THE DIGITAL SERVICES LANDSCAPE: AN EMPIRICAL STUDY OF OPEN INNOVATION ICT FORUMS

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JEL Classification: O31, O32, L96

Keywords- Open Innovation, Digital Services, Forum, Consortium, Strategy, ICT, Telecommunications, Telecom, Telco, Mobile Data Services, MDS, Value Added Services, VAS, Cluster Analysis, Radical Innovation, Incremental Innovation, Innovation parameters

Abstract

Purpose – The ICT industry's growth and profitability is dependent on innovation in digital services. With Open Innovation gaining momentum, a number of Open Innovation based forums, which cater to Digital Services and the ICT/Telecom industry, have been established in recent years. This paper analyzes the forums, discovers the clusters they can be categorized into on the basis of factors extracted from a number of Open Innovation parameters, and presents the findings. Forums from across the globe were sampled for the analysis.

Findings– The Open Innovation forums for ICT/Digital Services were clustered on the basis of three prominent characteristics – intensity of Open Innovation, the global footprint of the forum, and how established the forum is. The clustering pattern reveals that the ICT forums follow a path towards maturity and effectiveness. Additional findings show how the maturity, locus of innovation, measurement of benefits, etc. have a bearing on the kind of innovations that the firm engages in.

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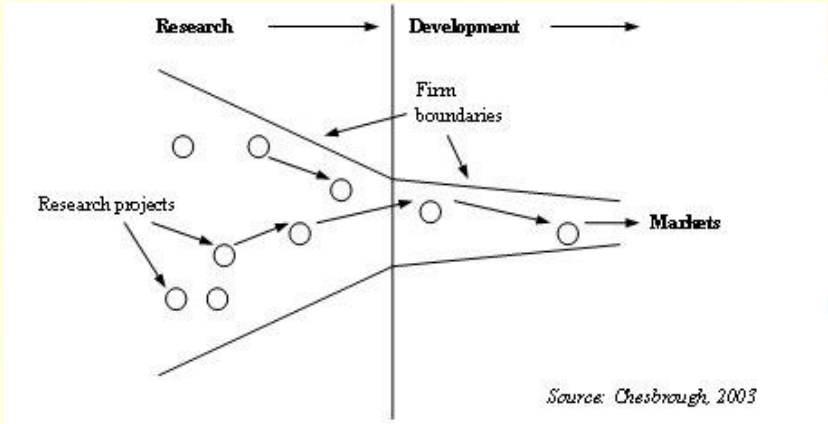
1. Open Innovation and the ICT Industry

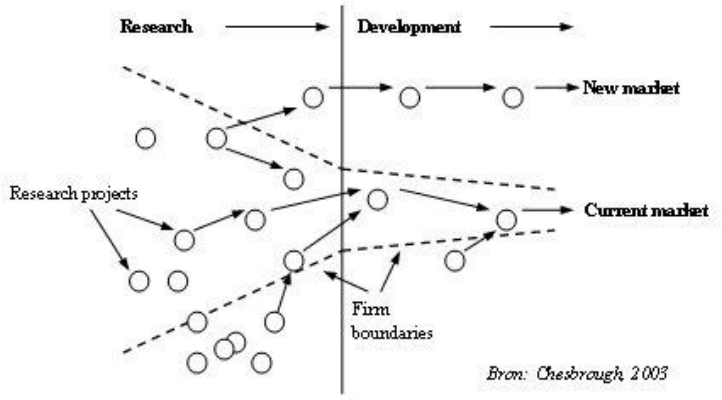
Innovation has been noted as a crucial growth and profitability driver for firms (Christensen, 1997, 2003, 2013, Drucker, 1988). Closed Innovation is the traditional model in which innovation takes place within the closed boundaries of the organization. The consequent business development and marketing processes are also conducted within the organization's boundaries.

