of connections or degree centrality observed in the motivational and planning phase of activity is significantly higher that of the non-entrepreneurial phase, i.e. those that are not entrepreneurial.

Table 15 Descriptive Statistics for Degree Centrality Between Entrepreneurial Groups

Descriptive Statistics

Degree Centrality

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
NE	43	7.53	3.686	.562	6.40	8.67	5	20
MP	24	11.63	7.155	1.461	8.60	14.65	5	30
EE	40	9.45	6.047	.956	7.52	11.38	5	29
Total	107	9.17	5.694	.550	8.08	10.26	5	30

Table 16 Levene's Test of Homogeneity of Variances

Test of Homogeneity of Variances

Degree Centrality

Levene Statistic	df1	df2	Sig.
5.061	2	104	.008

Table 17 Welch test for equality of Degree Centrality Means Between Entrepreneurial Groups

Robust Tests of Equality of Means

Degree Centrality

	Statistic[a]	df1	df2	Sig.
Welch	4.169	2	50.284	.021

[a]. Asymptotically F distributed.

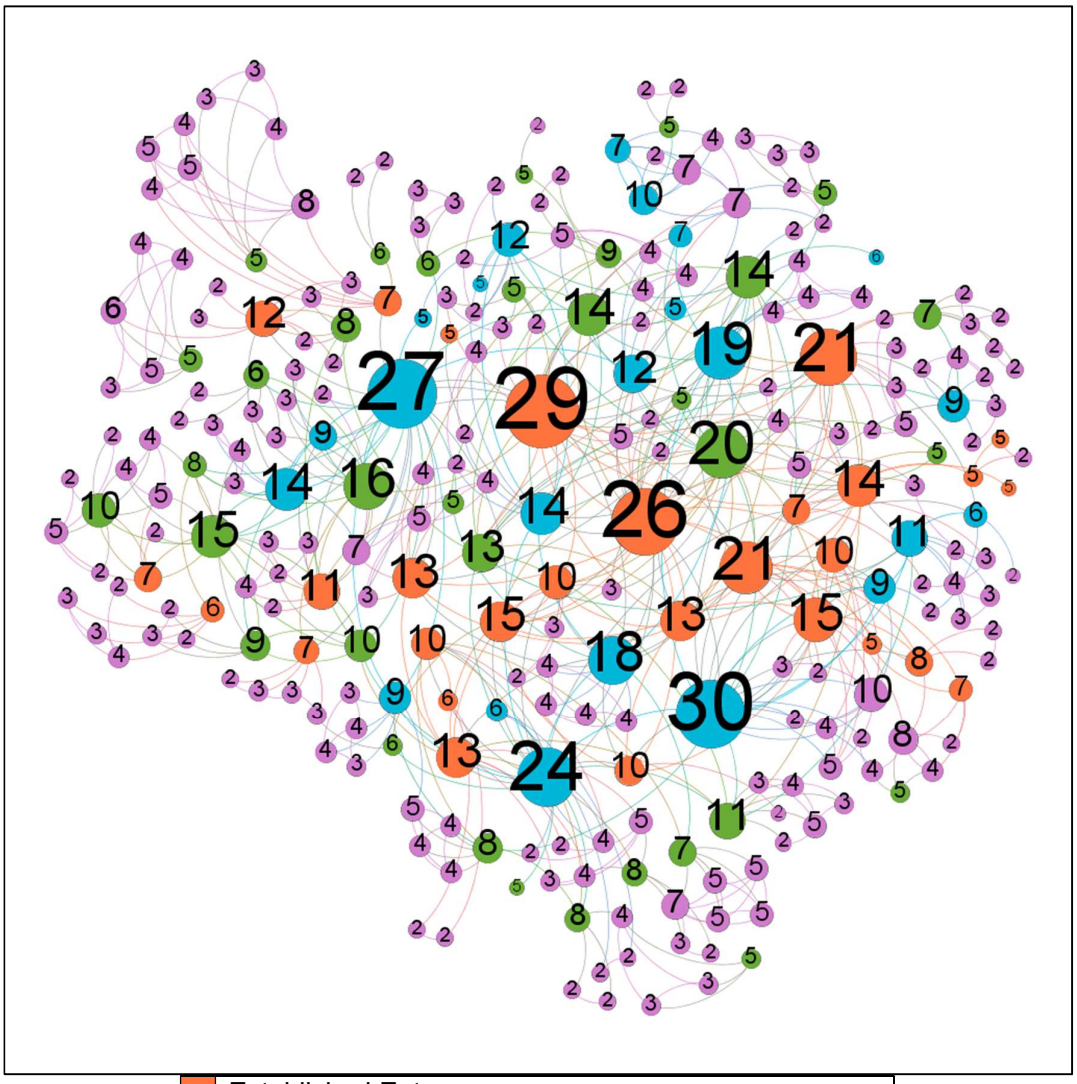
Table 18 Games-Howell Post-hoc Comparison Test for Mean Degree Centrality Between Entrepreneurial Groups

Multiple Comparisons							
Dependent Variable: Degree							
			Mean			95% Confidence Interval	
	(I) EA	(J) EA	Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Tukey HSD	NE	MP	-4.090*	1.408	.012	-7.44	-.74
		EE	-1.915	1.214	.260	-4.80	.97
	MP	NE	4.090*	1.408	.012	.74	7.44
		EE	2.175	1.426	.284	-1.22	5.57
	EE	NE	1.915	1.214	.260	-.97	4.80
		MP	-2.175	1.426	.284	-5.57	1.22
Games-Howell	NE	MP	-4.090*	1.565	.036	-7.95	-.23
		EE	-1.915	1.109	.203	-4.58	.75
	MP	NE	4.090*	1.565	.036	.23	7.95
		EE	2.175	1.746	.433	-2.06	6.41
	EE	NE	1.915	1.109	.203	-.75	4.58
		MP	-2.175	1.746	.433	-6.41	2.06
*. The mean difference is significant at the 0.05 level.							

Degree Centrality and Entrepreneurial Phases Social Network Visualisation

In order to graphically represent the network, Gephi was used. The Gephi visualisation as seen in Figure 17, displays all the actors or respondents which pertain to the study. The 107 respondents are coloured either green, orange, blue or mauve. These colours represent actors which are in the non-entrepreneurial activity, the motivational or planning, the established or unknown phase respectively. The mauve coloured nodes are terminal nodes, which would have been nominated by one of the respondents as discussed previously.

All nodes were then scaled according to the relative degree centrality, i.e. the higher the degree centrality, the larger the size of the node relative to the rest. On examination of the social network, it can be seen that the majority of large nodes come from the orange (EE) and blue (MP) groups. Interestingly, the blue nodes or the MP nodes are the fewest in number with highest relative sizes or degree centrality. This put simply, implies that those respondents which are either motivated to start a business or who are planning on starting a business, have the highest number of connections followed closely by the established entrepreneurs. These findings reinforce the statistical conclusions observed in the above Welch's test for equality of variances.



	Established Entrepreneur
	Motivational and Planning Entrepreneur
	Non-Entrepreneur
	Unknown

Figure 17 Degree Centrality, by Group

5.4.3 Research Question 3

H_0: no difference in the mean betweenness centrality score between the three phases of entrepreneurial activity.

