Effects of the External (Macro) And Internal (Micro) Source (Factors) of Innovation on the Performance of Ghanaian Telecommunicationsmes: Using The Resource Based View Perspective.

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ABSTRACT:*In an attempt to use the resource-based theoretical approach, this article tried to empirically investigate the influence and impact of theinternal (micro) and external (macro) environmental factors of innovation performance using a sample of small and medium sized firms in the telecommunication cluster in Ghana with the main focus on examining variables such as customer inputs, the intensive role of R&D, cooperative networks, the uncertain environment and the complex environment of the firm.*
A sample of 31 SMEs in the telecommunication cluster was selected with 109 questionnaires administered. The results indicate that the macro environmental sources as cooperative network and customer inputs actually impact positively on the innovation performance of SMEs in the communication cluster in Ghana. However, firm size, network size and complex environment were shown to be negatively related to firm innovation performance.
Keywords*: Network cooperation, external and internal environment, innovation, customer input, uncertain and complex environment.*

I. INTRODUCTION

In the modern era where innovation by firms and enterprises has become pervasive and in vogue, innovation can be seen to be generated from different sources. Firms in their quest to innovate to guarantee their survival in the market place may source innovation from either the micro (internal) sources such as R&D, the exploitation of employee creativity and core competences or from the macro (external) sources such as customers and other strategic alliances usually referred to as cooperative networks (Chaharbaghi, Adcroft, Willis, Todeva, & Knoke, 2005) as well as taking advantage of the uncertain and complex nature of the firm to enhance their innovation performance.

The environment has been described by many authors as both internal and external factorsto the organisation and therefore has a direct influence on firms' innovation activities (Aragón-Correa, García-Morales, & Cordón-Pozo, 2007). Thus the environment is considered as a key factor for organisational innovation. This is because its frequent changes of making the management of value and quality of products and services difficult help stimulate the creation of new ideas and the innovation of new products and services onto the market place (Aragón-Correa et al., 2007). The influential role played by both the internal and external factors of the firm's environment in their innovation performance has been outlined by many authors (Menguc, Auh, & Ozanne, 2010). Various studies in the area of SME innovation have shown that the external (macro) environmental source is mostly relied upon by SMEs in their innovation activities due to their resource constraints (Al-Ansari, 2014; Madian, 2015). Due to high competition on the global market space as well as the fact that today's customers' expectations keep rising on daily basis and the need for firms to satisfy these growing expectations,SMEs have no option than to try and build critical innovation capabilitiesespecially firms in the communication sector, and transform their businesses in order to become more competitive and survive in the global market. Due to the fact that communication firms are in the high-tech sector of SMEs, they operate mainly in the highly technological driven environment where firms face both vibrant external and internal competitive environment occasioned by rapid changes in technology as well as short product life cycles(Parida, Westerberg, & Frishammar, 2012; Romijn & Albaladejo, 2002). It is therefore incumbent on these SMEs to chart a sustainable path of innovation not only for survival but to be able to satisfy the growing demands of their customers at all times(Klewitz & Hansen, 2014; Purcarea, del Mar Benavides Espinosa, & Apetrei, 2013). The environment has been associated with uncertainty, heterogeneity, turbulence and dynamism(Van de Ven, Polley, & Garud, 2008). The environment has also been described as having two basic dimensions: thus the simple complex environment which is described as having a relationship with the environmental factors and the one

described as the static and dynamic environment that is associated with the degree in which the decision elements of the macro environment change(Leach, Scoones, & Stirling, 2010). In the analysis of DeSarbo, Anthony Di Benedetto, Song, and Sinha (2005), they categorized environment under two headings: these are uncertain environment which they related to the predictability of the changes at the marketplace and the heterogeneous environment which is related to the variety of production and marketing requirements. According to Auh and Menguc (2005), the environment is of two forms: the market turbulence linked to the diverse nature of consumers' preferences and also technology turbulence associated with the absence of a common technological standard of the manufacturing sector. In the perspective ofSantos-Vijande and Álvarez-González (2007), the environment is made of two aspects: thus, market turbulence relating to the changing rate of customers' preferences and the turbulence nature of technology relating to the changing rate of the development of new products and processes due to the faster rate of the spread of technology.

Fig 1: Perspective of the environment by different authors. Source: the authors.

