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The Effects of Network Ties on Product Innovation Success: A Study of SMEs

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Keywords: *network ties, innovation success, small and medium enterprises.*

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The Effects of Network Ties on Product Innovation Success: A Study of SMEs

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Keywords: network ties, innovation success, small and medium enterprises.

I. General Introduction

a) Theoretical background and statement of the problem

According to Gaudici (2013), network ties is the pattern of relationships involving direct and indirect ties with different external actors. Large firms can establish separate sub-units for pursuing the exploitation and exploration strategies simultaneously, but SMEs do not usually have that option. How, then, can a firm pursue this strategy if it has limited resources? When resources are limited, SMEs must remain alert for windows of opportunities. They can compensate by relying on their network ties (Hewitt-Dundas, 2006; Theresia et al.; 2015) which may provide them with additional resources. Network ties provide access to a diversity of new ideas, referrals, knowledge and information (Stam, 2010). Firms' ties serve a "radar function" in seeking and collecting relevant information for current strategies and future planning (James, Dennis & Vincent, 2014).When a firm is pursuing experimentation, efficiency, refinement and innovation, it can benefit greatly from the insight found through the extracluster ties (ECTs) or intra cluster ties (ICTs) and has effect on innovative performance of firms (Theresia et al.; 2015).

Product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. Which underlies new products, may include improvements in features, materials and components, the development of new product, enhanced user friendliness, and other aspects (OECD, 2005). While product innovation success in this study refers to the number of innovative products that a firm has introduced onto the market, achieve success in both market and financial success. Market success (its market share size in the market, acceptance of new product by customers) and financial success (sales volume and net profit growth) (Griffin and Page, 1993; Mohammad, 2013; Theresia, 2015).

The role of the small and medium scale enterprises (SMEs) has been critical and the sector is considered as the "backbone" of many economies (Wymenga et al.; 2012). However, the SME sector in the developing nations faces many constraints such as technological backwardness, and entrepreneurial capabilities, unavailability of appropriate and timely information, insufficient use of information technology and poor product quality. Consequently, the economic contribution of SMEs in developing countries is currently far behind compared to developed countries (Altenburg & Eckhardt, 2006; Asian Productivity Organization, 2011; Emine, 2012). But also, the result of study on innovation and barriers to innovation: small and medium enterprises in Ethiopia (Silashi, 2014) shows; lack of cooperation (network ties), lack of competitive strategic orientation & market information, inadequate R&D were obstacle to SMEs' technological and product innovation success.

Accordingly, low level of innovative success in SMEs sector is one of the key issues in most of the developing countries though they have been expected to play a critical role in their economies and the current

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globalized competitive rivalry has multiplied the importance of the issue (Herath & Rosli, 2014; Theresia, 2015).

Therefore, to obtain an increased understanding of the role those network ties plays in SMEs to improve their innovative success*; a field study was conducted to test the hypothesized relationships of components of network ties and their effects on product innovation success of SMEs. A field study refers to a non-experimental scientific inquiry aimed at hypothesis testing in real social structures (Kerlinger and Lee, 2000). The specific context for this study involves a cross-sectional survey within small – medium sized in Ethiopia.*

b) Basic research and objective of the study

By exposing gaps and to fill these gaps, this study is addresses the following main research question.

How do network ties affects product innovation success of the SMEs?

The main objective of this study is to fill some of the research gaps *assessing the effects of network ties on product innovation success of SMEs* in Ethiopia. Mulu and Pierre (2011) contrast local and non-local knowledge linkages, whereas, Giuliani (2013) compares business and knowledge networks effect on firm innovation and finds positive effect of business and knowledge networks on firm innovation when these variables are included separately in the model. James, Dennis & Vincent (2014) finds a strong association between connectedness with local or non-local networks and product innovation success.

II. Litrature Review

This section deals with review of related literatures pertaining to the effects of network ties on product innovation success emphasizing on major variables.

a) Overview

Innovative or die. Since the beginning of the recent decade when the competitive environment went through a major transformation due to globalization, business organizations have intensified their search for strategies that will give them a sustainable competitive advantage and improve their success. Such strategies generally require that the firm continuously differentiates its products and process, that is, firms must constantly be innovative (Popadiuk and Choo, 2007). In such condition, where product innovation regarded as an essential prerequisite for the organizational survival and success, attention to entrepreneurship orientation and change to success of firms attracted the much attention of academic researchers and organizational members (Wang and Ahmed, 2004).

In the present global knowledge economy, technology and innovation are important determinants of economic growth (OECD, 2004). Innovation is important for economic growth because it makes a contribution to increased productivity and higher employment rates (European Commission, 2007). Thus, the degree to which firms are able to product innovation and bring them to the market successfully determines the economic prosperity of many nations.

Product innovation is probably one of the most important processes for many firms as it influences the revenues and margins that a firm can achieve and it has a positive impact on firm value (eg. on growth and survival of individual firms) (Pauwels et al.; 2004). The product innovation literature has consistently shown that product innovation success is positively related to organizational success (Montoya Weiss and Calantone, 1994, Griffin and Page, 1996, Hultink et al.; 1998, Cooper, 2001, Langerak, Hultink and Robben, 2004a,). The most recent best practice study showed that, among the best performing firms, 48% of sales are derived from new products introduced in the last five years (Adams and Doug, 2004).

i. *Innovation strategy*

Innovation defined as the generation, acceptance, and implementation of new ideas, processes, products or services (Rogers, 1995; Robertson and Yu, 2001). *The innovation process includes the acquisition, dissemination and use of new knowledg*e (Calantone et al; 2002) and *successful implementation of creative ideas within an organizatio*n (Amabile et al; 1996).