H_1: There is a significant difference in the mean betweenness centrality score between at least one of the three phases of entrepreneurial activity.

Betweenness Centrality and Entrepreneurial Phases Statistical Comparison

The average or mean betweenness centrality between the three phases of entrepreneurial activity was analysed in SPSS and is presented below in Table 19. The descriptive analysis indicates the mean degree centrality score is the highest within the MP group, and lowest in the NE group. This indicates that actors in the non-entrepreneurial phase of activity appears to have the lowest betweenness centrality score. In contrast, the motivational and planning phase has the highest betweenness centrality. These results, however, may not be statistically significant and therefore statistical tests for difference were conducted.

In order to test if these differences in degree centrality are statistically significant, either a one-way ANOVA or a Welch's test must be performed. A one-way ANOVA can be performed if the assumption of homogeneity is satisfied and the Welch's test if homogeneity is violated. The test for homogeneity was conducted using the Levene's test which indicated that the assumption of homogeneity was indeed violated as the Levene's test yielded a p-value of 0.007 (less than 0.05) (Pallant, 2007) as seen in Table 20. This result shows that equal variances cannot be assumed and that the Welch test for equality of means is used instead of the one-way ANOVA, as the assumption of homogeneity which is required for an ANOVA, is violated.

The Welch test for equality of difference was conducted. The Welch test showed that equal variances in betweenness centrality cannot be ruled out, at a 95% confidence interval, given a P-value of 0.080. This result indicates that the null hypothesis cannot be rejected and therefore no posthoc test was necessary. See Table 21 below.

Table 19 Descriptive Statistics for Betweenness Centrality Between Entrepreneurial Groups

Descriptive Statistcis								
Betweenness Centrality								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
NE	43	6.19	5.856	.893	4.38	7.99	0	20
MP	24	15.25	21.852	4.460	6.02	24.48	0	100
EE	40	9.05	11.906	1.882	5.24	12.86	0	50
Total	107	9.29	13.466	1.302	6.71	11.87	0	100

Table 20 Levene's Test of Homogeneity of Variances

Test of Homogeneity of Variances			
Betweenness Centrality			
Levene Statistic	df1	df2	Sig.
5.243	2	104	.007

Table 21 Robust Tests of Equality of Mean Betweenness Centrality

Robust Tests of Equality of Means				
Betweenness Centrality				
	Statistic [a]	df1	df2	Sig.
Welch	2.679	2	45.090	.080
[a]. Asymptotically F distributed.				

Betweenness Centrality and Entrepreneurial Phases Social Network Visualisation

In order to graphically represent the network, Gephi was used. The Gephi visualisation as seen in Figure 18, displays all the actors or respondents which pertain to the study. The 107 respondents are coloured either green, orange, blue or mauve. These colours represent actors which are in the non-entrepreneurial activity, the motivational or planning, the established, or unknown phase respectively. The mauve coloured nodes are terminal nodes which would have been nominated by one of the respondents, as discussed previously.

All nodes were then scaled according to the relative betweenness centrality, i.e. the higher the betweeness centrality, the larger the size of the node relative to the rest. On examination of the image it would seem that the blue or MP nodes and the EE or orange nodes are larger than the green or NE nodes. It is also interesting to note that some of the mauve nodes are

also large. No conclusions, however, can be drawn relating to the mauve nodes, as no information relating to their entrepreneurial activity was collected. The figure suggests that Established entrepreneurs (EE) and those that are either motivated to start or are planning to a business (MP) have a higher betweenness centrality when compared to non-entrepreneurs (NE). Additionally, the nodes with high betweenness centrality are relatively few when compared to the majority. In other words, very few nodes are large and enjoy the positional advantage with respect to betweenness centrality.

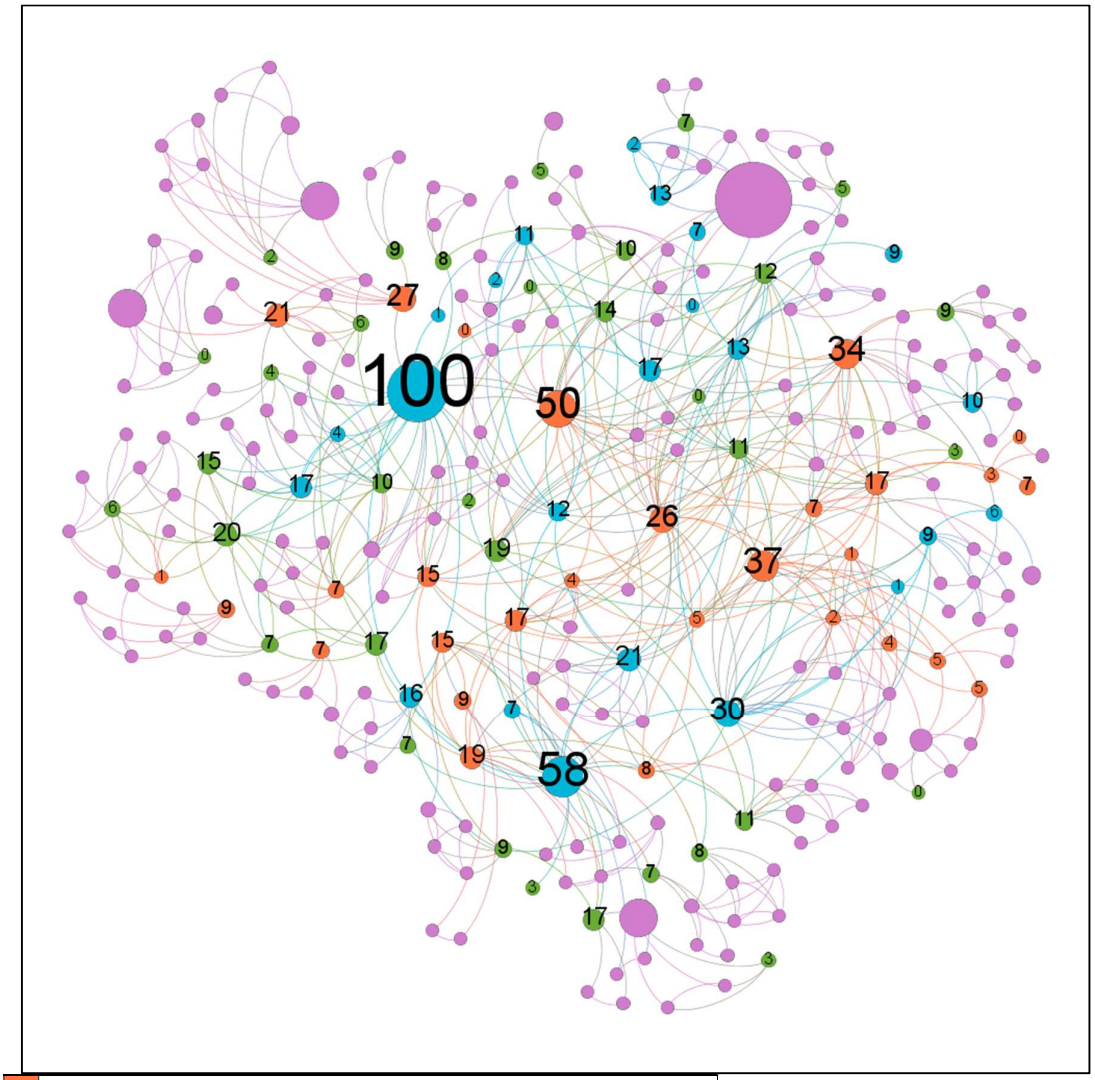


Figure 18 Betweenness Centrality, by Group

6 CHAPTER 6: FINDINGS AND DUSCUSSION

6.1 Introduction

This section will discuss how the behavioural orientation (tertius iungens orientation) and ego-centric structures concerning both degree and betweenness centrality differ in each of the three phases of entrepreneurial activity. The results are interpreted within the context of the Johannesburg Jewish ethnic network, characterised by high levels of cohesiveness and homogenous culture and values. Following on from the results, the implications of this study on business, the contributions it makes to existing research, suggestions for future research and a discussion on its limitations will follow.