Figure 1: Closed Innovation



The closed innovation model is eroding away in favor of the Open Innovation model (Chesbrough, 2003), owing to growing recognition and importance of several factors, notably: greater availability of talent, resources and knowledge outside the boundaries of the organization, out-licensing and in-licensing of ideas and technology due to misfit (or underutilization) between the ideas/technology and the strategy of the originating organizations, availability of investment capital for spin-offs, partnerships and ventures that can better exploit the ideas and technology.

Figure 2: Open Innovation



In Open Innovation, firms adopt external ideas in their innovation process, while exposing their own underutilized/unaligned ideas to be exploited by other organizations (Chesbrough, 2003, 2006, 2011).

The ICT industry has implemented Open Innovation successfully for survival and growth (Bigliardi et al, 2012 and Bouwman, 2008 and Nesse, 2009, Al-Debei et al, 2010, 2013, Diener and Piller, 2013). The landscape of the current Telco/ICT industry has changed owing to intense competition, regulatory changes, new technology (e.g. wide-spread use of Internet Protocol, mobile technology, smartphones, etc.), and new business models. To successfully launch more innovative and profitable services, ICT firms are collaborating with a variety of partners: Providers for Mobile Digital Services, Mobile Data Services, Value Added Services, Research & Development labs, academic institutions, equipment vendors, government organizations, and even collaborating with other ICT firms. Globally, several Open Innovation alliances and consortia are being setup in the industry to improve the digital services landscape. In this paper, these forums are analyzed for characteristics related to Open Innovation. In this paper, these forums are analyzed, classified and studied from different angles.

2. Digital Services Forums

Although Digital Services are key for growth and profitability of the ICT industry, they encompass manifold domains, most of which are outside the remit of traditional Telcos. Examples of digital services include: healthcare, media, agriculture, banking, government,

regulatory, security, legal, advertising, publishing, retail sector, manufacturing, logistics, software products development, etc.

Hence there has been a steep rise in the number of ICT related Open Innovation forums, hubs, and consortia, many of which lie outside the boundaries of the Telcos. Thus genuine Open Innovation in the free marketplace is a strong and growing reality. This is a real growth driver for existing or upcoming VAS/Mobile Digital Services ecosystem, and this in turn helps the Telco/ICT industry (Nesse, 2009). This paper is an empirical study of the current landscape of the ICT - digital services related Open Innovation collaborations. The characteristics of the different forums for ICT, what kind of collaborations are formed, and how they engage in open innovation are all examined. The studied characteristics have been derived from the Open Innovation literature (Duarte and Sarkar, 2011; Dahlander and Gann, 2011).

3. Open Innovation Forums for ICT

A sample of about 40 Open Innovation ICT Forums globally were studied and analyzed. To avoid sampling bias, the sample items were selected based on diverse parameters as listed in the tables.

Table 1: Sampling based on Size of Collaborators

S. No.	Size of Collaborators	Examples
1	Large	EIT ICT, Holst Centre, China-Finland Alliance
2	Medium	Adastral Park, Synergia, Fing
3	Small	iHub, KINU, FOSS4G

Table 2: Sampling based on Investors

S. No.	Origin	Examples
1	Government backed	Miriade, Lindholmen Park, Fing, iCluster
2	Corporation backed	Cisco EIR, AT&T Foundry, KDDI Open Innovation Fund
3	Funded from diverse sources	iHub, KINU, FOSS4G

Table 3: Sampling based on Geography

S. No.	Geographic Region	Open Innovation ICT Forums
1	North America	Cisco EIR (USA), iCluster (Mexico), TR Labs (Canada)
2	South America	Telefonica Innovation Hub (Brazil), STI (Chile),
3	Africa	MEST (Ghana), HiveColab (Uganda), iHub (Kenya), ActivSpaces (Cameroon)
4	Europe	Open Living Labs, Lindholmen Park (Sweden), Miriade (France), Adastral Park/Martlesham (UK)
5	Asia	Init (India), THTI (China), Telecom Ideas (India), FOSS4G (Thailand)