In general, innovation denotes the successful introduction of novelties. The word “innovation” itself originates from the Latin word “innovare”, which can be translated as “renewal”. To be innovative thereby indicates the ability to create something new. It is normal to separate the act of innovation and the output of innovation. It is also normal to distinguish between *inventions and innovations*. *An invention* is the first occurrence of an *idea for a new product* or process, and *innovation* is the *act of putting it into practice* (Fagerberg et al., 2005). From an economic perspective, *an invention must be advantageous, or at least thought to be advantageous, to be considered an innovation.*

As per (Schumpeter; 1934, Drucker, 1985) innovation is the process of generating something new (*new good /service*) that has a significant value to an individual, a group, an organization, and industry, or a society. Innovation is the use of new knowledge to offer a new product or service that customers want (Marijan and Rozana, 2010). *It is invention plus commercialization*. It is according to Porter (19980) a new way of doing things that is commercialized. The process of innovation cannot be separated from firm’s strategic and competitive context by Marijan and

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Rozana (2010). Figure 1.show how new products, low cost, improved attributes and new attributes depend on competence and firm assets. New technological knowledge and new market knowledge also, depend on each other but each separately interferes with firm assets and competences. New knowledge technological and market, contribute to firm competences and their assets.

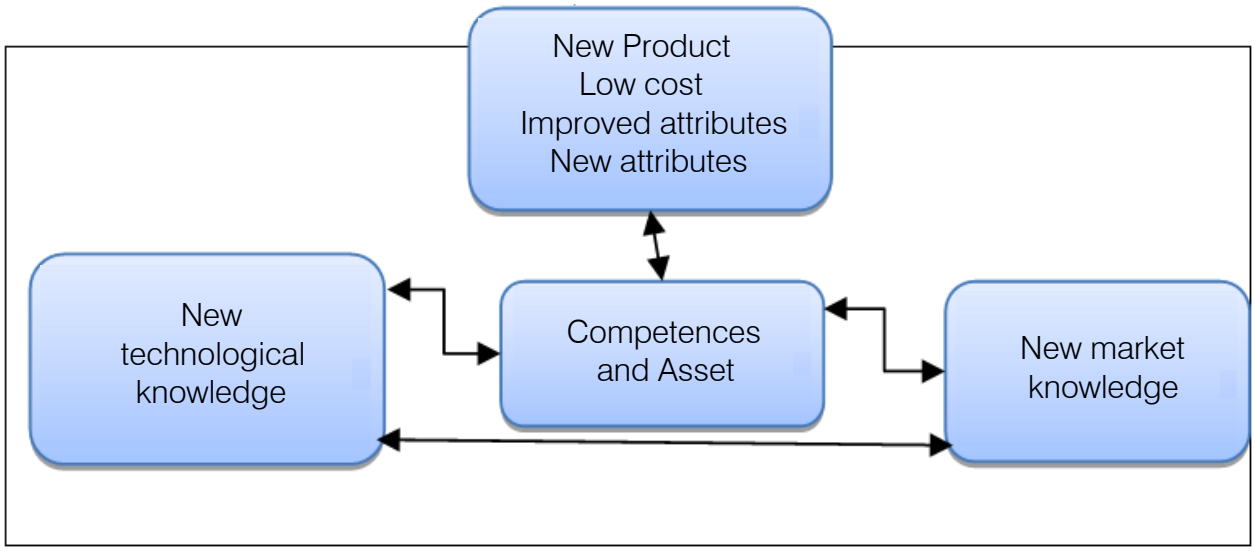

Figure 1: Innovation strategies overview (Sources: Marijan and Rozana, 2010)

Firm competence and asset determine the innovation of new products, gaining low cost products, contribute to improve attributes but also to create new attributes which will help firm in competitiveness (Marijan and Rozana, 2010).

ii. *Typology of Innovation*

Past scholars have often found it necessary to categorize and distinguish innovations in order to understand the true nature of the construct (Downs and Mohr 1976). Innovation can come in different forms, including: product innovation, organizational innovation, management innovation, process innovation, marketing innovation, and service innovation (Trott, 2008). According OECD (2005)*;* Jaramillo et al (2001:157-62) four types of innovation are identified: *Product innovation:* is the introduction of *a good or service that is new* or significantly improved with respect to its characteristics or intended uses. *Process innovation:* is the implementation of a new or significantly improved production and/or delivery method for the creation and provision of services. *Marketing innovation* is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion and pricing that is use of new pricing strategies to market whereas, *Organizational innovation* is the implementation of a new organizational method in the firm's business practices, workplace organization or external relations(OECD, 2005).

The different types of innovations and their uniqueness may lead to different impacts on strategy, structure, and success of the organizations (Damanpour et al. 1989, Daft 1982, Damanpour and Evan 1984, Ettlie and Rubenstein 1987).However, studies focused on innovation generation have primarily used the following typologies: [1](1) product versus process, and (2) radical versus incremental 3)Administrative versus technical.

These different typologies were developed in order to bring some clarity to the study of innovativeness. While the objective of this thesis is to help gain a broader understanding of product innovation (good or service), because it is difficult to integrate the research on innovation together with so many different typologies examined.

Product innovation, which underlies new products, may include improvements in features, materials, and components, the development of new software, enhanced user friendliness, and other aspects (OECD, 2005). It is in the context of a relevant group, or niche and environment, that the product needs be new (Zinga et al., 2013).New product development can be considered as one types of product innovation. The next section reviews the theoretical and empirical literatures on the definition of product innovation.

iii. *Product innovation*

Product innovation is, by definition, deemed to be novel, but the degree of novelty differs by product (Arundel and Hollanders, 2005). OECD (1992, 1996, 2005) classifies firm's product innovation into two types; "the introduction of a product only new to the firm" and "the introduction of a product new to the market." The latter innovation is newer and more drastic than the former (OECD, 2009), and is considered to be novel. It

[1] While we do acknowledge as there are various typologies present within the innovation literature, we do focus *on product*

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is an important research agenda to examine product innovation in light of its novelty in three counts. First, new-to-market product innovation may contribute to firm performance, as it can provide a firm with temporary market power (Petrin, 2002). Second, new-to-market product innovation exhibits possible technological spillovers in firm's innovation activities. Spillovers associated with firm's innovation activities have attracted much attention in both theoretical and empirical studies.