6.2 Tertius Iungens (TIO) and Entrepreneurial Activity

The study results indicated that a tertius iungens (TIO) is a preferred orientation amongst the sampled respondents. A high TIO score as recorded in the study shows that actors are likely to connect unconnected actors and forego their positional power. The latter could have otherwise been used to broker deals and control information flow between the disconnected actors. Additionally, the results of the one-way ANOVA demonstrate that there is no significant difference in the TIO scores between the different phases of entrepreneurial activity. These results show that the majority of actors within the Johannesburg Jewish ethnic network are more inclined to connect and introduce disconnected actors without the expectation of personal benefit, that is having a tertius iungens orientation. Also, the last concept is visually depicted in Figure 16 revealing that no pattern with regards to colour (activity phase) and TIO scores appears, further reinforcing the fact that TIO does not differ by entrepreneurial phase. Thus, concluding that there are no significant differences in the TIO score between the three entrepreneurial groups, and hence the null hypothesis which states equal mean scores between phases, can't be rejected.

Interestingly, the absence of a significant difference between the activity phases demonstrates that actors who are not entrepreneurial are equally likely to connect unconnected actors, as are actors who are established entrepreneurs. These results show that TIO and the phases of business activity are not necessarily related. Interestingly, Ebbers (2014) finds a positive relationship between TIO and newly established enterprise growth. Similarly, Obstfeld (2005) finds a positive relationship between innovation and TIO. Furthermore, the theoretical contributions of Ebbers (2014) and Obstfeld (2005) would possibly be one explanation as to

why the Johannesburg Jewish community has significantly high levels of entrepreneurial activity. If TIO is indeed responsible for elevated levels of innovation and enterprise growth and the majority of actors within the Jewish network have elevated levels of TIO, irrespective of their entrepreneurial activity, then it would stand to reason that this network would exhibit high levels of business activity.

Moreover, study finds that entrepreneurs are unlikely to exploit information asymmetry to gain a competitive advantage within their network. In fact, they would rather reduce the information gaps and promote connections and network closure within their community, which is in direct contrast to that of Burt (1992, 2015; 2000) and Granovetter (1973, 2005).

Burt (1992, 2015; 2000) and Granovetter (1973, 2005) argue against connecting of disconnected groups and maintain that this leads to reduced brokerage opportunities and reduced access to unique resources, necessary for entrepreneurial activity. Additionally, it is argued that entrepreneurs are likely to maintain separation and exploit the information asymmetry through brokerage strategies (R. Burt, 1992; Ozdemir et al., 2016). Moreover, Ozdemir et al. (2016) does, in fact, concede that brokerage or a tertius gaudens orientation (TGO) requires significantly more time and energy than a tertius iungens orientation and therefore advocate a mixed strategy. This argument is at odds with the findings in this study and those of Ebbers (2014) and Obstfeld (2005).

This resultant high TIO scores for all phases of entrepreneurial activity is best explained, given that the study was undertaken within an ethnic network. The Jewish community for all intent and purpose can be considered highly cohesive and dense. Networks which are comprised of groups which share a common identity or ethnicity will share a common culture and as a result are governed by a set of norms and values (Portes & Sensenbrenner, 1993). This collective identity actively promotes normative behaviour and actively discourages action which is considered detrimental to the network as a whole (Tan et al., 2015). Brokerage or TGO is often associated with the exploitation or the achievement of one's entrepreneurial advantage at the expense others and therefore would not be encouraged within such a cohesive network. Moreover, it is possible that TIO is also considered a cultural norm and therefore actors are not only punished for having a TGO but are simultaneously rewarded for having a TIO. Gedajlovic et al. (2013) support this argument as they conclude that cultural orientation is a requirement for promoting mutual trust, norms and obligations within the network which all oppose a TGO and encourage a TIO. Also, a TIO actively supports network closure and

thereby reinforces the normative behaviour (Latora et al., 2013), which in effect creates a self-reinforcing cycle.

In conclusion, network closure causes actors to be structurally embedded within these networks which results in pervasive enforceable trust (Gedajlovic et al., 2013; Portes & Sensenbrenner, 1993). Enforceable trust promotes efficient economic transactions and normative behaviour (Uzzi, 1997). This phenomenon ultimately leads to the resource acquisition (Ozdemir et al., 2016) necessary for entrepreneurial activity, which arguably is relatively high in the Jewish ethnic network. These key findings and their relations to the previous literature are summarised in the figure below.

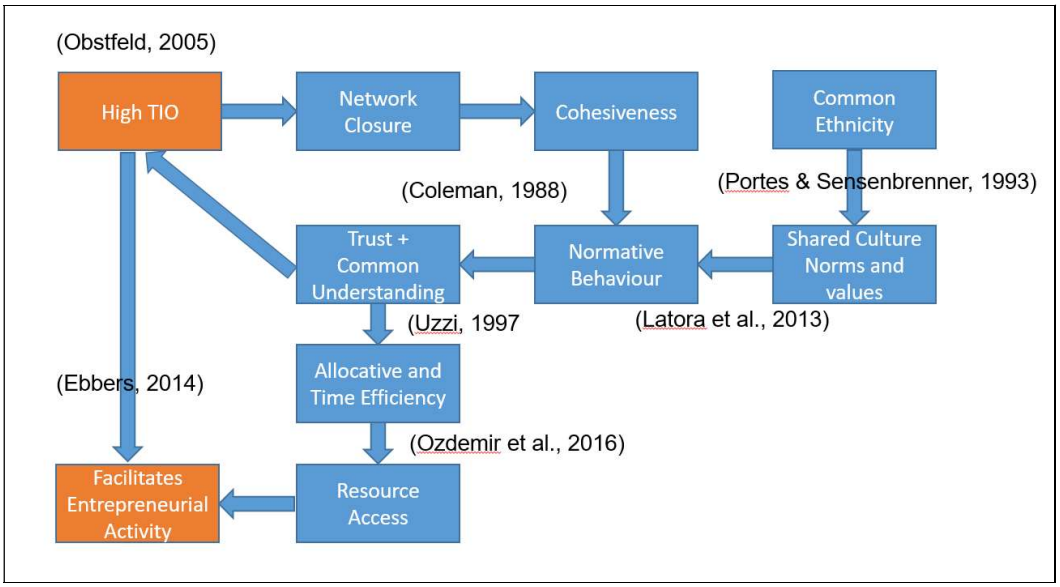


Figure 19 The relationship between TIO and Entrepreneurial Activity in the Context of an Ethnic Network

Lastly, networks in which the majority of its actors have a tertius iungens orientation are likely to be structurally cohesive and dense. The high density would indicate that many of the actors are indeed connected to one another. This phenomenon is discussed in the followed section.

