CHAPTER 6

OPEN INNOVATION AND CO-OPETITION IN ICT:
THE MODERATING EFFECT OF COMPETITIVE INTENSITY
6.1. Overview

In the Telecom or ICT (Information Communication Technology) industry, firms are both competing and cooperating with each other. They are launching services jointly, and sharing subscribers, bandwidth, infra-structure, etc. to improve their performance. When a Telco firm launches services jointly with other Telco and Information/Media Service Providers, it is engaging in Open Innovation and Co-opetition (or Coopetition). Does competitive intensity improve or weaken the performance of Telcos in such collaborations? This chapter explores empirically the moderating effect of competitive intensity on the relationship between a Telco Firm's business performance and Open Innovation Strategy in Coopetitive collaborations. MDS (Mobile Data Services) parameters are used to estimate Open Innovation; Herfindahl-Hirschman's Index for competition.

The key findings are as follows:
Globally, Competition has a positive influence on the relationship between Open Innovation strategy and the Telco Firm's performance. In other words, with increasing competition, the relationship between Open Innovation Strategy and the Telco firm’s performance does not weaken, but remains strong. The results have been found to hold regardless the country or size of the Telco firm (above a certain size of about 1.5 Billion USD).

6.2. Introduction

Open Innovation (Chesbrough, 2003) is defined as innovation done across the boundaries of an organization, in both directions, i.e. innovation done with purposive inbound and outbound flows of ideas. In this thesis, Open Innovation is used as a term used to collectively represent active collaborations with partners outside the boundaries of the Telecom Service provider organization. These partners could be Information and Media companies or other Telcos. The ICT (Information and Communications Technology) industry has become increasingly complex and competitive, and the products and

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12 Coopetition: Collaboration between business competitors, in the hope of mutually beneficial results.
services have become sophisticated (Sato, 2009). The R & D, production, distribution and consumption of these products and services need breadth and depth of capabilities across the vast spectrum of domain knowledge, technologies, innovation, and partnerships (complementary capabilities) (Al-Debei et. al. 2013; Henttonen et al., 2011). As it is difficult for any organization to constantly stay at the forefront in all these areas at all times, firms focus and specialize in creating value in specific areas, which are their core strengths, while collaborating in all other areas (Bigliardi, Dormio and Galati, 2012). There is increasing focus on open innovation and partnership collaboration for reducing time to market as well as for lower cost of integration, converging industries and dropping margins and price on existing services.

Closed Innovation is done within the confines of the organization, such as in an in-house R&D division that produces ideas and patents that can be used by the marketing and delivery divisions of the company (Chesbrough, 2003). Closed Innovation is severely constrained by several factors such as the talent pool the organization can deploy, availability of expertise in different domains, protracted reaction time to the changing conditions in the market, quantum of risk a single organization can undertake, marketing wherewithal, hierarchy of the organization, technological capabilities, etc.

Telcos themselves have divisions or subsidiaries that develop and provide Value Added Services and relevant software in Information, Technology, Media, and Entertainment areas. For e. g. KDDI has dozens of subsidiaries like AU, Nanapi, Mediba, Jibun, WebMoney, etc.; Bharti Airtel has Bharti Telesoft; SK Telecom has TU Media Corp and SK Communications; Tata Communications has Tata Teleservices; Oi has Oi TV and Oi Voip; Vodafone has Vodafone Global Enterprise; BT has BT Global Services; Etisalat has Etisalat Services Holding; Verizon has Verizon Enterprise Solutions and Verizon Partner Program, etc.

Hence Telcos have morphed into ICT (Information Communications Technology) and CME (Communications, Media and Entertainment) companies. When they collaborate with other Telcos or with pure Value Added Services Provider or with pure Media/IT companies to launch services jointly, they are essentially engaging in Coopetition (Competition and Collaboration on
different fronts at the same time) and Open Innovation. The question is whether these collaborations are really fruitful, in the background of competition, or would the Telcos have been better off launching the services on their own, using their own internal resources and subsidiaries. What effect does competitive intensity in the industry have on the performance of these collaborations (as measured in the Telco firm's performance)?