In our study, we focus on product innovation, which is "new products or services introduced to meet an external user or market need"(Damanpour, 1991). Zmud (1982) distinguished between the initiation and implementation stages of the adoption of innovations. Following Zmud's approach, we further distinguish among three constructs associated with product innovation. They are innovation orientation, resources commitment in product innovation and product innovation success.

From a collective perspective, *innovation orientation is defined as openness to new ideas as an aspect of a firm's culture* (Cooper and Kleinschmidt, 1988, Rosenau and Moran, 1993, Urban and Hauser, 1993, Hurley and knight, 2004), and it reflects the organization's willingness to innovate its offerings. Innovation resources refer to the actual investment activities while implementing innovation strategy, and product innovation success is the outcome and consequence of innovation activity (Zahay et al. 2004). Obviously, these three constructs are interrelated but quite different concepts, and innovation orientation and innovation resources can be considered as innovation-related resources.

iv. *Innovation Success*

Innovation is traditionally understood to mean the introduction of new goods, the use of new materials, the development of new methods of production, the opening of new markets, or the implementation of a new approach to organization (Schumpeter, 1934). Since, both academics and practitioners agreed that *measuring innovation success* is important (Griffin and Page, 1993). However, measuring new product success is not easy. Several researchers have suggested that *innovative* success is multidimensional and that success can be measured in different ways (Griffin and Page, 1996; Hart, 1993; Marsh and Stock, 2003). There are many success criteria available to determine whether a new product is a success or a failure (Griffin and Page, 1993; Hultink and Robben, 1995).

According to (Katila & Ahuja, 2003), *the ability of firms to develop new products* is considered as a measure of innovative success. New products are an important indicator of innovative success because they reflect a firm's ability to adapt to changes in markets and technologies (Schoonhoven et al., 1990) and they exert a significant impact on *market share, market value, and firm survival* (Banbury & Mitchell, 1995). *New product success* is the degree to which organizational goals involving new product profit, sales volume, and market share have been reached (Erik, 2008).

Product Innovation success defined, as it is the success in new products is occurring when the product is adopted by a large number of the target customers and the organization is able to achieve target sales figures (Griffin and Page, 1993; Kleinschmidt and Cooper, 1991).In addition, they define new product success as the degree to which the new product being evaluated meets that product's success goals (Griffin and Page 1993; Montoya-Weiss and Calantone, 1994). For example, Marsh and Stock (2003) proposed that success in product innovative could be assessed at three different levels: project level (e.g., *time, cost efficiency and functional success), product level (e.g., profitability, market share and revenues of the new product*) and firm level (returns to the firm generated by the new product).

In a meta-study on NPD success factors, Montoya-Weiss and Calantone (1994) found three broad categories of new product success measures: (1) financial objectives, (2) market share objectives, and (3) technical objectives. The financial and market share objectives both were considered to be measures of commercial success. It turned out that all studies in their review considered measures of commercial success, and only four of the forty-seven studies considered technical objectives. Therefore, the authors used only studies based on commercial measures of product innovation success in their meta-analysis. Based on a review of 77 publications and a survey of 50 practitioners, Griffin and Page (1993) identified 75 different measures of new product success used by academics or practitioners. Expert grouping by a group consensus process and factor analysis resulted in five general independent categories of success and failure measures: (1) measures of firm benefits, (2) program-level benefits, (3) product-level measures, (4) measures of *financial success*, and (5) measures of *customer acceptance.*

A comparison of the measures that academics use with the measures practitioners use or would like to use resulted in 16 core measures that everyone uses or wants to use to assess the success of a single product development. Three independent dimensions were identified underlying these measures: consumer-based, financial-based, and technical or process-based measures of success (Erik, 2008). *Based on these empirical findings, this research project defines innovative success at the project level as the extent to which a new product has achieved its market success or consumer-based and financial based objectives.*

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b) Network Ties Orientation

The focus of this section is to find out the concepts of network ties and its role in product innovation success of SMEs. So, different theories and empirical studies are conducted to find the relationship between network ties strategy and innovative success. Therefore, this section tried to discuss network or cluster (intra and extra-cluster ties) as can be driving forces in SMEs' innovative success.

i. *Network Ties Orientation Contextual Antecedents*

A relational network orientation is apt to emerge when the organizational context promotes external cooperation and when distinct partners of individuals in the network are not the overriding emphasis (Alina and Noshir,2015).This orientation is promoted by a network structure emphasizing dense and integrated networks of various partnerships and relationships, where density refers to the ratio of actual to potential ties (Pittaway,2004) and integration refers to the degree of interaction among various partners (James, Dennis & Vincent, 2014).

Dense and integrated much relationships will increase the extent to which individuals view themselves as relationship partners inhibiting clusters corresponding to organizational characteristics (Alina and Noshir, 2015). By implementing temporary task coalitions, structuring tasks so that partners have differing and interlocking roles (e.g., Miller & Davidson-Podgorny, 1987; Gaudici, 2013), such networks encourage the sharing of ideas, information and perspectives across fluid relationship structures. Network theory has proved to be quite influential in explaining organisational outcomes (Gautam, 2000; James, Dennis & Vincent, 2014). Unfortunately, significant concerns in terms of the generation and management of knowledge transfer and change surround the network approach.