Different environment perspectives	Authors
Environment is "uncertain and complex"	Van de Ven, Polley and Garud (2008)
Environment is "uncertain and heterogeneous	DeSarbo, Anthony Di Benedetto, Song and Sinha (2005)
environment is "simple-complex and static-dynamic	Leach, Scoones and Stirling, (2010)
Environment is the "market turbulence and technological turbulence	Santos-Vijande and Álvarez-González (2007)

1.1. Relation between the environment and organizational innovation.
Brown (2009), posits that innovation is a process of creation and implementation of new ideas in the organization in response to the environment changes. According to innovation literature, there is an established relationship between the environment variables and organizational innovation(Garcia & Calantone, 2002). Innovation helps organizations to gain a competitive advantage in addition to strengthen their capability to respond to the dynamic environment(Sirmon, Hitt, & Ireland, 2007). Terziovski (2010), indicated that innovation is a principal element for the success of SMEs. Researchers writing on the relationship between the environment and organisational innovation state that consequences of innovation as well as imitations are still not known especially in environments with uncertainty and where information is very irregular (Amabile, Conti, Coon, Lazenby, & Herron, 1996). In the view ofAldrich (2008), the environmental dimensions must be analyzed in the area of environmental complexity and uncertainty since the two impact on the magnitude and the type of innovation. Tsuja and Mariño (2013), stated that some important characteristics of innovative organisations are that: they have flexible organisational structure, they promote diversity of opinions and have specialists rather than generalists who make decisions with regards to the organization's innovation.

1.2. Innovation defined
In relying on the resource-based theoretical approach, we define innovation as the adoption of new ideas and methods to enable organisational survivaland success(Drucker, 1985; Harmancioglu, Droge, & Calantone, 2009). Organizational innovation is the creation and the implementation of new ideas by an organisation in response to the environment change (Baregheh, Rowley, & Sambrook, 2009). Innovation comes from R&D that is mainly organisationknowledge accumulation and imitating the innovations of other firms(Breschi & Lissoni, 2001). For innovation to be successfulthere must be the interaction between both external and internalknowledge integration and technological capabilities (Caloghirou, Kastelli, & Tsakanikas, 2004).

1.3. The research problem
SMEs in their quest to have a sustainable innovation culture are constantly engaging both the external and internal factors to help them attain competitive advantage at the market place(Baloh, Jha, & Awazu, 2008). Proponents of the social capital theory state that one important external factor that helps in knowledge transfer for firms' growth and sustainable innovation culture is the cooperative network(Simard & West, 2006). Arguments supporting the resource based approach consider the creation and maintenance of networks as a good channel to access valuable but scarce external resources. External network resources play an invaluable role for SMEs in that it benefits the resourced-poor SMEs that enable them to create competitive advantages on the market(Gronum, Verreynne, & Kastelle, 2012). Also, networks with external partners play a pivotal role in SME innovation since it provides the platform for firms to have the opportunity to combine new forms of knowledge and also exposes them to current information needed for the enhancement of their innovation activities(Ceci & Iubatti, 2012).

One of the views held by the resource based perspective is that innovation success and performance of a firm is determined by the interaction of both external resources and internal characteristics of the firm(Bharadwaj, 2000; Priem & Butler, 2001). From the literature on SMEs, innovation source has mainly concentrated on

testing the impact of a particular environmental source which is either internal or external (Dodourova & Bevis, 2014; Sammarra & Biggiero, 2008). Following the literature closely, it has been observed that few studies have indeed attempted to examine the effects of the interaction between the external and internal factors on the innovation performance ofSMEs(Chang, Hughes, & Hotho, 2011). However, the complimentary role and the interaction of customer input, network cooperation, R&D intensity, the complex and uncertain nature of the environment have largely been ignored in the study of the effect of the environment on the telecommunication SME innovation in Ghana. This study will attempt to address that research gap. Whiles generalization may apply in this regard, the Ghanaian context may reveal some unique environmental SME innovation characteristics.Thus, guided by the resource based view,this study seeks toempirically investigate into the main effects of the interaction between both the external and internal sources of the environment as well as the effects of the uncertainty and the complexities of the environmenton the innovation performance the telecommunicationSMEs in Ghana.The objective of this study therefore is to investigate the influence of the environment in the organisational innovation performance. All hypotheses will be tested using a data from the Ghanaian telecommunication industrial cluster.

II.   THEORETICAL FRAMEWORK AND THE HYPOTHESES

1.1. Introducing the resource based view approach

The underpinned theory behind this study is the resource based view approach of analysing firms' external and internal environment in relation to organizational innovation performance. This theory holds that firms possess a valuable bundle of resources and capabilities as well as other factors that can have superior effects on firm innovation performance (Sirmon et al., 2007). Resource capabilities are represented by bundle of environmental factors, abilities and accumulated knowledge that enable the firm to achieve a desired outcome (Lavie, 2006). Sirmon et al. (2007), describe information and knowledge as increasingly valuable firm resources and dynamic capabilities. The study therefore adopts the resource and capability-performance framework to analyze the effect of the firms' environmental uncertainty and complexities of both the external and internal sources and their resulting capacities and capabilities on SME innovation performance by focusing on customer input in providing information on customer needs and experiences, cooperative networks in transmitting resources and capabilities and R&D intensity in cultivating R&D capability and absorptive capability.