6.3 Degree Centrality and Entrepreneurial Activity

This study shows that the difference in the mean degree centrality between actors at various phases of entrepreneurial activity to be small. The scores, however, need to be interpreted with caution as there are vast differences between actors with the least number of connections and those with the highest number of connections. To further elaborate, some actors have a relatively higher degree centrality when compared to others and therefore are said to be well

connected. Interestingly according to the Welch's test for equality of means and the Games-Howell posthoc test, the overall differences between the degree centrality for actors is highest in the planning and motivation (MP) phase of entrepreneurial activity. The null hypothesis therefore is rejected in favour of the alternate hypothesis.

This statistical finding is also visually verified in the social network depicted in Figure 17. The network shows that the majority of enlarged nodes (high degree centrality) belong to both the MP and EE phases. The MP phase, however, is almost half that of the EE phase and therefore relatively speaking the MP phase has a disproportionately high number of large nodes, indicating that actors within this phase of activity tend to have a greater number of connections and hence a high degree centrality. Greve and Salaff (2003) and Arregle et al. (2015) support this finding and conclude that an entrepreneur will vary their number of connections or degree centrality in accordance their phase of entrepreneurial activity. Arregle et al. (2015) and Greve and Salaff (2003) conclude that entrepreneurs who are starting a business or in the MP phase as described in this study, will increase their degree centrality to gain access to resources. Semrau and Werner (2014) also support this finding and explain that as the number of ‘degrees' or connections an individual has increases so do the number resources available to the entrepreneur.

These results show that entrepreneurs in established business have more connections when compared to non-entrepreneurs, but less than actors in the planning and motivation phase. In other words, entrepreneurs, in general, will tend to have more connections than non-entrepreneurs. These findings suggest that entrepreneurs within an ethnic network behave similarly to entrepreneurs in non-ethnic networks with regards to increasing their number of connections when starting a business as opposed to when their business is established. Furthermore, non-entrepreneurs tend to have fewer connections and hence have a lower degree centrality. It must, however, be noted that high degree centrality does not necessarily cause a network to be cohesive. In fact, the research does not quantify the difference between a cohesive network and a sparse network and therefore based on degree centrality alone the network cannot be classified as either sparse or cohesive. The context, however, provides a good idea as to whether or not the network is cohesive.

Moreover, this study takes place within a geographically bound ethnic enclave as described by Zhou (2014) and therefore the network under study can be classified as a cohesive network. Interestingly, despite the network under study being cohesive and having a high number of connections, there still appears to be a difference in degree centrality between

actors who are engaging in entrepreneurial activity and those who are not. Specifically, actors in the process of creating new business ventures and those continuously looking for entrepreneurial opportunities do indeed have a higher number of connections or larger degree centrality. It can, therefore, be concluded that the ethnic network described in this study, seems to behave similarly with regards to degree centrality when compared to other non-ethnic networks (Arregle et al., 2015; Greve & Salaff, 2003; Semrau & Werner, 2014).

Furthermore, the entrepreneurs who have a high degree centrality are likely to have access many resources as described by Semrau (2014). If however, the other actors to which these entrepreneurs are connected are also well connected, as is the case in this study, then the entrepreneurs will have access to fewer structural holes and as a result will have limited access to new information (R. Burt, 1992, 2015; R. S. Burt, 2000). The presence of structural holes, as available to the network actors is described by that actor's betweenness centrality which is discussed next.

6.4 Betweenness Centrality and Entrepreneurial Activity

A high betweenness centrality for an ego indicates that the ego is likely to have access to structural holes (R. Burt, 2015) and as a result, in a position to control the flow of information between disconnected parts of the network and exploit unique opportunities. Burt (1992), Ozdemir et al. (2016) and many other researchers argue that actors spanning structural holes are at a competitive advantage when compared to other network actors. These actors have the first sight of entrepreneurial opportunities which they can control and influence for personal gain.

The distribution of betweenness centrality, a key indicator of the presence of structural holes, is relatively narrow as seen in the frequency distribution shown in Figure 15 in the previous chapter. Approximately 80% of all respondents have a betweenness centrality score below 15%. These results mean that very few actors within the sampled network will enjoy a competitive advantage relative to others. Also, the betweenness centrality did not differ significantly between the phases of entrepreneurial activity as confirmed by Welch's test for equality of means and therefore the null hypothesis, which assumes equal variances between phases, cannot be rejected.

Likewise, these results are also visually recognised in the social network diagram in Figure 18, which scales the nodes size by their relative betweenness centrality. This socio-gram

shows few enlarged nodes which vary randomly by the entrepreneurial group. It is also interesting to note that there are also very few mauve nodes (unknown entrepreneurial group) with relatively high levels of betweenness centrality which indicates that very few actors in the entire network are in a position to exercise brokerage and exploit their position for personal gain.

These findings demonstrate that the sampled actors, irrespective of entrepreneurial phase, do not have significantly different betweenness centrality scores and therefore do not have access to any more structural holes than others. A similar study by Liao and Welsch (2005) conducted between non-entrepreneurs and nascent entrepreneurs also confirmed that the differences in social structure between the two phases were not significant. These findings are supported by the fact that cohesive networks bound by common ethnicity are likely to punish individuals who exploit their structural position for personal gain at the expense of the network as a whole (Latora et al., 2013; Tan et al., 2015). Additionally, as shown in the first research question, the majority of network actors have an above average level of TIO and therefore actively encourage network closure. Network closure reduces the likelihood of structural holes and consequently promote a more even distribution of betweenness centrality (R. S. Burt, 2000).

Interestingly, much of the current literature would suggest that very few unique opportunities and resources would be available to actors within the studied network, given the low betweenness centrality and few structural holes. Indeed, Burt (2000) argues that structural holes, indicated by a high betweenness centrality, lead to business performance and growth. In contrast, low differences in betweenness centrality imply that many of the egos' alters are connected to each other and therefore egos have many redundant connections, from an information and resource perspective (R. Burt, 1992; Granovetter, 1973). In other words, when alters know each other, they are all likely to have the same information resulting in no competitive advantage for any actors within the network.

It then begs the question as to how actors within a cohesive network with small differences in betweenness centrality access unique and novel entrepreneurial opportunities? This issue is more pronounced and exciting given the fact that the majority of respondents within this network are truly entrepreneurial. The descriptive statistics relating to business activity indicate that over 60% of all respondents either have their own business, are looking to start their own business or are currently in the process of starting their own business, see Table 9 above.