According to Gaudici (2013), network ties can be defined as the pattern of relationships involving direct and indirect ties with different external actors. A literature review study by Pittaway, (2004) found that there is considerable ambiguity and debate within the literature regarding appropriate network ties for competitiveness. This research gap can be further expanded as prior studies also hold diverse views on how to capture a network ties, for example formal versus informal ties, strong versus weak ties (Stam, 2010), and customer-oriented (Mulu and Pierre, 2011) against supplier-oriented ties, intra cluster ties (ICT) and extra cluster ties (ECT)(James, Dennis and Vincent, 2014).

ii. *Cluster Theory*

Industrial clusters can be defined as "geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions in a particular field that compete but also cooperate (Porter 1988, 2000).

Players within a cluster include providers of specialized products and services, infrastructure providers, governmental institutions, competitors, suppliers, customers and trade associations who provide technical support that benefits or contribute to a specific sector. Clusters are an important competitive advantage because other factors that were previously important, such as access to non-scarce resources, are becoming less important as global logistics serve the need for resource transportation (Reynir, Gudmundur and Runar, 2015).

A cluster's absorptive capacity is the "capacity of firms to establish intra- and extra- cluster knowledge linkages" (Giuliani, 2005). This is the capacity of a cluster to gather knowledge from the outside and effectively distribute this knowledge on the inside. However, when digging deeper into cluster theory, it can be seen that the knowledge flow is not equally distributed between firms within a cluster. In fact, clustering may isolate some firms while others increase their collaboration. In addition, even though business flows are frequent between firms within a cluster, knowledge flow does not necessarily follow (Reynir, Gudmundur and Runar, 2015).

From a resource based view (RBV) the network encompassing ICTs and ECTs of a firm can be seen as its resource pool, contributing to the firm's technical know-how, trade contacts, and capital (Wernerfelt,1984). In addition, network ties provide legitimacy, increasing a firm's odds of forming partnerships with highly valuable potential partners (Eisenhardt & Schoonhoven, 1996). The large bundle of resources that networks generate can increase the ability of the form to create new combinations of knowledge, thereby enhancing its competitive advantage (Wernerfelt, 1984). Such a so called recombinatorial ability is particularly relevant when firms confront a high degree of competition, as SMEs in emerging economies do (Theresia, Jojo and Geert, 2013).

iii. *Intra cluster ties (ICT) and extra cluster ties (ECT)*

In this study 'intra-cluster ties 'defined as a clustered firm's network ties to others firms operating in the same geographical industry (Giuliani, 2005). While 'extra-cluster ties', as a clustered firm's network ties to other affiliated firms outside the geographic concentration (Giuliani, 2005; Theresia, 2015).

According to several studies, firms located in geographical clusters can obtain local knowledge freely and easily (Gilbert & Fernhaber, 2014; Giuliani, 2005). The free exchange of information enhance the knowledge and competencies of the cluster member. Clusters are therefore good for innovation and technological advancement (Mulu and Pierre, 2011). Some studies have singled out clusters and

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collaborative networks as being efficient instruments for boosting the ability of SMEs to overcome size limitations (Berry et al., 2001; Theresia et al.; 2013). Moreover, many studies have identified firms that have been successful in terms of both innovation and profitability as being part of a regional cluster (Gaudici, 2013; Theresia et al.; 2013; James, Dennis & Vincent, 2014; Alina and Noshir, 2015).

Nevertheless, relying exclusively on cluster ties, including intra-cluster ties (ICTs), is not considered sufficient for competing in today's business environment. Basically, the flow of knowledge in the cluster cannot keep pace with the changing environment. Without an injection of new insights and information, knowledge within ICTs can be obsolete (Theresia et al; .2013, Theresia, 2015).

Thus, many studies suggest the importance of extra-cluster ties (ECTs) as a complementary resource for introducing knowledge diversity. It has long been acknowledged that heterogeneity of knowledge is a source of competitive advantage (Wales et al., 2011). Moreover, ECTs are particularly crucial for SMEs that operate in lagging technology clusters, where local knowledge and competency are insufficient (Mulu and Pierre, 2011).Giuliani (2005) found as the knowledge network matters for differential innovation success among clustered firms. However, the emphasis on explicit knowledge networks and extra-cluster linkages is not tenable at least in the case of small firms' clusters in developing countries as most of them information and innovation ideas largely from interactions with their business partners or social ties, thus, in such cluster the knowledge is a source of product innovation success.

III. Conceptual Analysis of the Relationship between Network ties and Product Innovation Success

Introduction

The main objective of this section is to discuss the association of network ties and product innovation success.

a) Network Ties and Product Innovation Success

A relational network orientation is apt to emerge when the organizational context promotes external cooperation and when distinct partners of individuals in the network are not the overriding emphasis (Alina and Noshir,2015).This orientation is promoted by a network structure emphasizing dense and integrated networks of various partnerships and relationships, where density refers to the ratio of actual to potential ties (Pittaway, (2004) and integration refers to the degree of interaction among various partners which has positive effect on product innovation success(James, Dennis & Vincent, 2014).According to Gaudici (2013), network ties can be defined as the pattern of relationships involving direct and indirect ties with different external actors. A literature review study by Pittaway, (2004) found that there is considerable ambiguity and debate within the literature regarding appropriate network ties for competitiveness.