In the view ofJiménez-Jiménez and Sanz-Valle (2011); (Walker, 2008), organizationalinnovation is the creation and the implementation of new ideas by an organisation in response to the environment changes. Various types of innovation has been found in the SME innovation literature (Dahlander & Gann, 2010). Classical among these types of innovation are: the radical innovation which is related to the production of major changes in a firm's innovation performance: the incremental innovation type which causes a slow and lower pace of change in the firm's innovation activities: the technical innovation that refers to the changes in products and services as well as technology(Chesbrough, 2006; Hollen, Van Den Bosch, & Volberda, 2013).

Fig 2: A table depicting the various dimensions of innovation by various authors

The innovation type	Author
Disruptive innovation	Yu and Hang (2010)
Product and process innovation	Pearce and Ensley (2004)
Radical and incremental innovation	Song and Thieme (2009)
Technical and administrative innovation	Ibarra (1993)
Compatible, incompatible, compatible-radical, incompatible-incremental	Sok and O'Cass (2011)

Source: Author

1.2. Customer input and innovation performance

The input of customers as a reflection of a firm's innovative capability is an important source of a firm's competitive advantage on the market place (Salunke, Weerawardena, & McColl-Kennedy, 2011). Thus, in an attempt by firms to ensure total satisfaction of their customers at any point in time, they rely mostly on customer input which provides vivid information about customers' needs and experiences and by that firms can leverage this resource in their innovation processes (Mahr & Lievens, 2012). A major customer input identified in firm's innovation process is usually referred to as the "voice of the customer" (VOC),(Griffin & Hauser, 1993). They refer to VOC as "a hierarchical set of customer needs where each need or set of needs has been assigned to a priority level which indicates its importance to the customers.An effective means of unraveling customer needs in order to capture their inputs by firms is to directly ask them what they want a new product or a service to do for them at a particular point in time(Annacchino, 2011). The identification of customer needs and the ability of firms to translate these needs into new innovative products can increase the chance of firm's success in new product development as well as the survival rate of the firm on the market(Veryzer & Borja de Mozota, 2005).It

has been observed by Trott (2008)that firms with the highest level of customer input always deploy VOC throughout the entire process of new product development process, including idea generation, product design, manufacturing and service delivery.Thus engaging and learning from customers can accelerate the speed of innovation and reduce uncertainty surrounding new product development which improves the innovation performance of SMEs(Kessler & Chakrabarti, 1999). Thus customer input has a positive effect on the innovation performance of SMEs.

1.3. Cooperative networks and innovation performance

One most valuable external factor for firms' innovation performance is network cooperation(Zeng, Xie, & Tam, 2010). This is due to the fact that networks transmit new knowledge, information and new technology among firms in the network(Coe, Dicken, & Hess, 2008). Firms that take advantage of network collaboration gain additional resources and assets that lead to better innovation performance(Nieto & Santamaría, 2007). Collaborative networking has a significant potential to reduce the risks that SMEs face and increase the chances of enhanced innovation performance of firms(Coe et al., 2008).

A cooperative network system may consist of such players as research institutions, professional and technical centers, clients, suppliers, educational institutions as well as government agencies. Some benefits that cooperative network provide for SMEs include helping them to improve on their competitiveness by providing technical assistance, expose them to market requirements and providing vital market information regarding strategic choices made by other firms(Di Gregorio, Musteen, & Thomas, 2009).Networking with informal governance institutions in Sub-Saharan Africa has proven to yield more innovation performance(Spielman, Ekboir, & Davis, 2009). Inkpen and Tsang (2005), noted that network size and tie strength are two most important dimensions of social network offering different benefits. In SME literature, most studies report that tie strength often functions as a multidimensional construct including the duration of the tie, contact frequency and emotional closeness(Mittal, Huppertz, & Khare, 2008). Bae and Insead (2004), define network size as the number of partners in the cooperative network. Most studies in the literature report that both the size and the number of cooperation partners greatly impact on firm's development of new products due to the fact that the more partner connections a firm has in the network, the more information knowledge source that are available to it(Nieto & Santamaría, 2007).

Network duration is another construct that represents the continuity of collaboration among firms(Rivera, Soderstrom, & Uzzi, 2010). Continuing network collaboration for a reasonable long period by firms has a positive impact on firms new product innovation processes(Nieto & Santamaría, 2007). A number of studies have assessed the network duration by using the length of network experience(Thorgren, Wincent, & Örtqvist, 2009). It is therefore imperative for firms to tap into the in-depth key external sources like network collaboration with other partners for the success of their internal innovation processes (Van Wijk, Jansen, & Lyles, 2008). In view of the aboveit is clear that the size of the cooperative network has a positive effect on the innovation performance of SMEs.