This apparent contradiction can most likely be explained, by the fact that many members of the ethnic network operate in both the ethnic economy and the general economy and therefore act as “Middlemen minorities” (Zhou, 2014, p. 1041). In other words, actors may work in the general economy and live in the ethnic enclave and are therefore structurally embedded in both the general and enclave economy. These duel networks allow entrepreneurs to access different resources and novel opportunities external to the enclave, and simultaneously allowing them to access human and financial capital within their enclave. Indeed, this is analogous to transnational entrepreneurs who access resources from both within their host countries and from their countries of origin.

Bagwell (2014) argues that ethnic entrepreneurs operating between their countries of origin (ethnic enclaves) and their host societies (external to the enclave) earn "diversity dividends" (pg.329) which offer ethnic members a competitive advantage from an entrepreneurial perspective. It must be noted that the so-called "diversity dividends" are not useful for business activity within the enclaves as a result of few structural holes. However, they are very useful for entrepreneurial activity within the general society or external to the enclave. Furthermore, the entrepreneurial activity observed within the South African Jewish community, generally does not service the ethnic enclave, nor are the businesses embedded within the enclaves. In fact, the overwhelming majority of Jewish entrepreneurs live within the ethnic enclaves, but embed their businesses within the general economy. The population of the enclave is too small to establish viable enclave businesses and therefore enclave enterprises are few.

6.5 Summary of Findings

In conclusion, the tertius iungens orientation (TIO) for this sample does not differ significantly by entrepreneurial phase and is above average. The above average levels of TIO indicate that the preferred behavioural orientation of actors within the Johannesburg Jewish community is that of connecting people as opposed to exploiting their separation or TGO. Furthermore, this study shows that actors within the motivation and planning phase of entrepreneurial activity have more connections and hence a higher level of degree centrality. This logic implies that entrepreneurs thinking of starting a business or planning to start one, actively increase their connections to improve the acquisition of start-up resources.

Lastly, the results indicate that there are no significant differences in betweenness centrality across the various phases of entrepreneurial activity. The small differences in betweenness centrality suggest that there are few structural holes within the ethnic network and as a result,

network actors do not have access to novel opportunities and resources within the network. These entrepreneurs are rather likely to access entrepreneurial opportunities externally to the enclave.

These findings indicate that while actors within the ethnic networks encourage social cohesion and build embedded trust within their networks through the mechanisms of a TIO, they are unlikely to access structural holes within their network as a result. Indeed, these findings explain how ethnic networks promote economic efficiency through the mechanism of embedded trust and how entrepreneurs increase their number of connections when planning to start a business. The findings do not, however, explain entrepreneurial opportunities relating to novel resources and ideas borne from within the ethnic network itself. The high levels of entrepreneurship, therefore, cannot be explained by exclusively studying the ethnic network in isolation, but should rather be explained by considering the ethnic network with the general economy.

7 CHAPTER 7: CONCLUSION

7.1 Principal findings

The three primary aims of this research as set out in chapter one have been achieved. 1) The study successfully quantified the networks social structure in the form of betweeness centrality and degree centrality at each of the three phases of entrepreneurial activity. 2) The study was able measure the ethnic actors networking orientation across the phases of entrepreneurial activity. 3) This research has indeed provided a base on which future researcher can build, and conduct similar comparative studies based on different ethnic networks. Moreover, this study is unique in that it obtains empirical data relating to a Jewish ethnic network which is considered to be highly entrepreneurial. In contrast, much of the current literature does not explicitly focus on ethnicity and no known studies of this nature have been exclusively conducted within the South African Jewish ethnic group.

Entrepreneurship and social network literature have previously centred on the debate around whether or not the preservation of unconnected actors (structural holes) provides more entrepreneurial benefit than the connecting of unconnected actors (network closure). Indeed, network closure and structural holes are related to the networking orientation of tertius gaudens (maintaining separation and preserving the structural hole) and tertius iungens orientation (connecting unconnected actors and bridging the structural hole) respectively. Moreover, the current literature neglects the role common ethnicity and network cohesiveness plays in shaping network structure and behavioural orientation.

The overwhelming consensus relating to the debate argues that structural holes are a vital source of unique resources and opportunities from which entrepreneurs are likely to benefit, whereas network closure or the connecting of people and bridging of structural holes has the exact opposite effect. Network closure, in fact has been shown to reduce the likelihood of identifying unique resources and opportunities, apart from the studies of Obstfeld (2005) and Ebbers (2014). Furthermore, structural holes are abundant in sparsely connected networks and correlate with unique opportunities which entrepreneurs can exploit (Latora et al., 2013; Semrau & Werner, 2014; Tan et al., 2015).

These opportunities arise as a result of the entrepreneur's ability to broker deals and share information and resources between otherwise unconnected actors. These brokered deals are often associated with exploitation. Entrepreneurs who span these structural holes use information asymmetry for their entrepreneurial advantage. This behaviour is described in the

literature as a tertius gaudens networking orientation or TGO and is said to be the preferred orientation for entrepreneurs. In contrast, this study was uniquely conducted within the context of a culturally homogenous ethnic network and therefore its findings, which are somewhat unexpected, contribute to the cultural dimension of social networks.

This study has three primary findings: 1) The majority of actors throughout all the phases of entrepreneurial activity, both entrepreneurs and non-entrepreneurs alike, exhibit a TIO and not a TGO as one would have expected. In other words, actors which form part of the Jewish ethnic network are likely to connect unconnected actors, forming network closure, as opposed to actively maintaining and exploiting their separation for person entrepreneurial benefit. We, therefore, cannot reject the null hypothesis which states that there are equal variances in the mean TIO score between the phases of entrepreneurial activity.

2) Entrepreneurs who are motivated to start or who are planning to start a business are likely to have denser networks than those who have an established business or those who are not entrepreneurial. The null hypothesis is therefore rejected in favour of the alternate hypothesis, which states that the mean degree centrality score differ between the phases of entrepreneurial activity.

3) Ethnic networks have few structural holes, as measured by betweenness centrality. In other words, actors within the Jewish social network are not in a position to broker deals and exhibit a TGO as they do not have access to structural holes. Actors across the various phases of entrepreneurial activity are well connected and therefore there are few actors which are able to control and exploit their positional advantage (spanning structural holes). The null hypothesis which states that there is no difference in betweenness centrality between the phases of entrepreneurial activity, therefore cannot be rejected.

The first and third findings seem to present the reader with a paradox. Despite the fact that the Johannesburg Jewish community is considered highly entrepreneurial, the majority of its actors exhibit a TIO and not a TGO. Likewise, few structural holes and relatively small differences in betweenness centrality were found in this study, which would as per the literature also suggest low levels of entrepreneurial activity. Indeed, the literature would have argued that small differences in betweenness centrality and a TIO would in fact produce low levels of entrepreneurial activity, and not the high levels measured in the Johannesburg Jewish community.

These contradictory findings are reconcilable as the literature argues that cohesive networks, which often result from shared identity and common culture prevent TGO (Tan et al., 2015) and actors from attaining positional advantage within their networks, given their exploitative nature. The TGO is therefore discouraged while TIO is encouraged. Furthermore, it is probable that if the study were not exclusively conducted within the ethnic enclave, but rather within the context of the broader society, there would have been more structural holes and high differences in betweenness centrality. In other words, ethnic entrepreneurs may indeed span structural holes between actors externally to the ethnic network and use these holes to exploit opportunities.