The theoretical framework for the new generation of Telcos indicates that Services Innovations are the top of the pyramid of a Telco Operator, and the innovations at the various levels serve to produce better Business Performance (Sato, 2008; TMF). Mobile Data Services based Value Added Services are the key to the revival and growth of the Telecom sector (Kelen A., 2005) in the new competitive era. Open Innovation has a positive impact on Telco Firms' performance (Bigliardi, Dormio and Galati, 2012). However there are practically no empirical studies on the effect of intensity of competition on the performance of Open Innovation and Coopetition in the Telecom industry. This thesis examines addresses the empirical research gap and examines how competitive intensity moderates the relationship between Open Innovation (with Coopetition) on one hand and the Telco Firm's performance on the other. Again, as in the basic model presented so far, the scope of the study is global in context.

This research verifies the hypothesis that while Open Innovation improves the performance of Telcos, competition maintains a positive effect on Open Innovation's impact on Telco Firm's Performance. Two years of data from Telcos world-wide was studied by analyzing the Telcos in terms of their size, country of operation, degree of open innovation, kind of services offered, revenue sharing with partners etc. The overarching theory of Open Innovation has been verified and validated in several industries over the past decade (Fasnacht, 2009), but in the coopetitive ICT industry it is all the more important now to study the impact of Competition on the effectiveness of Open Innovation. If leveraged well, Open Innovation can play a significant role in the revival, transformation and growth of the Telcos (Rohrbeck, 2009) despite the competitive environment.
6.3. Dimensions of Competitive Priorities

Leong et al. (1990) define competitive priorities as a consistent set of goals to gain competitive advantage. Competitive priorities are strategic preferences or the ways in which an organization chooses to compete in the marketplace (Hayes and Wheelwright, 1984). There are four dimensions to competitive priorities—low cost, quality, delivery performance, and flexibility (Ward et al., 1998; Berry et al., 1991; Skinner, 1969). The fifth dimension to competitive priorities is innovativeness (Leong et al., 1990). Firms enter into collaborations with external organizations to improve innovation, decrease time to market, reduce the costs of internal integration, improve efficiency, and focus on joint opportunity recognition (Moffat and Archer, 2004). This is the essence of Open Innovation. The question is whether the collaborations which are in the nature of Coopetition also yield the desired benefits. The competitive priorities are now examined in detail.

6.3.1. Cost

With intense competition and declining revenue margins for services and in the Telecommunications/ICT industry (Sato, 2009), there is pressure on the bottom-line. Hence the need to lower costs for two reasons, competing in the market on price, as well as for improving margins. Although cost is an important competitive priority, most firms do not compete solely or even primarily on this basis (Ward et al., 1998). Competition causes firms to seek lower cost options without compromising on quality, e.g. lean operations, Information Technology, automation, lower cost partners and vendors, outsourcing, etc. Open Innovation can help find partners (even in competitors) who can optimize cost structure without compromising on other vital dimensions. For e.g. Telcos in a country share infrastructure, such as cell phone towers or mast sharing or co-location (MOA UK; GSM), or sharing spectrum (FCC, 2005; APT 2012). In the context of launching new Mobile Data Services, they can share optimize costs on R & D, processes, infrastructure, marketing and deployment due to economy of scale.
6.3.2. Quality

Garvin (1987) has defined Quality as having eight dimensions: performance, features, reliability, conformance, durability, service-ability, aesthetics, and perceived quality. In the context of Telecom, to measure the service quality of basic services (telephony and network) provided to the users, several aspects of the network service are considered – error rates, congestion, bandwidth, throughput, transmission delays, jitter, availability, control policies, etc. (ITU). To ensure compliance with the dimensions of quality, firms use concepts like TQM, Six Sigma, ITIL, and CMMi to ensure that service quality is maintained at a certain acceptable standard. With unbundling of the infrastructure (e.g. the network) and the Services, Open Innovation provides opportunities to collaborate with partners for providing superior quality services to customers (Sato, 2009). Coopetition brings together the best of breed quality processes and critical thinking from the different organizations, because each organization not only serves its subscriber base with the new services launched, but also has a chance to get a share of revenue from the coopetitors' subscriber base.