1.4. The role of R&D

Most firms regard R&D as the most important internal factor of innovation(Balachandra & Friar, 1997). Many studies indicate that to produce innovative products or services, firms are required to make a huge amount of investment in R&D (Balachandra & Friar, 1997). The intensive nature of firms R&D activities reflects the extent to which it put premium on strategic innovation (Arora, Ceccagnoli, & Cohen, 2008). The result of the intensive nature of firm's R&D is normally the development of a firm's innovative knowledge and capabilities(Mol, 2005). According to the resource based view, firms must properly organise themselves to make efficient and effective use of the rare, unique and valuable resources that they possess(Hämäläinen & Schienstock, 2001). Santamaría, Nieto, and Barge-Gil (2009), opined that larger firms usually rely on formal market research carried out internally as their main source of innovativeness whiles small firms usually depend on external source such as customers for their innovative ideas. Various writers suggest that the intensity level of a firm's R&D has a positive effect on an organization's technological innovation capabilities(Lin, Lee, & Hung, 2006). SMEs with high intensity level of R&D thus are more likely to possess more competences in sourcing, gathering and implementing innovative ideas from customers which consequently influence SME innovation whereas SMEs with low level intensity of R&D are less likely to implement effectively information from customers (Zeng et al., 2010). This therefore presupposes that the intensity level of firms R&D as an internal factor has a positive relationship with firm's innovation performance denoting that the relationship is stronger when the intensity level of R&D is higher and vice versa.

1.5. Influence of the uncertain and complex environment on organizational innovation.
We found in the literature review that other factors that affect the innovation performance of SMEs are the uncertain environment and the complex environment which influence mainly technical innovation.Daft (2012), indicated that, since a change in the environment impacts on the organizational behaviour, firms will be better positioned by considering better organisational designs that can cope with such changes. Research has shown that for firms to be able to create and transform new ideas into products that will create demand in the marketplace there is the need for a high level of inter-functional cooperation and integration(Swink & Song, 2007).Tsuja and Mariño (2013), noted that some important characteristics of innovative organisation are that: they have flexible organisational structure, they promote diversity of opinions and have specialists rather than generalists who make decisions with regards to the organization's innovation.

1.6. Hypotheses
H1: Customer input has a positive effect on the innovation performance of SMEs.
H2: The size and duration of the cooperative network have a positive effect on the innovation performance of SMEs.
H3: The intensity level of firms R&D as an internal factor has a positive relationship with firm's innovation performance.
H4: An increase in theuncertain environment generates an increase of firm's organizational innovation.
H5: An increase in the complexity nature of the environment generates an increase of the technical innovation of the firm.

III. CONCEPTUAL FRAMEWORK

The interaction of the external (macro) and internal (micro) environment of a firm for innovation
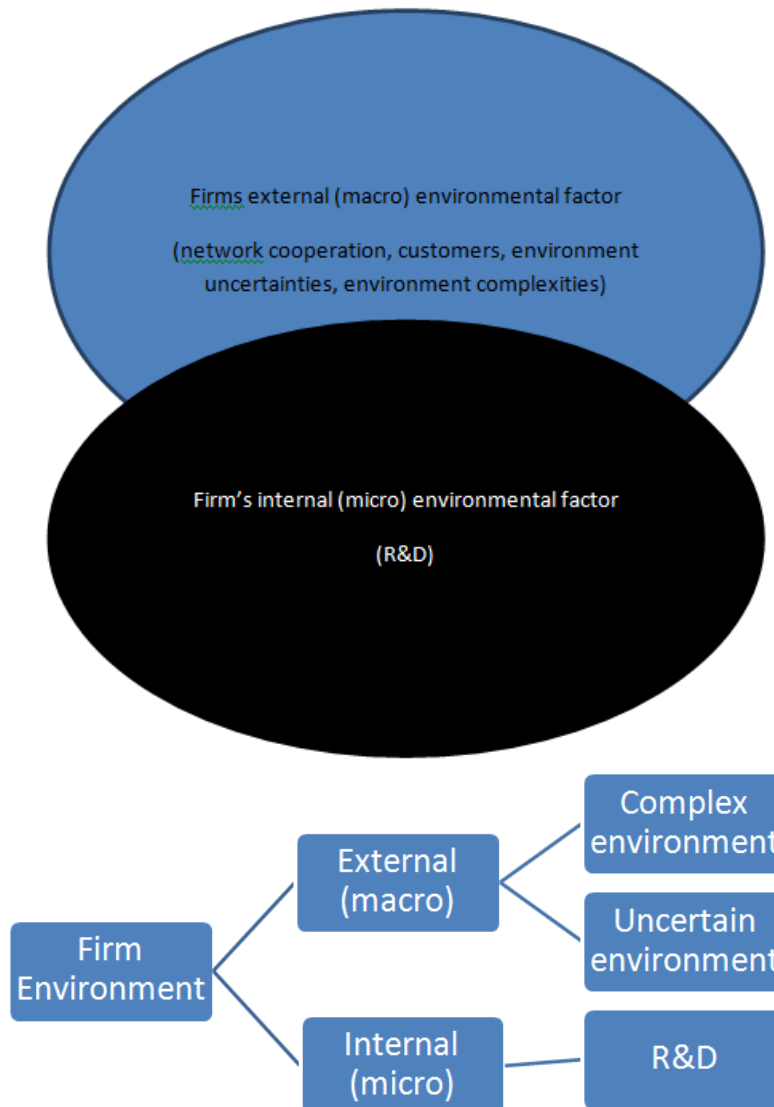
IV. THE STUDY METHODOLOGY