Additionally, current literature also considers the advantages of cohesive networks which are said to be highly effective in promoting embedded trust (Ozdemir et al., 2016; Tan et al., 2015) and hence improve economic efficiency for contracting (Uzzi, 1997) and sharing of resources such as human and financial capital. Cohesive networks, however, are considered to be ineffective in promoting entrepreneurial opportunities, as a result of fewer structural holes (R. Burt, 1992). The literature also examines the role of shared identity and cohesiveness in their ability to actively discourage TGO behaviour and promote network closure which in turn increases network cohesiveness (Coleman, 1988; Ozdemir et al., 2016; Portes & Sensenbrenner, 1993).

7.2 Contributions to Current Literature

This research has contributed to the current literature in three primary ways. Firstly, the study is the first of its kind to be conducted within an ethnic network and its results and methodology serve as a baseline for future comparative studies between ethnic networks. Secondly, this study is unique in that it combines ethnicity, structural characteristics of social networks, behavioural elements and empirically tests traditional ideas concerning entrepreneurship within the context of an ethnic network. In particular, this study has demonstrated that actors within an ethnic network have a high TIO, irrespective of their entrepreneurial activity. This finding contributes to a better understanding of how TIO vs. TGO may indeed vary with cultural or ethnic context. Furthermore, actors do not exhibit high differences in their betweeness centrality and as a consequence do not have access to structural holes. This finding enhances the literature through an improved understanding of how ethnic boundaries in SNA, may indeed impact the results and that structural holes may be a function of how the SNA boundary is constructed.

7.3 Implications for Management

The findings in this study are relevant from an organisational culture perspective. It was said by Peter Drucker that "Culture eats strategy for breakfast" meaning that culture is paramount in driving organisational performance. Organisations are cohesive and dense from a network structure perspective and therefore can resemble the social structures of ethnic enclaves. What is more, organisations can create common shared values and a strong organisational culture which when combined with their cohesive structures would promote TIO behaviour, as is the case in ethnic networks. TIO has also been shown by both Ebbers (2014) and Obstfeld (2005) to promote revenue growth and innovation respectively, which are both key drivers of business performance. Additionally, a strong organisational culture and the resulting set of common shared values or cognitive capital (Gedajlovic et al., 2013) promotes embedded trust, which is enforceable (Nahapiet & Ghoshal, 1998; Portes & Sensenbrenner, 1993). This trust acts a form of organisational social capital and promotes normative behaviour which is beneficial to the organisation and ensures all members are aligned with its corporate values.

Thus, in conclusion, organisations can learn from ethnic networks and mimic both their behavioural and structural characteristics. As is the case with ethnic networks, organisations can promote embedded trust by encouraging the formation of shared cognitive capital and a TIO networking orientation amongst all employees. TIO will ultimately lead to the formation of a cohesive network structure and resultant social capital which in turn reinforces embedded trust. Embedded trust ensures that all organisational employees share and collaborate with each other which promotes innovation and efficiency.

7.4 Limitations

This research has several limitations which consequently affect the applicability of the findings and results. These limitations are discussed within three broad categories:(1) data collection method, (2) sample size, (3) subjectivity and key assumptions.

7.4.1 Data Collection Method

The survey method of collecting ego centric data as discussed previously made use of the snowball sampling method. This method, despite attempts to mitigate its shortcomings as described above, led to the collection of a disproportionate number of respondents to which the researcher is connected in one way or another. Additionally, many of the respondents did

not “snowball” the survey and if they did, many did not complete the survey. As a consequence, the generalisability of the results to the greater Johannesburg Jewish ethnic population may be limited.

Furthermore, respondents were only asked to list five persons to whom they were related and additionally many refused to list any relationships citing privacy concerns. This limitation with respect to the number of relations the respondents has would likely lead to artificially low levels of egocentric network centrality (betweenness and degree centrality). This resulted in individual respondents having fewer mutual connections and hence understated levels of egocentric network centrality. These results may have skewed the network statistics for individuals at the various stages of entrepreneurial activity which may impact the overall findings.

7.4.2 Sample Size

The final sample size of the sample was 107 which, when divided into three groups of entrepreneurial phase resulted in relatively small groups and thus reduce the confidence which can be placed on the final results from a generalisability perspective. Furthermore, it was not possible to ascertain the correct statistical sample size, given that the total size of the relevant population (of working age) within the Johannesburg Jewish community could not be determined.

7.4.3 Subjectivity and Key Assumptions

In order to ensure that the final network was as complete and as accurate a representation of the 107 respondents network as possible, a manual intervention was required. This intervention asked of three independent persons, one of which was the author, to connect any missing connections observed in the network. These three persons are all part of the population, however, their interpretation of what is deemed a relevant relationship between unconnected persons is often subjective and it is this subjectivity which may have resulted in the creation of some unnatural or irrelevant relationships. This impact may not be severe, as three independent persons were used to triangulate the information, but nonetheless is a limitation of the study. Lastly, the boundary used to define the sampled network may have in fact been artificial and would have excluded many actors which in fact operate both within the ethnic and general business networks simultaneously. This boundary definition may have negatively impacted the results.

7.5 Suggestions for Future Research

Future researchers would be advised to replicate this research within other ethnic communities to allow for comparative studies of network structure and networking behaviour. This future comparative research would improve the generalisability and relevance of the findings concerning ethnic networks as a general concept. Secondly, the role of the distinct network cultures, as opposed to ethnic homogeneity as a whole, needs to be better understood. Some cultures may influence entrepreneurial activity more than others. A better understanding can be achieved by comparing networking orientation and structure of different ethnicities. These studies would significantly enhance the current academic literature regarding whether different culture plays a greater role in determining structure and networking behaviour as opposed to common ethnicity. Perhaps, certain cultures despite having homogeneous cohesive networks may indeed have different networking orientations and social structures.

In addition, the interface between the ethnic network and the greater non-ethnic network could also be studied, by expanding the research boundary. Extending the boundary would allow for a better understanding of how entrepreneurs within the ethnic networks leverage resources and relationships externally to the ethnic enclaves. In other words, ethnic entrepreneurs may indeed maintain structural holes across external to the ethnic boundary through a tertius gaudens orientation while simultaneously promoting network closure by exhibiting a tertius iungens orientation within the ethnic network.

Lastly, this research would have benefitted from a mixed-methodology. A qualitative aspect would have added context to the quantitative findings and would have provided for a complete understanding of how the ethnic culture contributes to networking behaviour and social structure. The role of culture also influences the entrepreneurial orientation and this dimension also needs to be considered when attempting to understand entrepreneurial activity within the context of social networks.

7.6 Concluding Remarks

The South African economy desperately needs jobs and these must come from entrepreneurs. The South African government and civil society can no longer rely on corporate South Africa to create jobs and therefore must find ways to promote an entrepreneurial economy. South Africa needs to learn from its entrepreneurial ethnic communities and use its learning to shape policies and attitudes. This study will hopefully inspire future research into the role ethnic networks play in the promotion of entrepreneurial activity.