Table 4: Sampling based on Commercial/Non-Commercial Interests

S. No.	Commercial/Non-Commercial	Examples
1	Non-Commercial Interests	GSM OneAPI, FOSS4G, STI, etc.
2	Commercial Interests	AT&T Foundry, KDDI Open Innovation Fund, PlugAndPlay
3	Mixed	OpenAlps, Holst, Fing

Table 5: Telco and Non-Telco sampling

S. No.	Telco/Non-Telco	Examples
1	Non-Telco	FOSS4G, STI, Lindholmen, Fujitsu Labs, KLab
2	Telco	AT&T Foundry, KDDI Open Innovation Fund, Verizon Center, Telefonica Hub

- Forums were sampled from different geographic regions
- Forums of different sizes were chosen – ranging from those collaborations driven by governments, or large corporations, to those that focused on innovations from startups

and academia or even smaller groups for training individuals and preparing/funding entrepreneurs.

- Different kinds of forums/consortia were sampled – Commercial, non-commercial, research, non-research, collaborations with academic, educational and R & D institutes and laboratories, venture capital raising forums for startups, forums for ideation contests, open-source groups, training forums, Telco/non-Telco, etc.

4. *Studying Characteristics of the ICT Forums*

Each of the Open Innovation Forums described in the earlier section was rated on 15 different parameters (Birudavolu and Nag, 2015).

Table 6: Parameters to Rate the Open Innovation ICT Forums. (Source: Birudavolu & Nag, 2015)

S.NO.	PARAMETER	DESCRIPTION
1	BENEFITS - Inbound-Outbound	Inbound to Outbound. Rated on a scale of 1-5, i.e. 1 (Lowest) to 5 (Highest). This describes whether the benefits are more inbound (i.e. receiving ideas), or more outbound (sharing out). (Elmquist, 2009) (Dahlander et al., 2010)
2	BENEFITS - Pecuniary	Relates to whether business or monetary gains are a part of the goals. Rated on a scale of 1-5. (Dahlander et al., 2010)
3	BENEFITS - DIRECTNESS OF USE (1-3)	The three levels are: Symbolic (Lowest), Conceptual (Medium), and Instrumental (Highest).
4	LOCUS OF COLLAB (1-5)	This ranges from Internal (lowest) to External (highest), in a reference from whether the collaboration is between internal divisions (or subsidiaries) of an organization or whether it extends to many parties outside the organization.
5	NO. OF COUNTRIES	The number of countries the collaboration extends to
6	NO. OF ORGS INVOLVED	The key number of strategic players in the collaboration
7	NO. OF LABS	An indication of the research involved
8	SIZE OF COLLABORATORS	Graded from Very Low- Very High (1-5), where a startup company would be rated as Very Low, and a giant corporation or government would be very high (Elmquist, 2009)
9	TARGET (INCR-RADICAL)	About target innovation – ranging from Incremental Innovation to Radical Innovation on a scale of 1-5. Pelz (1978)

10	ROLE OF COMPANY (1-4)	From merely Investor (L), to Facilitator, Idea Generator, Developer of Platform (H) (on a scale of 1-4)
11	ORGANIZATION STRUCTURE (1-4)	Rigid Teams (Low), Task Forces, Federated, Mass Collaboration (High) (on a scale of 1-4)
12	TYPE OF COLLAB (WEAK-STRONG)	From Weak Ties (Low) to Strong Collaborations (High) (on a scale of 1-5)
13	METHOD OF INNOVATION (1-3)	Lead User Method, Ideation Contest, Mass Collaboration (on a scale of 1-3) (Erkens, et al., 2013)
14	MEASUREMENT TYPE (1-4)	How the innovation is measured: Input (Low), Process, Output, Outcome (High) (on a scale of 1-4). (Erkens, et al., 2013)
15	YEARS SINCE ESTABLISHED	For how long has the forum been established?

Factor Analysis with Principal Components was carried out on the resulting data pertaining to the Open Innovation ICT forums (Birudavolu, 2015). The results of the Factor Analysis were as follows:

The following 4 variables, from the list above, were removed on account of high cross-loading of these variables on the factors:

- Size of the collaborators
- Method of Innovation
- Locus of Collaboration
- Benefits – Inbound/Outbound

The reasons for this have been given in (Birudavolu, 2015).