This research investigates and analyses the external and internal environment of SMEs in the telecommunication industrial cluster in Ghana. The telecommunication cluster was selected because the sector employs a sizable number of the population especially the youth although an exact number and the percentage to the unemployment rate in the country was not immediately available. The sector is also growing at a faster rate and acts as an important driver for the growth of the Ghanaian economy with an estimated annual growth rate of 8% in the past six years. The sector contributes about 2.3% of the country's annual GDP (Ghana Statistical service report 2015).

The study took a sample of 31 companies in the telecommunication cluster in Ghana.These firms are made up of communication voice service providers (VSPs), internet service providers, mobile phone manufacturers and sellers, communication banks, training institutions, research institutions and other auxiliary service providers in the industry whichare all located in the Ridge communication cluster in Accra. We selected SMEs in the cluster with more than 30 but less than 100 employees. This size used as our selection criterion was based on the American Small Business Administration (ASBA) definition of SMEs. This criterion has widely been used in the SME literature. It must be emphasised that although the measure of defining SMEs vary among various authors in terms of firm size, number of employees, annual revenue etc., scholars writing about SMEs in Ghana often use the ASBA definition.

Data was collected through the use of both a live interview survey and questionnaire of 109 top executives, operational heads and unit managers. The main advantage of the live survey compilation procedure was to allow the evaluation of the fitness of respondents to the study. It also gave the respondents the opportunity to explain some gray areas about the object of the study. All the 109executives were given questionnaires to answer whiles 52 out of the 109were interviewed as well. These executives occupy key positions with regards to the firms' innovation activitiesand the questionnaire allowed them some form of flexibility and independence of answering the questions devoid of the biases usually exhibited in the presence of the interviewer. All the 109 questionnaires that were administered were correctly filled and obtained: thus, a response rate of 100%. The respondents were selected from different hierarchical levels of the various firms and consisted of 12 Chief Executive Officers (11%), 18 general managers (17%), 21 departmental heads (19%), 17 supervisors (16%), 19 system analysts (17%) and twenty production engineers (20%). In all, it took four weeks to collect all the information taking cognisance of ensuring that there would be avoidance of significant differences between the first and the last respondents.

1.7. Instrument of measurement

The main instrument of measurement for the study was questionnaire. Thus, questionnaire was designed to cover and evaluate all the variables of the study. These variables are thus: customer inputs to the firm's innovation activities, the role of R&D to firms' innovation, the cooperative network, the uncertain environment and the complex environment of the firm. Questions on the variables were based on the work of different authors and were thoroughly explained for the purpose of this study. The concepts ofOlson, Slater, and Hult (2005), as well as Bharadwaj (2000), were considered for the work on the environment. With regard to organisational innovation, we considered the views held by Jansen, Van Den Bosch, and Volberda (2006). On customer input, we considered the work of Griffin and Hauser (1993) known as the "voice of the customer" (VOC) as well as the concept of Brentani (2001) who stated that a firm's previous experience with customers may generate both incremental and radical innovation. On the issue of network cooperation, the work ofZou, Zhu, and Zhang (2013) was considered.On the issue of R&D the study relied on the works ofEnkel, Gassmann, and Chesbrough (2009).

In order to validate and also elaborate on the measurement instrument, the following steps were taken.
a)   A thorough review of the definition of each environment dimension. b). the elaboration of the new instrument proposal, c) review of the questionnaire assisted by a survey specialist, d). Conduction of a pilot test to check the reliability and the validity of the instrument.
All the interviews and questionnaires were in English since all respondents could speak and read English fluently.

1.8. Measurement.

We suggested in the investigation a data collection instrument i.e. questionnaire that collects perspective answers about how the various variables behave. Using the perspective answers is quite important since it permits the researcher to compare results among different subsectors. Concept of questionnaires with perspective answers is modeled on the application of Peterson (2000) and (Schwarz, 1997). In doing the

measurement, we used an average of the items composed of each variable. The Liker scale of five points was used in presenting the questions.

Environment in this study is defined as "the changes of the uncertain and complex; external and internal factors that affect the organization"(Calantone, Garcia, & Dröge, 2003). Crossan and Apaydin (2010), referred to uncertain environment as "frequency of change of external variables that affect the organization". These variable are customers, competition and technology", whiles they defined the complex environment as "the amount of external variables that affect the organisation such as customers, competition and technology. Each of the environment dimensions was measured by the average of the questions composing it.