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APPENDIX 1 – ELECTRONIC SURVEY INSTRUMENT

Figure 20 Pilot Study Completion Time and Statistics

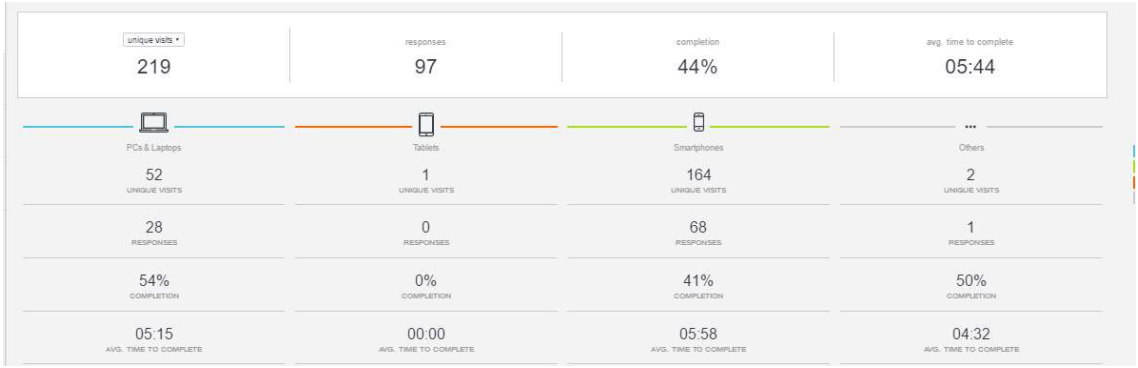

Figure 21 Primary Survey Completion Time and Statistics

Figure 22 Electroni Survey

9	Please rate the following statements on a scale of 1 - 7.	
	a	* I often try and introduce people to each other, who might have common business-related interests.
	b	* I often try describe business opportunities in a way that will appeal to people with diverse interests.
	c	* I often see business opportunities for business collaboration between people.
	d	* I often try to point out the common ground between people who have different perspectives on business related issues.
	e	* I often try to connect people if I think that they would benefit by being acquainted (from a business perspective).
	f	* I often try connect people who are dealing with similar business related issues.
11	What do you mainly discuss with the people you listed above? Please select appropriate choices.	
	a	What would you mainly discuss with {{answer_26882172}} ?
	b	What would you mainly discuss with {{answer_26882173}} ?
	c	What would you mainly discuss with {{answer_26882174}} ?
	d	What would you mainly discuss with {{answer_26882175}} ?
	e	What would you mainly discuss with {{answer_26882176}} ?
12	Please categorise your relationship with each of the people you named above?	
	a	* Please describe the option that best describes your relationship with {{answer_26882172}} ?
	b	* Please describe the option that best describes your relationship with {{answer_26882173}} ?
	c	* Please describe the option that best describes your relationship with {{answer_26882174}} ?
	d	Please describe the option that best describes your relationship with {{answer_26882175}} ?
	e	Please describe the option that best describes your relationship with {{answer_26882176}} ?

Figure 23 Electronic Survey

APPENDIX 2 – DATA PREPARATION

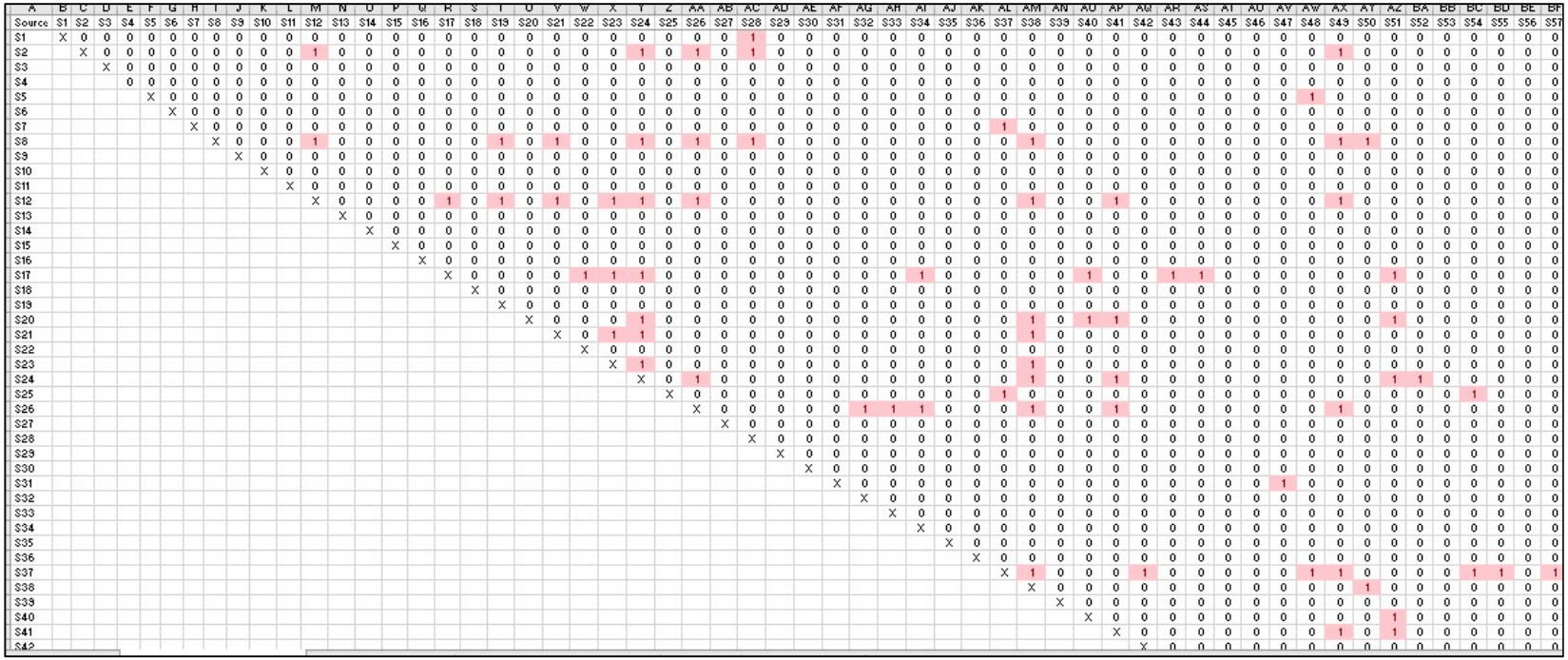

Figure 24 Adjacency Matrix to Define Relationships

Source	Target	Type
1	87	Undirected
1	170	Undirected
1	513	Undirected
2	9	Undirected
2	97	Undirected
2	177	Undirected
2	261	Undirected
2	340	Undirected
2	475	Undirected
3	91	Undirected
3	172	Undirected
4	32	Undirected