6.3.3. Delivery Performance

This is measured against SLOs (Service Level Objectives) and SLAs (Service Level Agreements) drawn up with the retail and enterprise users. Beyond a level of assured quality, the Telco firm attempts to differentiate itself in the market through superior and speedy delivery of services. Customer experience and satisfaction are assured, tracked, and measured through various mechanisms and processes – e.g. OSS/BSS Software, support organizations and portals, feedback, product management, etc. This is often a driver of continuous improvement and innovation. The TeleManagement Forum (TMF) defines a framework called Frameworx which helps Telcos manage their business. This is described in detail in a different section. Due to the standardization, well defined interfaces and loose coupling, Telcos may integrate product, solution and services offerings from different vendors more seamlessly. This enables Open
Innovation to thrive and yield high benefits for delivery performance, as vendors with specialized know-how and expertise may be brought in or collaborated with for individual areas. Coopetition brings together complementary skills pertaining to delivery and expertise on customer experience. This is because each coopetitor brings experience from its own (different) subscriber base.

6.3.4. Flexibility

It is the ability of a Telco firm to respond to changes in the market, business environment, or in customer needs or preferences and adapt in an agile manner. This includes the ability to configure and customize services and products to changing customer needs and preferences in real time, as well as the ability to introduce new products and services to respond to the market's needs. Flexibility is dictated by the Enterprise Architecture of the Telco Firm, the agile practices and processes, and by the strategy of the firm with respect to collaborations with partners and vendors. Open Innovation enables high flexibility as the Telco firm can collaborate with a variety of partners (including competitors) to increase the richness of offerings and the speed-to-market.
6.3.5. Innovativeness

In this dimension, the competitive priority of a Telco firm is the constant ability to make evolutionary and revolutionary innovations to its products and services. This enables the firm to effectively differentiate its products and services in the market vis-à-vis its competitors. If the firm is able to capture the market with its unique offerings, then the firm gets a first mover advantage. The risk is that the market may not respond to the new offering, and the Telco firm incurs losses. The new offering can come from Closed or Open Innovation. In Closed Innovation, the entire risk is borne by the firm, but Open Innovation helps scan the industry for the best of breed ideas, technologies and abilities, increases speed in delivery, reduces costs and shares risks (Rohrbeck, 2009). There is scope for experimenting with new ideas without with minimal risk. Several Telcos, such as Telenor, BT, Vodafone, etc. have setup open labs or playgrounds, with the tools and environment, where partners can test out and experiment new services in the market on a pilot basis (Nesse, 2009; Sato, 2009). This is done to select and refine the successful services, which they can launch on a full scale in collaboration with the Telco. With Coopetition, the Telcos get richer opportunities to experiment on a much wider, mixed and complex subscriber base, in terms of geography, types of users, strata, etc. Hence, for all the reasons given above, in theory competitive intensity should maintain or sharpen Open Innovation's edge towards improving the Telco firm's performance. This study attempts to verify the hypothesis, by building a model and validating it empirically. The listed competitive priorities have been used in the model building in the following manner depicted in Table 6-1:
Table 6-1: Competitive Priorities as Used in the Model

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Competitive Priority</th>
<th>Used in the Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low Cost</td>
<td>• Efficiency measures – EBITDA per Employee and Revenue per Employee</td>
</tr>
</tbody>
</table>
| 2      | Quality              | • Revenue Sharing Arrangements with Partners – ensures that the best of breed ideas and processes in the market are implemented as all the parties have a stake in making the venture a success  
  • Global Innovative Index – Accounts for the capability of a country to produce high quality innovations |
| 3      | Flexibility          | • The Open Innovation Social Capital variables, Intrapreneurship and Ambidextrous Thinking  
  • Revenue Sharing Arrangements with Partners – ensures agility and flexibility in the market |
| 4      | Delivery Performance | • Performance measures – EBITDA per Subscriber and Revenue per Subscriber |
| 5      | Innovativeness       | • Open Innovation Strategy (used in the basic model, and the extended model that includes Competitive Intensity)  
  • Open Innovation Social Capital (used in the basic model in Chapter 5) |

6.4. The Indicator of the Degree of Adoption of Open Innovation Strategy

MVAS (Mobile Value Added Services) refers to the services offered by a Telco over and above its basic voice services. MDS (Mobile Data Services) offerings by a Telco constitute VAS. Mobile Data traffic and revenues from related services are growing rapidly, whereas voice services revenues are declining (TM Forum, ITU). The intensity of collaboration with MVAS partners can be measured by the Partner's Revenue split. The Value Added Service Provider Partner's Share for Telcos in a country are distributed with a tight spread due to the collective effect of regulation, competition, innovation environment, industry practices, etc. The Telco is intimately involved at every step in marketing, launching and operations of the service to the retail end-users and enterprise customers. The traffic flows through the Telco's networks, and the Telco tracks the end-User statistics, metrics and analytics for both enterprise and retail customers. There is a constant feedback loop to the VAS provider.
Then the Telco is the medium through which actual the consumption of the Service happens. The Telco is deeply involved at every step, right from the marketing of the Service to its consumption.