1.9. Measurement of variables
Customer input:We measured this variable based on a four-point scale representing the level of customer involvement as stated by respondents.1. Repeatedly collecting market information on current customer needs and wants through a customer satisfactory survey and reporting same to the R&D department. 2. We always deploy customer inputs throughout R&D, design, manufacturing and service delivery. 3. Collection of information regularly on customer needs and wants on marketing practices and delivering a report to the R&D department. 4. We hold cross-functional meetings regularlyto discuss and clarify ideas for new products and services.

R&D intensity: this variable was measured by the R&D expenditure by firms divided by the total sales of firms in a given year.

Cooperative networks: this variable as seen in the study has two dimensions. Thus, network size and duration. We measured network size by the number of partners the firms have cooperation with in terms of technology and expertise. These partners included educational and research institutions, customers, suppliers, government agencies etc. Network duration on the other hand was measured based on four different levels of network engagement. These are: 1. Co-development of new products and services with partner firms in the network. 2. Regular cooperation with partner firms in the network in technical or professional assistance for less than a year. 3. Provisional cooperation with network partners sustained for less than one month. 4. Co-development of new products and services with partner firms in the network sustained since the establishment of the firm.

Innovation performance: this was measured by the frequency of the introduction of new products on to the market and the revenues accrued from these new products and services which were calculated by averaging revenues over a given period of time.

V.   RESULTS
1.10. Descriptive Statistics: Firm age, Firm size, Customer input, network size, network duration, R&D intens ity, UNCE, CPXE.

Table 1:

Variables	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Firm age	2.275	0.103	1.079	0.000	1.500	2.000	3.000	4.000
Firm size	2.294	0.117	1.219	0.000	1.000	2.000	3.000	4.000
Customer input	2.138	0.118	1.228	0.000	1.000	2.000	3.000	4.000
Network size	2.330	0.114	1.187	0.000	1.000	3.000	3.000	4.000
Network duration	2.083	0.120	1.248	0.000	1.000	2.000	3.000	4.000
R&D intensity	2.211	0.119	1.240	0.000	1.000	2.000	3.000	4.000
UNCE	10.440	0.244	2.547	4.000	8.500	10.000	12.500	16.000
CPXE	6.872	0.188	1.968	3.000	5.000	7.000	8.000	11.000

Note: firm age and firm size were in order of a range that were assigned weights in the following order:
0-1 = 0, 2-5 = 1, 6-8 = 2, 9-10 =3, 11 and above = 4

Note: UNCE represents the aggregate of factors constituting *'uncertain environment'*.
      CEXE represents the aggregate of factors constituting *'complexenvironment'*.
The means of all the variables as shown in table 1 are negatively skewed indicating that they all contribute to the innovation performance of firms in the telecommunication cluster.

Table 2: mean, standard deviations and correlations

VariablesMean S. D1   2   3   4   5   6 7 8
1.   Firm age2.275 1.079
2.   Firm size   2.294 1.219   0.001
3.   Cust. Input2.138 1.228   0.0620.022

4. Network size   2.330 1.187 -0.043 0.163 -0.082
5. Network durat. 2.083 1.248 0.1750.081 -0.158 -0.150
6. R&D intensity2.211 1.240   0.032 0.044 -0.098 -0.016 0.036
7. Uncert.Env't10.440 2.547   0.090 -0.0330.057 0.022 0.096   0.017
8. Complex Env't6.872 1.968 -0.009 0.135   0.042   0.034 -0.158   -0.012   -0.162

N= 109

The mean, standard deviations and correlations of the variables are presented in table 2. From the table, the correlation as shown indicate that customer input, network duration, firm age and uncertain environment are all positively related to innovation performance (r = 0.018, r = 0.04, r = 0.081, r = 0.020) respectively. However, firm size, network size R&D intensity and complex environment are negatively related to firm innovation performance (r = -0.123, r = -0.025, r = -0.031 and r = -0.096) respectively. This therefore calls for management of the various firms to conduct further investigation to find out what causesthese inverse correlations of the variables.