Table 1: Case analysis of empirical finding of SMEs in Ethiopia

Exhibition on: Innovation & Barriers to Innovation: SMEs in Addis Ababa, Ethiopia
The data for the study was collected from four selected sub cities of Addis Ababa SMEs (Akaki, Bole, Kirkos and Yeka). The questionnaires were distributed randomly for 207 SME managers and/or owners to gather the needed information (Silashi, 2014). From the selected enterprises 58 had engaged in innovation whereas, the remaining 94 enterprises didn't introduced technological innovation. Out of those 58(38.1%) enterprises introduced technological innovation, 34(22.3%) are small & 24(15.7%) are medium enterprise. Proportionally, new technology introduced account construction, garment and textile; and metal and woodwork sectors were 10, 3 & 21 for small and 7, 4 & 13 are medium enterprises, respectively. This shows mostly metal and woodwork sectors were involved in product innovation in Ethiopia.
The result of Silashi(2014) study indicates that the major barriers of introducing or expanding technological innovation for SMEs were: lack of government policy and regulation, lack of technological and market information, inadequate research and development, high cost of innovation, organizational culture, absence of cooperation(network ties), size of enterprise, lack of skilled personnel and lack of finance. In addition, the comparative analysis indicate that, except government policy and regulation, organizational culture, size of enterprise, lack of network ties & lack of skilled personnel, all other factors were considered as barrier to industry level and both for small and medium enterprises.

As per the result study of Silashi (2014) shows in Ethiopia; the lack of cooperation partners (network ties) of SMEs was one barrier for innovation success. For instance; low cooperation with institution & business services providers, low access of expertise's from other firms, having low relationship with different association, deficiency of having cooperation with government, private institution & NGO in relation to innovation were some barriers identified for SMEs technological innovation.

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IV. Research Methodology

a) Research Design

The primary objective of this research is to assess the effects of network ties on product innovation success of SMEs in Ethiopia for specifying the relationships in the conceptual framework and through a series of theoretically justified research hypotheses. To test the posited hypotheses, a cross- sectional field study was used. Furthermore, for this study, with triangulation potential problems of construct validity and reliability was addressed. *Triangulation* refers to the use of two or more *data sources, methods (data collection etc.), investigators, theoretical perspectives and approaches* to analysis in the study of a single phenomenon and then validating the congruence among them. Therefore, for current study mixed approach was employed. Mixed approach research is formally defined here as the class of research where the researcher mixes or *combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study* (Creswell, 2003, Punch, 2005).

A quantitative positivistic approach is selected as one of the methodological choice. "It is a *deductive or theory-testing approach*". Such an approach avoids speculation and bias (Wicks and Freeman, 1998). Furthermore, through the use of quantitative, scientific methods, data are generated that can then be replicated for verification purposes in future studies. Replication of results is critical for theory testing (Creswell, 2003, Punch, 2005). Thus, the positivistic approach offers opportunity for testing the hypotheses posited using effects of network ties on innovative success of SMEs. The research design for this study is a key informant survey *designed to collect data from the workers and or owners.* The workers and owners are selected because they would be able to represent accurately their organization's views on the issues covered in this study (John and Reve, 1982, Creswell, 2003, Punch, 2005, Campbell, 2005; Muhammad, 2010).*The survey was initiated by directly distributing a questionnaire to the workers of firms selected from the list of small and medium enterprises in Ethiopia.*

In addition, because of network ties is relatively young discipline, qualitative interpretive approach was utilized (Hutt, Rein-gen, and Ronchetto 2008; Imai, Nonaka and Takeuchi, 2005, Sylvia and Kalsom; 2013, Justina and Craig, 2014).

Interpretive approach is "an inductive or theory-building approach". It is one whereby the researcher deemed part of the research process and endeavours to uncover meaning and gain understanding of broad interrelationships in the context they research. It helps to *understanding how and why things happen: exposing meaning. Induction* involves the *inference of a generalized conclusion from the patterns observed between particular instances* (Remenyi et al., 1998). Using an inductive process, *it is entirely acceptable to formulate a research topic or question from experience or intuitive notions rather than reflection on established theory and concepts.*

For qualitative survey, in-depth interviews; analytical approaches was employed (Creswell, 2003, Punch, 2005).

b) Data Analysis

To test the relationships between various variables of *strategic orientations and innovative* success, statistical technique for hypothesis testing specifically, *multiple hierarchical regression* analysis and structural equation modeling (SEM) were used. Structural equation modeling (SEM) with latent variables has changed the nature of research in marketing and strategic management. SEM offers the possibilities of distinguishing between measurement and structural models and explicitly considering measurement error. As Gefen, Straub, and Boudreau (2000, p.6) point out, SEM has become de rigueur in validating instruments and testing linkages between constructs. SEM can be further distinguished between two families of SEM techniques: covariance- based techniques and variance-based techniques. For testing of structural equation and goodness fit of model, Analysis of Moment Structures (AMOS) was used.

c) Sampling Technique and Sample Size

A multi stage clustering and stratified sampling were used for the survey. In the first stage, we conveniently selected region, in second stage, we selected industry area/zone in region as representative of the SMEs in Ethiopia. Accordingly, at the first stage Oromia region has been selected. At the second stage, in Oromia region industrial zones (particularly, Finfinne area and Jimma) have been selected as sample representative. The selection criteria of these areas was based on *high density of small and medium enterprise location* in Ethiopia. For this study, more than 386 respondents (owners/managers) from small and medium enterprises were targeted as sample size that has been determined by using the following formula (Saunders et al.; 2000).

$$n = \frac{z^2 pq}{E^2} = \frac{(1.96)^2 (.50)(.50)}{(.05)^2} = 386$$

Where:

n = adequate number of sample size with a given amount of confidence level (95% confidence level) which is recommendable in social science.

N = population size

Z = table value of the confidence level from normal distribution table

E = the researcher's tolerable amount of error

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p= the probability of success (the proportion of the study unit who may give adequate information)
q = the probability of failure (the proportion of the study unit who may not give adequate information)

Accordingly, 386 plus 10% in order to *offset an anticipated low response* or unresponded rate percent 10% to 20% and to maximize the generalizability of the results (Remenyi et al., 1998),*totally 425 respondents were selected* proportionally from both manufacturing and service sectors. This sample size is hoped to generate the required information with relatively good precision *for infinite or large populations* (Saunders et al.;2000).Also it is more than recommended size for applying statistics tools such as; factor analysis, AMOS, regression etc. (Julie, 2005; Field, 2013).