6.5. The Indicator of the Performance of Open Innovation

The success of MVAS partnership can be measured in terms of the business performance of the collaboration. Each year, the Telco may launch several services with each partner and bundle the services under different rate-plans. Hence specific collaborations and revenue streams are difficult to measure on account of the complexity and privacy of the contracts between the Telco and the Partner, different/changing durations or contracts etc. A Telco may be very successful with some MVAS services, and unsuccessful with some. Hence it is essential to see the sum total effect of all these MVAS services launched. The effectiveness of Open Innovation in the Telco, or the Performance of Open Innovation is measured by the following performance parameters of the Firm:

a) The MVAS Revenue per Subscriber— Indicates revenue at subscriber level, from the high-margin areas (Data/VAS). This is a direct consequence of Open Innovation activities. Higher MVAS revenue indicates successful Open Innovation. It also indicates increasing revenue in the high margin and growth area for the Telcos.

b) The Telco Revenue per Subscriber — Indicates overall mobile revenues per subscriber, wherein the revenues include voice and non-voice/data revenues. Indicator of overall salutary effect on the Firm. Also indicates the overall diffusion of benefits of OI to all the Telco subscribers and the value-capture.

c) The EBITDA per mobile Subscriber — Indicates Profitability per Subscriber

d) Total EBITDA — Indicates absolute Profitability and
e) The Total Revenue per Employee, which reflects the Efficiency of the Telco, in terms of employees needed to achieve the top-line

f) The EBITDA per Employee – The efficiency measure, in terms of Profitable Revenue measured at the Telco employee level

Note that in (b) the Total Mobile Services Revenue include Voice Revenues and VAS revenues. Voice Revenues are the basic Telco services, and it is presumed that they do not require (or represent) much innovative collaborations. As this is a global study, all monetary figures are adjusted using PPP (Purchasing Power Parity) to account for differences in currencies and their values.

6.6. The Indicator of Competition

Competition is a disruptive force, and the question arises as to how Open Innovation can thrive in a competitive atmosphere. The competitive intensity among Telcos within a country affects the performance of a firm. The focus of this study is to examine the impact of Open Innovation on a Telco firm's performance. Hence it is explored how competition among Telcos fits into this relationship. The measure of competition is taken as the inverse of Herfindahl-Hirschman Index (HHI) for Telcos. HHI is a measure of the size of firms in relation to the industry (DoJ-USA). It is proportional to the average market share, weighted by market share. The value of HHI ranges from 0.0 to 1.0 – spanning a spectrum in which the lower end indicates a large number of small firms in the market and the higher end indicates a single monopolistic firm. Increase in HHI indicates a decrease in competition. Hence the arithmetic inverse of HHI is taken as a measure of competitive intensity. It is found that competitive intensity maintains or strengthens the relationship between Open Innovation and Firm's performance, but does not weaken it.
6.7. The Indicator of Country Effects

Telcos in different countries face different innovation environments due to country-specific factors, such as: Regulatory Environment, Economic Development Index, Technological Readiness, Population, Number of Mobile connections (Subscriber base), Smartphone penetration, etc. To account for these country effects, the World Economic Forum's country-wise Global Innovation Index (GII), a score which represents the innovative capability of a country, has been taken.

6.8. The Construct and the Relationships

From the theory on Open Innovation, (Chesbrough, 2003), Open Innovation in Financial Services (Fasnacht, 2009), Network Innovation (Nambisan and Sawhney, 2008), the INNO-GRIPS 2008 Study on European Firms, and Open Innovation in Telcos (Sato, 2008), the following relationships can be hypothesized for Telco Services:

a) Open Innovation strategy plays a key role in the Telco MVAS play. The Revenue Split with VAS Providers (which is an indicator of the extent of Open Innovation) has a strong positive impact on all of the six performance parameters (Dependent Variables) described earlier.

b) Competition plays a positively moderating effect on the impact of Open Innovation on Firm's Performance.

c) Country Effect: The Global Innovation Index (GII from World Economic Forum) of a country has a positive impact on the Telco's Performance. The GII is used as an independent variable in the construct.
6.9. Defining the Focus