Results of regression analysis predicting the innovation performance of telecommunication SMEs
Table 3:
Variables

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Term              Coef   SE Coef  T-Value  P-Value   VIF
Constant          9.29     1.37     6.76    0.000
Firm age          0.134    0.180    0.74    0.459    1.05
Firm size        -0.183    0.161   -1.14    0.257    1.07
Customer input    0.035    0.160    0.22    0.828    1.07
Network size      0.010    0.166    0.06    0.951    1.08
Network duration  0.049    0.163    0.30    0.765    1.15
R&D intensity    -0.044    0.154   -0.28    0.778    1.02
UNCE             -0.0054   0.0763  -0.07    0.943    1.05
CPXE             -0.0754   0.0999  -0.75    0.452    1.07
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Regression Equation
INNOVATION = 9.29 + 0.134 Firm age - 0.183 firm size + 0.035 customer input + 0.010 network size + 0.049 network duration - 0.044 R&D intensity - 0.0054 UNCE - 0.0754 CPXE

As reported in table 4, customer input contributes positively to innovation performance as seen in the model. Firm size and firm age have stronger predictive strengths in the model than customer input. This supports our hypothesis 1. As can be seen in table 3 both network size and network duration were significant in predicting firm innovation performance as their contribution to innovative performance was positive in the model. Thus hypothesis 2 is supported. However, it was realised from the model that R&D intensity and uncertain environment contribution contribute negatively towards innovation performance which is quite alarming, although the correlation between the two variables is positive as seen in the table of correlations. This may be due to interaction among the predicting variables in the model since these predicting variables are all competing in the same model for the interpretation or prediction of innovation performance. Thus, in the model there exist an inverse relation between innovation performance and R&D intensity as well as uncertain environment suggesting an inverse contribution to innovation performance, thus, hypotheses 3 and 4 were not supported.

Note: it must be observed that the result revealed two interesting scenarios. Thus, the uncertain environment variable shows a positive correlation (r = 0.020) on firm innovation performance whiles it shows a negative contribution (-0.0054) on the regression coefficient as shown on table 3. Also, with regards to network size, the variable shows a negative (-0.025) relation to innovation performance while it indicates a positive contribution (0.010) to innovation in the regression analysis. In view of this, we recommend a further detailed analysis on these two variables to ascertain their unusual behaviours. It must be noted however that their behaviour only change to negative when they form part of the general analysis but when they are measured alone against innovation they show   positive relationship to innovation performance both in regression and correlation analyses.

1.10.   Discussions
Relying on the resource-based view, the study has revealed that the interaction between the external source and the internal environmental source of the firm has a major effect on innovation performance of telecommunication SMEs in Ghana. The study further showed that customer input, network duration, firm age

and uncertain environment are all positively related to innovation performance of Ghanaian telecommunication SMEs. The study however revealed that, firm size, network size R&D intensity and complex environment are negatively related to the innovation performance of telecommunicationSMEs in Ghana.

Environment variables being complex or uncertain influence organizational innovationNaranjo-Gil (2009) and that innovation helps SMEs to better respond to the changes in the environment. With the analysis of the environment dimensions, the study showed that the uncertainty of the environment has a significant impact on technical innovation of telecommunication SMEs in Ghana.Thus, the more changes and uncertainty that firms perceive in the behaviour of competitors, customers and technology, the more importance they attach to the innovation of new products, services and processes.

VI.   CONTRIBUTIONS OF THE RESEARCH

The entire study makes a good contribution to the SME innovation literature especially as it reveals some unique characteristics in a developing country as Ghana. The results of the study have showed that customer input referred to as VOC, plays a crucial role in the firm's innovation activities and has a greater positive effect on the innovation performance of Ghanaian telecommunication SMEs(Griffin & Hauser, 1993; Marasco, Masiello, & Izzo, 2011). The study further reveal that information on customer needs and wants is a valuable resource that firms can use to leverage their innovation activities(Davenport, 2013).

On the role ofcooperative network, the study focused its attention on the impact of the twodimensions of the cooperative network, i.e. network size and network duration on the innovative performance of Ghanaian telecommunication SMEs. It must be stated however, that previous studies have examined the relationship between cooperative network and product innovation, this current study reveals major significant differencesabout the Ghanaian telecommunication SMEs (Abor & Biekpe, 2006; Asare, Gopolang, & Mogotlhwane, 2012).One significant difference is that we included in our definition the broader scope of technological cooperation. It must be observed that cooperative networks and other network partnerships and alliances may play different roles in different national economies. In this regard, we observed in the study the Ghanaian usage known in the local network parlance as *"nnoboa"* to wit one helps another to accomplish a project so that they receive help in return.This practice according to the industry practitioners helps keep the strong bond in the network partnership. The results of the study again indicate that the size of the network is positively related to the innovation performance of the Ghanaian telecommunication SMEs. This wasdue to the fact that the more the number of firms in the network the better quality information and other auxiliary assistance received from the members of the network.

The study further revealed that cooperative network duration is positively and significantly related to the innovation performance of the Ghanaian telecommunication SMEs. Earlier research by authors on cooperative duration has examined the impact of tie strength on firms' innovation activities such as new knowledge exploitation(Kotabe, Jiang, & Murray, 2011). In our current study, we paid attention to network duration. The results of the study therefore showed that there is a significant relationship between longer network duration and innovation performance of telecommunication SMEs in Ghana. Longer network duration encourages and helps to facilitate the cultivation of high trust and quality relationship with the network partners which in the end leads to the exchange of greater quantities of tacit and complex knowledge necessary for innovation. The findings in this regard point to the fact that a long lasting healthy network cooperation provides new knowledge necessary for firm's innovation performance over a long period of time(Rothaermel & Hess, 2007).