The following principal components were extracted:

[1] Open Innovation Intensity in the collaboration

[2] Global footprint of the collaboration

[3] How established is the collaboration

The cumulative explained variance pertaining to the rotated sum of the squared loadings of the factors was found to be 75% which was considered good enough, i.e. containing the loss of information to 25%. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was above the recommended value of 0.6, with good significance (p-value = 0.000, i.e. $p < 0.05$).

After factor analysis, Hierarchical Cluster Analysis was done on the data pertaining to the three factors. The Cluster Analysis was done using the tool SPSS. This resulted in the forums forming six clusters. These six clusters were based on the basis varying levels of the 3 principal components extracted in the Factor Analysis. The forum clusters are given in the table below.

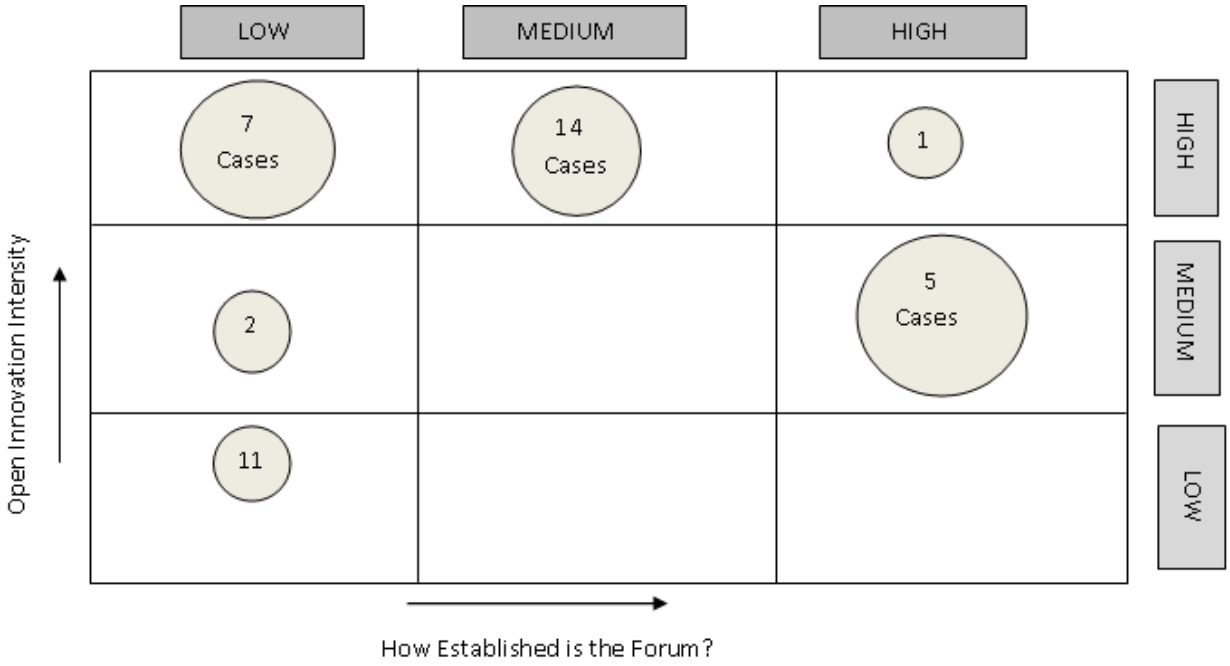
Table 7: Hierarchical Clustering Results