6.9.1. The Problem in Question

The concept of Open Innovation has been applied and verified successfully in several domains e.g. Open Innovation in the Financial sector (Fasnacht, 2009). In the Telecom (ICT) industry too, the theory has been supported through means of case studies and specific analyses (Raivio et al., 2011) (Bigliardi et al, 2012). However there are practically no empirical studies done to verify the role of Competition on the overall effect of Open Innovation strategy (in the context of Coopetition) on the performance of Telecom firms. The theories on Open Innovation define Open Innovation strategy as being an important component of the Open Innovation practices adopted by the Firm (Fasnacht, 2009). The research is about how Competition has a moderating effect on Open Innovation Strategy's impact on the Firm's Performance. This will help determine how Open Innovation can be better used in Telco firms world-wide. The Telco firm is the unit of analysis for this study.

6.9.2. The Proposition pertaining to Competitive Intensity

Does Competition have a moderating effect on Open Innovation in improving the Performance Measures of the Telco Firm, in the context of Coopetition? The Performance Measures of the Telco Firm have already been described in an earlier section (Construct).

The specific hypotheses in this chapter are:

**H1**: Competitive Intensity moderates the relationship between Open Innovation and Performance of the Telco Firm

**H2**: Competitive Intensity does not have a negative effect on the above relationship, and may even improve (strengthen) the relationship
6.10. The Methodology

The Telcos’ adoption of Open Innovation strategy has been measured by the revenue-sharing arrangement (with the Telcos’ partners, i.e. coopetitors). Competitive Intensity is estimated as the arithmetic inverse of Herfindahl-Hirschman Index. Factor Analysis and Linear Regression were carried out. Moderation Analysis was done as described in the next sections. This Moderation Analysis took Competition as the moderating variable applied on the relationship between Open Innovation Strategy (independent variable, i.e. factor from Factor Analysis) and Firm's Performance (dependent variable).

6.10.1. The Model

6.10.1.1. The Basic Structure

The research investigation is about how Competitive Intensity in the industry (within a country) influences the impact of Open Innovation (with Coopetition) on Telcos' Performance globally. Open Innovation has a positive impact on Firms' Performance, which is established theory (Chesbrough, 2008; Han, 2012). A Multivariate Linear Regression model was used. First a Principal Components analysis was done separately on the sets of independent variables (IVs) and the dependent variables (DVs). The dependent variables were reduced to one factor representing the firm's performance score.

The two independent variables (Revenue-Split with VAS partner, GII), yielded one factor: Open Innovation Strategy. The six Dependent Variables have already been described under the earlier chapter that defines the Firm's Performance Indicator.
**6.10.1.2. Why Moderation**

Moderation is the variation in the impact of Open Innovation (Independent Variables) on the Firm's Performance (Dependent Variable), owing to the changing level of Competition in a country.

The effect of Competitive Intensity on the relationship between Open Innovation and Firm's Performance was explored. First, a basic regression model was established and tested with Open Innovation strategy as the Dependent Variable and Firm's Performance Score as the Independent Variable. Then the Competition variable was included directly in the equation as an Independent Variable and the model was tested. The results showed that Competitive intensity had very low statistical significance as a direct independent variable, and hence was removed from the model. It was then checked whether Competition had any indirect bearing on the basic model such as Moderation effect. It was found that Competition has a purely Moderating effect on the model. The resulting model has been presented in this chapter.

**6.11. The Quantitative Analysis**

**6.11.1. Creating a Performance Score for the Firm**

The Performance score for the firm was created in a similar fashion as described for the basic model. As the data collected is for a slightly different set of Telco firms, hence the procedure is being presented again, for the sake of consistency. Principal Components Analysis was done to yield a composite score denoting Firm Performance.