V. Conceptual Model and Research Hypotheses

Introduction

The purpose of this section is to construct a model synthesizing the results from the literature review and the interviews was held with owner/managers.

a) Impacts of network ties on product innovation success

Several authors (Stam, 2010) have asserted the significant role of networks in influencing entrepreneurial process and innovation success. Entrepreneurship theory implies that the essence of entrepreneurship is the ability to detect, willingness to pursue and exploit the opportunity in the marketplace (Stevenson and Jarillo, 1990, Shane and Venkataraman, 2000). Yet, not all entrepreneurs have capabilities and sufficient resources to utilize those opportunities. They need collaboration with the economic actors to enable them to carry out some activities in order to gain access to resources and markets (Rauch, 2009). Clearly, they need to develop networks in business to take advantage to exploit new opportunities, obtain knowledge, learn from experiences and benefit from the synergistic effect of pooled resources (Gaudici, 2013). For that reason, acknowledged that entrepreneurship is naturally a networking activity. Network is considered as one of the most powerful assets since it provides access to power, information, knowledge, technologies, and capital which results financial and market success of product innovation Stam, (2010). The hypothesis from this discussion is formulated as follows.

Hypothesis 1_0*:* Network ties has positive effect on product innovation success

VI. Emperical Results

a) Reliability and validitry tests of a construct

In this study, to test the reliability of the constructs, Cronbach's alpha was used. One of the most commonly used indicators of internal consistency is Cronbach's alpha coefficient (Juile, 2005). Reliability can be measured with Cronbach's coefficient alpha which should surpass the .70 threshold (Nunnally, 1978, Field, 2013). High Cronbach's alphas refer to patterns of *high inter-correlations among the items in a scale,* indicating that they constitute a coherent whole in measuring a construct. However, other scholars (Churchill, 1991; Slater, 1995; Sekaran, 2000; Muhammed, 2010) have suggested that Cronbach's alpha as low as .60 are acceptable for hypothesis testing. Moreover, inter *item to total correlation* values *0.3 or greater is* acceptable *for data analysis* that indicates of *the degree (strength) to which each item correlates with the total score (Julie, 2005).*

In the current study the Cronbach alpha coefficient of all constructs are greater than 0.7 except extra cluster ties 0.607 which exceed the 0.60 minimum threshold and acceptable. This shows almost all constructs of current studies have good the internal consistency (inter--*correlations*) scale with the exception of few extra cluster ties are acceptable for hypothesis testing. Furthermore, to obtain unidimensionality of constructs , we checked the inter-item correlation for all the scale items by using the confirmatory factor analysis; the values of *item to total correlation of all items are greater than 0.3 here indicated that the items have strong inter-correlation with their constructs and then factor analysis is appropriate*(Juile,2005; Field,2013).

Table 2 displays each construct, item to total correlation and its associated reliability coefficient.

Table 2: Construct reliability

Constructs	No. of Items	Item to Total Correlation	Chronbach Alpha (reliability)
Network ties	**8**		**0.756**
Intra cluster ties	4	.427	0.714
Extra cluster ties	4	.599	0.607
Product Innovation Success	**5**		**0.760**
Market success	3	.469	0.872
Financial success	2	.495	0.865

Moreover, two statistical measures are also generated by SPSS to help assess the factorability of the data (i.e. ***suitability of the dataset for factor analysis***): Bartlett's test of sphericity should be significant ($p<0.05$) for the *factor analysis to be considered appropriate and* **Kaiser Meyer Olkin** *(*KMO)measure of

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sampling adequacy the value of KMO should be greater than 0.5 if sample is adequate (Hair et al., 2007;*Pallant, 2011;Field, 2005;*Field, 2013) and to proceed with factor analysis.

For current study, the KMO test values for all of the factors was greater than 0.6 and the Bartlett's test was significant (p=0.000) as mentioned in Table 3, indicated that the data were *suitable for factor analysis.*

Table 3: Factor Analysis Test of KMO and Bartlett's Test of Sphericity

Factors Developed in Factor Analysis	KMO	Bartlett's P-value	Sig.
Network Ties			
Intra cluster ties	0.704	.000	Sig
Extra cluster ties	0.680	.000	Sig
Product Innovation Success			
Market success	0.695	.000	Sig
Financial success	0.673	.000	Sig

Convergent Validity

Factor loadings are significant and greater than 0.5 and Average Variance Extracted (AVE) for each of the factors > 0.5 indicates good convergent validity assumption. Carmines and Zeller (1979) and Muhammed (2010, p.162) suggest that factor analysis provides a suitable means to examine convergent validity. *In factor analysis, loadings are used to detect whether or not an item appropriately loads on its predicted construct. It shows the reliability of individual items (indicators).*Typically, loadings of 0.50 or greater are considered to be very significant (Hair et al., 1995, Field, 2013). KMO values >.60 indicated that the data were suitable for factor analysis. Then, Principal components analysis explored the unidimensionality of each scale using an *eigenvalue of 1.0 as the cutoff points* (Field, 2013). Using SPSS, all constructs have been forced into *five factors and rotated* using the VARIMAX rotation method to assess their loadings.

Accordingly, as result of current final study in table 4. below shows; all of items has greater than 0.50 load on their predicted construct that demonstrate a higher degree of association between the latent items and that constructs; thus, *convergent validity is confirmed.* For this data set, the evidence suggests support for convergent validity.