Finally, by focusing on the R&D intensity we can establish from the study results that R&D intensity being a factor that represents firms' internal innovational strength and capability is indeed a critical measure to the innovation performance of the Ghanaian telecommunication SMEs.

1.11.   Managerial implications.

This study provides real management insights for management practitioners in the Ghanaian telecommunication sector who want to improve upon the innovation performance of their firms. Thus, in engaging customers through the use of the 'voice of customers' (VOC) model throughout their innovation processes, managers will be able to tap into the knowledge experience of customers about their products which ultimately helps to boost the firms' marketing capabilities leading to the enhancement of firms competitive advantage on the market.It is therefore incumbent on managers of telecommunication firms in Ghana to pursue the 'VOC' concept so as to recognize the value of customer inputs which as found in our findings is highly related to SME innovation performance especially the smaller firms. Managers having realized the great value of VOC, must also put measures in place that will motivate the R&D staff to capture customer needs regularly and translate them into the design and the actual production of their products or services that leads to the leveraging of their job

satisfaction and involvement of R&D innovation project initiatives(Antoncic & Antoncic, 2011). The study also revealed that a longer period of network duration with cooperative network as well as the bigger size of the cooperative network enhances the innovation performance of Ghanaian telecommunication SMEs. Managers of these SMEs must therefore endeavor to establish a long term partnership with network partners in order to build long term trust and acquire deep external knowledge, information and other precious firm resources. Engaging with network partners enhances firm's capabilities in establishing technical cooperation with these partners that ensures tacit technological knowledge exchange.Managers of telecommunication SMEs mustprioritize technical innovation when they perceive uncertainty in the environment. Managers must also take into account that the types and sources of firms' innovation are not necessarily independent and that they are interrelated as such their exploration must be continued. According to Frishammar, Florén, and Wincent (2011), the perception of the magnitude of the complexity of the environment results in technological innovation which also helps to promote organizational effectiveness.This may result in an effective way of firms introducing innovative products and services into the market of emerging economies such as Ghana.

The findings of this study have clearly shown that the integration of both external and internal resources of a firm leads to a greater improvement of firm's innovation activities. In this regard, managers should take cognisance of the fact that, they should not only concentrate on the establishment of good rapport with external sources such as customers and network partners to acquire the necessary and quality knowledge but also make good use of their scarce internal resources such as R&D to promote innovation projects. It is observed that Ghanaian telecommunication SMEs sometimes outsource and adopt external technologies in their innovation projects, its contribution has not been generally as significant as that of internal R&D (Tiwari & Buse, 2007). According to (Sher & Yang, 2005), a firm's R&D employees usually influence the firm's product development capability as such managers of firms should consciously invest into the human resource capacity of the R&D department to ensure commitment to developing competitive product strategies.

1.12.   Limitations of the study
The study consists of a sample size from the Ghanaian telecommunication SME sector alone and that makes it industry specific which serves as a constraint of the generalizability of the results of the study.Again, the sample was taken from Accra, Ghana which makes the study a regional bias. Although, Accra is the main economic and commercial hub of Ghana, it is important for other researchers to investigate the phenomenon in other cities in Africa and possibly other developing countries.

The study is further limited in scope since it only considers such environmental variables as internal and external resources such as network size, environment complexities and uncertainties as well as customer inputs. It is therefore recommended that future research should examine the different types of external environment resources such as alliances, joint ventures and outsourcing in firm's innovation activities and processes. Also firms' internal resources such the administrative structure and the human resource capabilities must be well examined as a critical internal resource of the firm.

1.13.   Conclusion.
This study draws on the concept of the resourced based view of the effects of firm's external andinternal environment on SME innovation performance in the telecommunication SMEs in Ghana. The study focused mainly on customer input in providing the necessary information on customer needs and experiences, environment complexities and uncertainty, cooperative networks in transmitting network information and capabilities and the intensity of R&D which drives the internal innovation capabilities of the firm. These factors were examined using Ghanaian telecommunication SMEs as a case study.The results revealed that the size and the duration of the network positively impacts on the innovation performance of the telecommunication SMEs in Ghana. The results also showed that the intensity nature of firms R&D has a positive relationship with the innovation performance of telecommunication SMEs in Ghana. Again, the results of the study has proved that customer input in the form of providing information on customer needs as well as their usage and consumption experiences positively affect the innovation behaviour of telecommunication SMEs in Ghana. Finally, the findings of this study provide a number of significant research and managerial implications and lessons especially for managers and writers on firms' innovation performance especially in the context of telecommunication SMEs in Ghana and emerging economies in general.

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