For all financial figures, PPP adjustment was done first and a natural logarithm applied on the result before using the data for Principal Components Analysis.
Table 6-2: Principal Components Analysis to Create Performance Score (Dependent Variable)

| Data taken for the Years       | 2011 and 2012 |
| Sample Size                   | 83            |
| KMO Measure of Sampling Adequacy (> 0.5) | 0.6           |
| Bartlett's test of sphericity (p Value < 0.05) | 0.006         |

Table 6-3: Principal Components Analysis: Component Matrix of Dependent Variables – With Component Loadings

<table>
<thead>
<tr>
<th>Component Matrix of Dependent Variables</th>
<th>Weight of the Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBITDA Per Subscriber</td>
<td>0.867</td>
</tr>
<tr>
<td>Total Revenue Per Subscriber</td>
<td>0.924</td>
</tr>
<tr>
<td>VAS Revenue Per Subscriber</td>
<td>0.893</td>
</tr>
<tr>
<td>Total Revenue Per Employee</td>
<td>0.615</td>
</tr>
<tr>
<td>EBITDA</td>
<td>0.457</td>
</tr>
<tr>
<td>EBITDA Per Employee</td>
<td>0.739</td>
</tr>
</tbody>
</table>

Component Matrix – Only one factor is formed (for each of the Factor Analysis done), because we need one Performance Score for the firm. This table contains component loadings, which are the correlations between the variable and the component. As these are correlations, the possible values range from -1 to +1. Correlations that are 0.3 or less are not meaningful. As is clear from the table above, there are no such cases.
6.11.2. Establishing the Relationship

6.11.2.1. Suitability of the Data

As with the basic regression explained in the earlier chapters, it was first verified that the data is suitable for conducting regression. The pre-requisites for regression were found to be met adequately. Before using or checking the data in any way, the natural logarithm of the data was extracted to linearize the data first. The data was checked for the normal-distribution assumptions, homogeneity of variance assumptions, and multicollinearity. Linear Regression was done using the Factor "Firm Performance" as the dependent variable.

For getting the independent Variables, factors were derived from the following variables:

(a) Revenue Sharing with Partner, for Services launched
(b) GII (Global Innovation Index from the World Economic Forum), which is country-specific

Principal Components Analysis yielded one factor for Open Innovation Strategy. The Competition Moderation Variable for Open Innovation Strategy was derived from:

(a) Open Innovation Strategy
(b) Inverse of Herfindahl Index (indicating Competitive Intensity)

This derived variable was used as the third Independent Variable (regressor), and linear regression was done.

6.11.2.2. Principal Components Analysis for the Independent Variables

The data for the years 2011 and 2012 were taken up for the Principal Components Analysis of the independent variables. Principal Components Analysis was done on Independent Variables, to yield one factor for Open Innovation Strategy. Samples from about 30 countries were taken for 2 years, 2011 and 2012.
Table 6-4: Principal Components Analysis of Open Innovation Variables – KMO & Bartletts’s Tests

<table>
<thead>
<tr>
<th>Sample Characteristics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>83</td>
</tr>
<tr>
<td>KMO &gt; 0.5</td>
<td>0.59</td>
</tr>
<tr>
<td>Bartlett’s Test of Sphericity - Significance (p value &lt; 0.05)</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Firms with annual revenue over US $1.5 Billion showed good statistical significance in Factor Analysis, and were considered in the sample.

Table 6-5: Principal Components Analysis of Open Innovation Variables - Component Scores

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor: Open Innovation Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>GII</td>
<td>0.648</td>
</tr>
<tr>
<td>VAS Provider's Revenue Share</td>
<td>0.648</td>
</tr>
</tbody>
</table>

6.11.2.3. The Basic Regression Model Adjusted for Use in Moderation Analysis

A subset of the basic model of regression, described in Chapter 5, was done here, with the factor (pertaining to Open Innovation Strategy) from the Factor Analysis being used as the independent variable and the Firm's Performance Score as the dependent variable.

Equation 6-1: The Basic Model used for Moderation Analysis

\[ \text{Firm's Performance Index} = \beta_0 + \beta_1 \times (OI \text{ Strategy}) \]
The results of the regression of this basic model are as follows:

<table>
<thead>
<tr>
<th>Regression Result</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted R-squared</td>
<td>0.441</td>
</tr>
<tr>
<td>OI Strategy (β)</td>
<td>0.615</td>
</tr>
<tr>
<td>Significance (p value &lt; 0.05) for Coefficients and for the Model</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>F (d1)</td>
<td>1</td>
</tr>
<tr>
<td>F(d2)</td>
<td>82</td>
</tr>
<tr>
<td>F Value</td>
<td>66.593</td>
</tr>
</tbody>
</table>

**Table 6-6: Regression Results of the Basic Model (Firm’s Performance)**

6.11.3. Moderation Analysis

Moderation Analysis (Sharma, 1981) was conducted using Competitive Intensity as a moderator for the dependent variable, OI Strategy. This is depicted in the following equation:

**Equation 6-2: The Moderation Model**

\[
\text{Firm’s Performance Index} = \beta_0 + \beta_1 \times (OI \text{ Strategy}) + \\
\beta_3 \times (\text{Competitive Intensity Standardized} \times OI \text{ Strategy standardized})
\]

The equation and each of its parts is described in detail next. In this study, Competition is measured in terms of intensity of competition, using the arithmetic inverse of Herfindahl-Hirschman Index for Telcos in any particular country. The moderation effect of Competition on the factor OI Strategy is studied. First, the two variables (Competition and OI Strategy) were centralized. Centralization (or mean-centring) is the process of finding the mean of the variable and then subtracting the value of the mean from every value of the variable. Hence we make a new variable whose mean is zero. Standardizing the variable (taking the Z-scores) accomplishes the same, because multiplying with a constant value does not affect the moderation analysis. Then the centralized (or standardized) Competition variable was multiplied with the centralized (or standardized) factor to create a new variable, viz. moderator variable.
Equation 6-3: Standardization of a Variable

\[ C_{\text{standardized}} = \frac{C_1 - \bar{C}}{\sigma} \]

Where \( C_1 \) is the value of the Competition variable, \( \bar{C} \) is the mean, and \( \sigma \) is the range. This moderator variable along with the competition itself and the factor OI Strategy were together taken as three Independent Variables for the Regression equation. However the beta value for Competition, as an independent variable, was not statistically significant in the regression results, and thus Competition was dropped from the equation. Competition was found to have a purely moderating effect on the relationship between Open Innovation practices and Firm's performance. The beta value of the moderator pertaining to interaction effects between Competition and OI Strategy was found to be significant and was retained. The results are given in the next sections.

6.11.4. The Results With and Without Moderation

The results of Regression are as follows:
For the combined data for two years, 2011 and 2012, the correlation was significant at 0.05 level (2-tailed) for the \( \beta \) coefficient of both the regressors. The VIF (Variance Inflation Factor) was less than 2 for all the regressors, indicating that there is no problem of multi-collinearity. The regression showed good significance for firms with annual revenue over US $1.5 Billion. The moderation effect has a positive impact on the relationship between OI Strategy Variable with the Business Performance of the ICT companies – The relationship (model fit) improved as shown in the table below.

The correlation was found to be significant at 0.05 levels (2-tailed) for the \( \beta \) coefficient of both the regressors. The VIF (Variance Inflation Factor) was less than 2 for all the three regressors, indicating that there is no problem of multi-collinearity. The Durbin-Watson value of the regression model was 1.8, which is well in the range of (1.5 – 2.5), indicating that serial correlation of residuals is insignificant (if any).

All of the above regression results show that Open Innovation improves the
revenues and profitability, right at the subscriber level and efficiency of the firm, right at the employee level.

Table 6-7: Regression Results With and Without Using Moderation for the Dependent Variable

<table>
<thead>
<tr>
<th>Regression Result</th>
<th>Value Using Moderation</th>
<th>Value Without Moderation</th>
<th>Using Moderation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted R-squared</td>
<td>0.47</td>
<td>0.441</td>
<td></td>
</tr>
<tr>
<td>OI Strategy (β)</td>
<td>0.663</td>
<td>0.615</td>
<td></td>
</tr>
<tr>
<td>Competition Moderation Variable for OI Strategy (β)</td>
<td>0.195</td>
<td>Not Applicable</td>
<td></td>
</tr>
<tr>
<td>Significance (p value &lt; 0.05) for Coefficients and for the Model</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>F (d1)</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>F(d2)</td>
<td>81</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>F Value</td>
<td>37.777</td>
<td>66.593</td>
<td></td>
</tr>
</tbody>
</table>

The results with and without including the moderation variable are given in the table above and it can be seen that competition has a moderating effect on the relationship between Open Innovation Strategy and Firm's Performance. The model fit improves by including the moderating variable as is evident from the improvement in both, the value of the Adjusted R-squared parameter and the coefficient, after moderation.