Table 4: Convergent Validity based on loading factors on constructs (Using SPSS)

Predicted constructs	Indicators(Items)	loading
Network Ties	Intra cluster ties	0.654
	Extra cluster ties	0.634
Product Innovation Success	Level of customer acceptance of new product	0.926
	Growth rate of product market share	0.919
	New product causes' level of customer satisfaction	0.829
	Growth rate of firms' net profit	0.905
	Growth rate of total sales	0.904

**all loadings are significant at the p<0.01*

In addition, Average Variance Extracted (AVE) is used as measure of convergent validity in AMOS method.AVE was proposed by Fornell and Larker (1981) as a measure of the shared or common variance in a Latent Variable (LV), the amount of variance that is captured by the LV in relation to the amount of variance due to its measurement error (Dillon and Goldstein, 1984; Gounaris and Dimitriadis, 2003). Their average variance extracted (AVE) for X with indicators x_1, x_2,...,x_n is

Σ [ri^2]ri= *regression weight of standardized estimate of LV to each indicators*

AVE = n i.e: X to $(x_1, x_2,...,x_n)$. (by AMOS)

n= number of indicators of one latent variable*(X)*

Σ denotes a sum

Thus, a compelling demonstration of convergent validity would be an AVE of 0.5 or above (Nunnally 1993; Gounaris and Dimitriadis, 2003).

The details of the current studies' results are provided in table-5 below. According to this data the AVE of all latent variables are greater than 0.5 (AVEs>0.5) that shows the *convergent validity* s *good* (Fornell and Larker 1981; Dillon and Goldstein, 1984; Gounaris and Dimitriadis, 2003). *In other word, there is no violation of convergent validity for this data.*

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Table 5: Convergent Validity by Average Variance Extracted (Using AMOS)

LV	Standardized Regression Weights					AVE
				Estimate(R)	R^2	
NWT	Extra	<---	NT	.638	.41	.475
	Intra	<---	NT	.734	.54	
PIS	MS	<---	PIS	.837	.70	.50
	FS	<---	PIS	.845	.71	

NWT-network ties : *Extra-extra cluster ties, Intra- intra cluster ties*
PIS-product innovation success : MS- Market success, FS-financial success

Generally, by loading factors and AVE the convergent validity assumption is confirmed. All predicted constructs' factor loadings are significant and greater than 0.5 and the Average Variance Extracted (AVE) for each of the factors close to 0.5 and above indicates that approximately good convergent validity assumption is achieved.

Discriminant Validity

There are two methods used to assess discriminant validity of data. One cross- factor loading method that expected each of block of indicators load higher on its respective latent variable than indicators for another latent variables (Churchill, 1991). If an indicators has high correlations with another latent variables then the appropriateness of model may be reconsidered. This implies that if two or more constructs are *unique*, then valid measures of each *should not correlate too highly* (Bagozzi and Phillips, 1991).

The other method is AVE also used to assess the discriminant validity of the constructs. For this a construct must have more variance with its indicators than with other constructs of the model. It is when square root of *AVE (√AVE) between each pair of factors greater than estimated correlation between those factors (√AVE>r) in other word AVE>r^2* (Fornell and Larcker, 1981; Gounaris and Dimitriadis, 2003) it is the more recommended method.

So for this study to assess discriminant validity, Average variance extracted is used. *The details of the current studies' results are provided in table 6, below. We assessed the discriminant validity of each construct by AMOS. The values of all of the average variance extracted in table 6, are approximately equal and greater than all corresponding correlations (Fornell and Larcker, 1981). According to this data, the discriminate validity is good. In other word there is no violation of discrimination validity*. In general, the overall evidence suggests the existence of discriminant validity.

Table 6: Discriminant Validity (using AMOS)

Discriminant Validity 1		2	Factor Correlations	Correlation squared (r^2)	Should be AVEs>r^2 AVE_1AVE_2	Discriminant Validity
NT	<-->	PIS	.385	.15	. 475.50	*Established*

b) Testing of the models using regression analysis

Regression analysis was carried out with the network ties as the independent variable for each of the following dependent variables. The various statistics results are reported in the following table 7.

Table 7: Results'Summary of Regression Analysis

Hypo.	Dependent variable	ANOVA F's value	R	R^2	Unstardardized beta	t	signif
$H1_0$	Product innovation success	33.08***	.423	.179	.586	9.173 ***	Sig.

P<.05;p<.01;***p<.001; ns:not significant model*

Table 7: presents the summary of results of regression analysis for hypothesis-1_0. Accordingly, the hypothesis1_0; the effects of network ties on product innovation succes has been accepted. This model fit was tested using ANOVA. So, that the model is significant (F = 33.08, p<.0001) that shows that the good model fit.Which indicates that apositive and significant coefficient (β=0.586, p<0.001) for the network ties variable confirm that the network ties of firms has positive effect on product innovation success of SMEs.

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c) *Testing the Model using AMOS*

Covariance based structural equation modelling software; (AMOS, ver. 20.0) was used to test the model. Furthermore, to check the quality of data or fitness of each model and to confirm the results obtained as overall model based structural equation modelling and result of regression obtained using SPSS-V21.

Fig. 2. depicts the model comprising network ties and product innovation success. The result shows reasonably good model fit and supports the hypothesis $H1_0$.The values of the fit indices are attractive high. The structural path estimate is significant. The loading estimates are significant and consistent with the theoretical expectations. All of t-value are greater than two in absolute value ($t>|2|$) indicate that all the relations are statistically significant (table 8.).

Tables 8: shows the overall fit statistics of resulting from testing the model. The chi square is ($X^2=0.001$; $df=1$; $p<0.05$) statistically significant that indicate model not well fit. However, other statistical model, the RMSEA =0.000 that indicates exact good fit. The model CFI is 1.000and GFI is, *1.000, AGFI=1.000* all values are greater than the recommended 0.90 (Hair et al.; 2007, James, 2011) which indicate a good fit.