Cluster No.	Open Innovation Intensity	Global Foot-print	Well Establi-shed	No. of Cases	Cluster Description	Examples
1	Low	Low	Low	11	Focus on ordinary, incremental innovation with less direct benefits. Focus on training, fund-raising for basic services, and indigenous innovation	KINU, KLab, HiveColab, BongoHive, BigInnovation, Connect, Miriade,
2.5	Medium	Low	Low	2	In Between	Synergia, Wenovate
2	High	High	Low	7	More radical innovation with more direct benefits and possibly commercial involvement and funding. Relatively New forums	STI, Cisco EIR, iCluster
3	High	Mediu m	Mediu m	8	More Established, More Commercial, More direct, more Radical	iHub, Fing, Holst, China-Finland ICT Alliance

					innovations, and moderately global i.e. more collocated	
4	High	High	Medium	6	More established, More Global, More Commercial, More Direct, More Radical innovation	KDDI OI Fund, Verizon OI Center, Telefonica Hub
5	Medium	High	High	4	More Established, more Global and Less Commercial, but strong alliances	AT&T Foundry, THTI, Asia Pacific Telecentre
5.5	Medium	High	High	1	Global Alliances with very large number of collaborators	ICT Living Labs
6	High	Low	High	3	Highly established, large # of collaborators, collocated, i.e. less global	Adastral Park Martlesham UK, TR Labs Canada, Lindholmen Park Sweden

The Clusters marked 2.5 and 5.5 cover the few cases falling between the clusters. For example Cluster 5.5 pertains to ICT Living Labs which is an exception because it constitutes collaborations with a very large number of organizations and is present in a large number of countries. These are depicted in the diagram below. The size of the bubble represents the size of the Global footprint.

Figure 3: Clusters from Hierarchical Clustering



5. *Discussion and Conclusions*

Open Innovation in ICT is being widely adopted in the ICT industry. As the study shows, ICT and non-ICT organizations from different background are collaborating in forums towards creating and launching innovative digital services. In the Open Innovation alliances being setup, corporations (Telcos & non-Telcos), governments, research institutes and non-profit organizations are funding start-ups. This reveals that there is immense potential in the space of open innovation in digital services, as the investors expect good profitability and growth from the startups that they're funding.

The clusters also show a distinct inclination towards radical innovation rather than plain incremental innovation. In the hierarchical clustering, four out of six forum-clusters exhibit propensity for radical innovation. In the sample of forums, the case-wise breakup for Target Innovation type is shown in the table below.

The bubbles in Figure 3 above and the Table 8 below depict how forums are inclined towards creating radical innovation (there are more number of cases in the High Intensity of Open Innovation, i.e. against higher part of Y-Axis as compared to number of cases against lower part of Y-Axis). It depicts that the more radical innovations come from companies that are a bit more

established (last row of Table 8) than the new and small ventures (first row of Table 8), as is shown by the mean age of the venture in years. This is because the firms (in the third row) have worked their way out of teething problems, in terms of getting funding, harmonizing the business model with the markets, and stabilizing the processes. The firms pursuing Open Innovation strategy also form global alliances and collaborate with a increasing number of organizations. Their locus of innovation also moves more towards outside. However, after firms reach a certain maturity, in terms of age, size, partnerships, global footprint, processes, etc., the internal and external innovation are more balanced (middle row). Hence the firm finds that both incremental and radical innovation yield value (middle row). Hence a healthy mix of incremental and radical innovation becomes the mainstay of the forum at that stage (middle row). The firm achieves a good balance between Open and Closed innovation over a period of time. Ideas from Open Innovation spur better Closed Innovation and shortcomings in Closed Innovation or misalignment of Closed Innovation with the firm's strategy cause the firm to seek out external ideas/technology through the Open Innovation process.

This is the reason why the values are highest in the specific middle row cells (of Table 8) with the underlined figures (under the three columns: Age of Forum, Global, and # of Orgs). In the table below, the middle row depicts more established/mature firms. In the middle row, the size of the partners is smaller than in the third row, because at the mature stage, the firms that are well established also start partnering with start-ups and fund new small ventures. Hence the average size of the collaborators dips slightly as the firm gets more established.

Examples of the Open Innovation Alliances in the first row of Table 8 (i.e. Incremental Innovation) are:

MEST (Ghana), iceaddis (Ethiopia), HiveColab (Uganda), BongoHive (Zambia), KINU (Tanzania), kLab (Rwanda).