6.11.5. The Direction of the Moderation Effect of Competition

To understand whether Moderation due to Competitive Intensity boosts or dampens the impact of Open Innovation on the Telco Firm's Performance, the standardized beta coefficient of the Open Innovation Strategy was examined before and after Moderation. Standardized beta coefficients are the estimates resulting from an analysis carried out on independent variables that have been standardized so that their variances are 1. Therefore, standardized coefficients refer to how many standard deviations a dependent variable will change, per standard deviation increase in the predictor variable. The result shows an improvement in the value of the standardized beta-coefficient after moderation.
Hence Competition has a positive effect on the relationship between Open Innovation Strategy and Firm’s Performance. The improvement in coefficient is seen more clearly upon checking the Standardized Beta Value of the Open Innovation Strategy, as given in the table (Table 6-8).

Table 6-8: Standardized Beta Value of OI Strategy in Regression, Before and After Moderation

<table>
<thead>
<tr>
<th>Regression Result</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OI Strategy (Standardized ( \beta )) Before Moderation</td>
<td>0.669</td>
</tr>
<tr>
<td>OI Strategy (Standardized ( \beta )) After Moderation</td>
<td>0.721</td>
</tr>
</tbody>
</table>
6.12. Summary

6.12.1. Interpreting the Results

The results of analysis showed that intensity of industry competition among Telcos within a country has a positive moderating effect on the relationship between Open Innovation Strategy and the Performance of the Telco operator firm. The results support both the hypotheses (H₁ and H₂) of this study and were found to be significant for Telco firms with larger than 1.5 Billion USD of annual revenue. As per the literature, Open Innovation itself has a significant and positive impact on the Telco firms' performance (Bigliardi, 2012; Han, 2012). This is an indicator of the fact that Telco firms above a certain size have larger capacity and stronger capability to form varied alliances, and get financing (Ahn, 2002). Smaller Telcos should build Open Innovation capability along with Closed Innovation, to propel their growth and lay foundations early on to take advantage of Open Innovation as they grow, either organically or inorganically (through merger or acquisition).

The moderating variable — Competition Intensity formed in association with the independent variable Open Innovation Strategy (factor) results in a better model fit (improved adjusted R-squared). The results of the statistical regression in this research indicate that the moderating effect strengthens the relationship in the model. This supports the hypothesis that Competition spurs Open Innovation strategy, in the context of Coopetition, to improve the Firms’ Performance. In the highly competitive Telecom market, firms are locked in survival struggle and price wars.

Open Innovation provides a way out, to counter the risks posed by Competitive Intensity. This is made possible through improving the ability to explore new opportunities, improving the time to market, raising competence to launch new services, co-create services and content with partners (including competitors) and users in real-time, and collaborate with competitors in a variety of different ways. Given the increasing Capex (e.g. spectrum costs and infrastructure costs) and Opex (upgrades, maintenance, skilled workforce, etc.), Open Innovation is a powerful strategic tool and an organizational culture, which must be nurtured carefully. This is all the more important in the highly
competitive Telco industry, where margins are tapering and older revenue streams are depleting.

6.12.2. Practical Implications

As is evident from the results of this study, Open Innovation Strategy's impact on Firm's performance does not deteriorate with Competition (as measured by firm concentration in a country), but in fact improves. Telco firms must adopt Open Innovation to exploit opportunities in the market, to find new ideas and to renew existing ideas and models. They must encourage and incentivize collaborations at all levels within and without the organization. There is a need to thoroughly explore possibilities of engaging in Open Innovation at every stage in each process in the organization.

Strategy starts a vision at the top, i.e. the executive management of the organization. It then permeates every sphere of activity, engaging all stakeholders, internal and external. Also, it is evident that, for the good part, greater the intensity of Open Innovation, the better the Telco firm's performance. Competitors are becoming partners to lower their increasing investments. There are several ways in which Competitors can collaborate to launch new services along with partners, to benefit everyone – infrastructure sharing, spectrum sharing, interconnection, unbundled access, reciprocal compensation arrangements, pooling subscriber bases for jointly launched services, etc.

Competitors can even make arrangements and agreements to increase their Revenue by improving their AMPU (Average Margin per User) rather than ARPU (Average Revenue per User). This would shift the focus from increasing market share to increasing profitability. This would pave the way for consolidation (strategic mergers and acquisitions), resulting in a few powerful profitable players, who actively collaborate with each other. All this can be done while still leaving room for new entrants in the market, (e.g. MVNOs – Mobile Virtual Network Operators, and VAS Providers, Media and IT companies), whose play can be in unique, specialized areas.