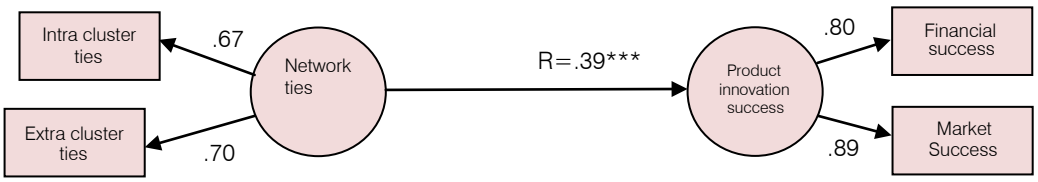

Fig. 2: Path Coefficients of Network ties on Product Innovations success using AMO

Tables 8: Various outputs of model NWT to PIS using AMOS

Regression Weights

			Estimate	S.E.	C.R.	P
Product_innovation succes	<---	Network ties	.377	.079	4.781	***
Extra cluster ties	<---	Network ties	.848	.180	4.707	***
Intra cluster ties	<---	Network ties	1.000			
Financial success	<---	product_innovation_succes	.797	.118	6.740	***
Market success	<---	product_innovation_succes	1.000			

Tables 9: Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	9	.001	1	.978	.001
Saturated model	10	.000	0		
Independence model	4	398.181	6	.000	66.364

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.001	1.000	1.000	.100
Saturated model	.000	1.000		
Independence model	2.340	.684	.473	.410

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	1.000	1.000	1.003	1.015	1.000
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

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RMSEA (*Root Mean Square Error of Approximation*)

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.000	.000	.000	.986
Independence model	.411	.377	.446	.000

The hypotheses assess the impact of network ties on product innovation success of the firms.The results of this study answer questions pertaining to the link between network ties and product innovation success in SMEs. First, how do network ties of firms affects and product innovation success of the SMEs ? Going by conventional thinking, it is not easy for SMEs to do network ties with internal cluster and external clusters ties , because doing so calls for them to possess several conflicting resources and capabilities.

Hypothesis	*Findings*	*Decision*
H1$_0$:*Network ties has positive effect on product innovation success.*	Signf.	Accepted

The hypotheses support that the higher level of network ties has strong impact on product innovation success, this impacts was discussed as follows.

According to our finding, hypothesis1$_0$ supports that the network ties has positive effect on product innovation success.This current finding supports thatyet, not all small and medium entrepreneurs have capabilities and sufficient resources to utilize various opportunities. So that, they need collaboration with the economic actors to enable them to carry out some activities in order to gain access to resources and markets (Rauch, 2009). Networks developing helps small firms in business to take advantage to exploit new opportunities, obtain knowledge, learn from experiences and benefit from the synergistic effect of pooled resources (Gaudici, 2013). For that reason, acknowledged that entrepreneurship is naturally a networking activity. Network is considered as one of the most powerful assets since it provides access to power, information, knowledge, technologies and capital which results financial and market success of product innovation (Stam, 2010). Firms with higher network ties lead to strongability to adapt to changes in markets and technologies and they exert a significant impact on profit, high sales volume, market share, market value, and firm survival (Banbury & Mitchell, 1995, Erik, 2008).

To summarize from current study, we found that the ECTs/ICTs of the SMEs compensated for their resource scarcity and acted as key driving forces of their success. SMEs, by definition, have limited resources in terms of capital, human resources, and up-to-date knowledge. Their network ties provide important resources, such as ideas and referrals. They also, particularly those spanning beyond the cluster in which an SME is based (i.e., ECTs), can allow SMEs to overcome the limitations of their small size. New ideas, technologies, knowledge, materials, and processes can be applied for exploitative and explorative strategies. Partnering through ECTs is therefore a major strategic resource, much more valuable than ties within the firm's cluster (Theresia, 2015).

Regarding this finding, most of the managers and owners of SMEs interviewed had similar comments. To quote a combined:

'*In any kind of business, the network is important because it can provide you with more information and knowledge about many strategies. However, learning from advanced firms is important; they can give you the pattern of success. Learning by doing and learning by guidance are good ways to improve innovation. For instance, external relations with outside of the cluster (our location boarder) to gaining access to new markets, increasing power in the market, altering competition, sharing research and expenses, and reducing risks. Creating social network with outside of the boarders to change their innovation by taking new idea, strategies from other firms, access to assets they could hardly have achieved single-handedly and to add valuable knowledge on the local information'.*

In general, our findings indicate that network ties has direct and indirect positive significant contribution in SME's product innovation success. Therefore, firms must have high cooperation levels of intra and extra cluster network ties to achieve high product innovation success.

d) Research Limitations and Future Research Directions

Our study is not without limitations, but also throws open opportunities for future research. One of the limitation is that the data we used, although original and derived from field research, is cross-sectional. This has prevented us from examining the effect of changes over time in firm behavior on product innovation success. Similarly, the lack of longitudinal data reduces confidence in causal effects, especially in the case of such relationships, which have not been so extensively examined in the literature, such as the relationship between financial success and network ties. Therefore, an important step for further research is the collection and analysis of longitudinal data to rule out alternative explanations.

The other limitations of this study is that it incorporates a limited number of network ties, i.e intra

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and extra cluster ties. For further research, other important strategies and external factors should be considered in the model.

e) Conclusion

This study has made a conceptual and empirical contribution to the research on SMEs in developing countries as general examining the network ties on product innovation success of SMEs. One is that networks ties (extra/intra cluster ties) are the drivers' successful product innovations of SMEs. Our study shows that committing too many resources to sharing knowledge only within clusters may be counterproductive, since it can lead to the diffusion of redundant knowledge, instead of bringing in new knowledge to the firm. Therefore, using both internal cluster ties and external cluster ties, then, seem to be a more preferred source for SMEs seeking new ideas, information and knowledge.

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