Figure 25 Example of Edge List for Import into GEPHI

Label	ID	EA	Education	Occupation	TIO	Age
1	481	1	3	3	4.33	3
2	112	1	3	2	7	2
3	325	1	3	3	4.83	2
4	488	1	1	3	5.83	3
5	492	1	3	3	5.67	3
6	429	1	3	2	2.33	3
7	472	1	3	3	5.17	1
8	483	1	3	0	4.67	2
9	2	1	3	0	6.83	2
10	484	1	3	3	6	2
11	496	1	3	2	4	2
12	24	1	3	2	5.5	1
13	509	1	1	3	6	3
14	79	1	3	3	5.5	3
15	68	1	2	0	6	2
16	113	1	3	2	7	2
17	418	1	3	0	5.83	1
18	156	1	3	3	4.5	2
19	145	1	3	2	4	2
20	178	1	1	0	6	3
21	189	1	3	2	6.17	2
22	200	1	3	2	5.17	2

Figure 26 Example of Node List for Import into GEPHI

id	label	EA	Education	occupation	TIO	Age	Degree	betweenesscentrality
90	[redacted]	2	3	2	5.17	2	27	3316.17
505	[redacted]	2	3	3	5.83	2	24	1928.73
486	[redacted]	3	3	3	5.17	3	29	1649.62
504	[redacted]	3	2	3	4.33	3	21	1223.82
490	[redacted]	3	3	1	7	3	21	1127.47
510	[redacted]	2	3	1	7	3	30	982.99
475	[redacted]	3	1	1	5.17	3	7	882.42
487	[redacted]	3	1	3	7	3	26	876.84
243	[redacted]	3	3	2	5	2	12	696.1
337	[redacted]	2	3	1	5	2	18	685
441	[redacted]	1	3	3	4.17	2	15	647.92
134	[redacted]	3	2	0	4.33	3	13	637.15

Figure 27 Example of Gephi Export and SPSS Import

Table 22 Sample of Data Exported from Gephi to be Used in SPSS

id	EA	education	occupation	TIO	age	degree	closeness centrality	betweeness centrality
481	1	3	3	4.33	3	14	0.307195572	2679.04568
112	1	3	2	7	2	9	0.251891074	1523.223353
325	1	3	3	4.83	2	5	0.215673575	1319
488	1	1	3	5.83	3	20	0.315939279	2909.334658
492	1	3	3	5.67	3	5	0	0
429	1	3	2	2.33	3	5	0.164607019	0.666666667
472	1	3	3	5.17	1	5	0	0
483	1	3	0	4.67	2	5	0.185102835	1321
2	1	3	0	6.83	2	6	0.213633597	283.11
484	1	3	3	6	2	3	0.282922685	0

APPENDIX 3 – OUTPUT FROM SPSS

Table 23 TIO Descriptive Statistics Frequency Plot

TIO

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	.9	.9	.9
	1.67	1	.9	.9	1.9
	2.33	2	1.9	1.9	3.7
	3.17	1	.9	.9	4.7
	3.67	2	1.9	1.9	6.5
	3.83	1	.9	.9	7.5
	4.00	5	4.7	4.7	12.1
	4.17	4	3.7	3.7	15.9
	4.33	5	4.7	4.7	20.6
	4.50	3	2.8	2.8	23.4
	4.67	4	3.7	3.7	27.1
	4.83	6	5.6	5.6	32.7
	5.00	7	6.5	6.5	39.3
	5.17	14	13.1	13.1	52.3
	5.33	4	3.7	3.7	56.1
	5.50	6	5.6	5.6	61.7
	5.67	3	2.8	2.8	64.5
	5.83	5	4.7	4.7	69.2
	6.00	8	7.5	7.5	76.6
	6.17	3	2.8	2.8	79.4
	6.33	4	3.7	3.7	83.2
	6.50	1	.9	.9	84.1
	6.67	3	2.8	2.8	86.9
	6.83	2	1.9	1.9	88.8
	7.00	12	11.2	11.2	100.0
	Total	107	100.0	100.0	

Table 24 Degree Centrality Descriptive Statistics Frequency Plot

Degree					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5	41	38.3	38.3	38.3
	6	9	8.4	8.4	46.7
	7	9	8.4	8.4	55.1
	8	6	5.6	5.6	60.7
	9	6	5.6	5.6	66.4
	10	7	6.5	6.5	72.9
	11	3	2.8	2.8	75.7
	12	3	2.8	2.8	78.5
	13	4	3.7	3.7	82.2
	14	5	4.7	4.7	86.9
	15	3	2.8	2.8	89.7
	16	1	.9	.9	90.7
	18	1	.9	.9	91.6
	19	1	.9	.9	92.5
	20	1	.9	.9	93.5
	21	2	1.9	1.9	95.3
	24	1	.9	.9	96.3
	26	1	.9	.9	97.2
	27	1	.9	.9	98.1
	29	1	.9	.9	99.1
	30	1	.9	.9	100.0
	Total	107	100.0	100.0	

Table 25 Betweenness Centrality Descriptive Statistics Frequency Plot

Betweenness Centrality Scaled					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	28	26.2	26.2	26.2
	1	4	3.7	3.7	29.9
	2	5	4.7	4.7	34.6
	3	4	3.7	3.7	38.3
	4	4	3.7	3.7	42.1
	5	5	4.7	4.7	46.7
	6	3	2.8	2.8	49.5
	7	10	9.3	9.3	58.9
	8	3	2.8	2.8	61.7
	9	7	6.5	6.5	68.2
	10	3	2.8	2.8	71.0
	11	3	2.8	2.8	73.8
	12	2	1.9	1.9	75.7
	13	2	1.9	1.9	77.6
	14	1	.9	.9	78.5
	15	3	2.8	2.8	81.3
	16	1	.9	.9	82.2
	17	6	5.6	5.6	87.9
	19	2	1.9	1.9	89.7
	20	1	.9	.9	90.7
	21	2	1.9	1.9	92.5
	26	1	.9	.9	93.5
	27	1	.9	.9	94.4
	30	1	.9	.9	95.3
	34	1	.9	.9	96.3
	37	1	.9	.9	97.2
	50	1	.9	.9	98.1
	58	1	.9	.9	99.1
	100	1	.9	.9	100.0
	Total	107	100.0	100.0	

Table 26 TIO Construct Item to Total Correlation

Correlations

		Q1	Q2	Q3	Q4	Q5	Q6	Total Score
Q1	Pearson Correlation	1	.682**	.598**	.573**	.711**	.675**	.845**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	106	106	106	106	106	106	106
Q2	Pearson Correlation	.682**	1	.670**	.670**	.558**	.509**	.814**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	N	106	106	106	106	106	106	106
Q3	Pearson Correlation	.598**	.670**	1	.717**	.588**	.602**	.832**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	106	106	106	106	106	106	106
Q4	Pearson Correlation	.573**	.670**	.717**	1	.629**	.623**	.838**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	106	106	106	106	106	106	106
Q5	Pearson Correlation	.711**	.558**	.588**	.629**	1	.798**	.853**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000
	N	106	106	106	106	106	106	106
Q6	Pearson Correlation	.675**	.509**	.602**	.623**	.798**	1	.839**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000
	N	106	106	106	106	106	106	106
Total Score	Pearson Correlation	.845**	.814**	.832**	.838**	.853**	.839**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	106	106	106	106	106	106	106

**. Correlation is significant at the 0.01 level (2-tailed).