Examples of the Open Innovation Alliances in the second row of Table 8 (i.e. very stable and mature forums having a mix of Incremental and Radical innovation) are:

Open Living Labs, iHub (Kenya), STI Cooperation (Chile & Europe), Innovativa Brazil, iCluster (Mexico), Joint Innovation Lab (Softbank, China Mobile, Vodafone, Verizon), Adastral Park (UK)/Martlesham (UK).

Examples of the Open Innovation Alliances in the third row of Table 8 (i.e. forums that have reached some level of stability and which engage in more Radical Innovation) are:

GSMA One API, Telefonica Innovation Hub , Cisco OI Program, TR Labs (Canada), AT&T's Foundry (USA), Verizon OI Center.

All these findings are in line with the central idea of Open Innovation, wherein a firm scans the industry and research organizations to find collaborations to take superior ideas and opportunities to the market, which it cannot do on its own, while exposing its own ideas to the collaborators (Chesbrough, 2003). Another finding is that there is a distinct move towards globalization. Even in the case where there are fewer labs or locations (e.g. Holst Center, Lindholmen Park), collaborations from different countries are sought after. In case of more global forums that do not have immediate commercial goals, building standards, or establishing common model or best practices and framework, seems to be a key driving force e.g. GSMA OneAPI, FOSS 4G, Telecentre, etc. However, in the case of non-commercial forums that are confined to one or two countries, their main goals seem to include social welfare – to improve entrepreneurship in the region, impart training, help them find funding, etc. These are also supported by the governments in some cases.

Another interesting observation is that the consortia or forums formed seem inclined to take on many responsibilities across the spectrum – finding ideas, partners & collaborators in the industry, government, academia, etc., training, funding startups, finding investors for startups, incubation, helping startups take-off, conducting collaborative events, mass ideation contests, etc. This again points to the rapidly growing interest and conviction in Open Innovation. A key take-away is that Open Innovation is not new in the industry; several well established Open Innovation forums have their centers running successfully for many years, even decades, e. g. Adastral Park in UK, Lindholmen Park in Sweden, AT&T Foundry in the USA, etc. This shows that Open Innovation is a sustainable idea, and has rightly attracted many organizations old and new, into its fold.

Table 8: Listing and Comparison of a few key Parameters' mean values

No.	Target Innovation Type (1 – 5)	# Cases in Sample	Age of Forum (years)	Size of Partners (1-5)	Locus of Collabn. (1-5)	Benefits (Inbound - Outbound) (1 – 5)	Method of Innovation (Lead User – Mass Collabn.) (1-4)	Global: # of nations	# Orgs
1	Incremental (1-2)	11	3.86	2.27	3.636	2.545	1.18	6.72	27
2	Mix of Incremental and Radical (3)	11	10.64	3.09	4	3.636	2	9.9	67
3	Radical (4-5)	19	8.06	3.36	4.315	4.2631	2.157	9.68	53

Focus is another softer aspect of a forum. An alliance may be considered as more focused if it deals with fewer topics in a sustained manner, and less so if it encompasses many areas (or has a more loosely defined agenda). For example the forums HiveColab, BongoHive, Activspaces, Meltwater, and Miriade have a lesser focus as compared to Cisco EIR, GSM OneAPI or KDDI Open Fund.

By assessing the clusters, it is found that Open Innovation intensity increases with focus. It also increases by building a strong system for making successful collaborations happen. The collaborations need to include diverse partners such as corporations, government agencies, research institutions, and academic institutions, besides involving individuals, and providing strong forums and opportunities for the partners to collaborate. The process takes time and effort to mature, especially if the forum is in a developing country with fewer resources, e.g. KINU, KLabs, ActiveSpaces, MEST, etc. Whereas the forums in economically developed countries backed by well established corporations tend to gain high intensity and productivity fast e.g. Cisco's EIR, KDDI's Open Innovation Fund, Verizon's OI center, Telefonica's OI forum.

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