An Ecosystem Model:
Innovation in the CSP Supply Chain

Executive Summary

Telecom networks are critical infrastructures which underpin all aspects of society and global commerce. Hence, the telecom industry has a disproportionately important role in society and must avoid becoming a barrier to progress by failing to meet society's evolving needs. But telecom innovation has been slowed by a failure to engage all relevant players effectively, particularly including start-ups and smaller vendors. This has led to collapse of vendor diversity in the telecom supply chain and stalling of revenue growth amongst telecom operators that has, in turn, negatively impacted plans for infrastructure investment and ability to attract talent compared with OTT players.[1]

The Telecom Ecosystem Group's (TEG's) target, and the focus of this document, is to outline an ecosystem model for specific industry engagement and collaboration that will broaden vendor diversity in telecom network operator innovation processes, with a special emphasis on facilitating innovative start-ups' and smaller vendors' productive participation and drive transformation of current industry practices from **bilateral vendor-telco interactions** (mainly seller- buyer relationships), to **enhanced ecosystem collaboration.** This will boost innovation through increased start-up engagement and more effective stakeholder partnerships which leverage complementary expertise and sharing of development costs, thereby reducing time to market and enabling creation of more compelling telecom services.

TEG recommends a bottom-up approach to building telecom ecosystems for specific use cases. Based on typical innovation use cases, the approach would allow replicating ecosystem success stories and positive experience, as well as prevent failure through better awareness of missing partners or capabilities. This approach provides an operational method to accumulate broad field expertise and to present real-world examples.

This document is intended to be the basis for a broader industry discussion on telecom supply ecosystem innovation and collaboration; we invite feedback and sharing of additional uses cases and examples. Contact details and guidelines provided in this document.

Contents

Introduction

The Telecom Ecosystem Group (TEG) has identified some key areas where telecom operators must improve their vendor engagement and procurement processes to encourage innovation and collaboration.[2] To address these deficits, we recommend an ecosystem-centric approach for telecom industry innovation[1] and outline major actions which should be taken by key stakeholders (i.e., telecom operators, vendors and others, including government) to boost innovation and investment in the telecom industry.

The TEG target, and the focus of this document, is to outline specific industry engagement and collaboration approaches which will:

1. Broaden vendor diversity in telecom network operator innovation processes, with a special emphasis on facilitating participation of innovative start-ups and smaller vendors.
2. Transform current industry practices from **bilateral vendor-telco interactions** - mainly seller– buyer supply relationships, to **enhanced ecosystem collaboration** that boosts innovation through effective stakeholder partnerships.

Ecosystem Definition

We define an innovation ecosystem as the collaboration of multiple heterogeneous contributors (organizations and individuals) with the diverse expertise and skillsets needed for competitive supply of the new technologies, products & systems needed to build and operate future telecom infrastructures, platforms and services. We consider collaboration and stakeholder co-innovation, i.e., joint activities and teamwork, to be a critically important dynamic.

Innovation Ecosystem Categories

The TEG envisions a diversity of ecosystem models with different partner sets and collaboration relationships that are adapted to specific development and commercialization objectives. Depending on a particular innovation target and scope, the ecosystems could be categorized as shown in Figure 1:

- **Innovation Supply Ecosystems** that focus on telco-vendor supply relationships dedicated to a specific and well-defined business goal.
- **Innovation Initiative Ecosystems** are intended to create an environment with few constraints and that encourages innovation through interactions between partners to address the broader activities[2] that enable, incubate or facilitate innovations in a specific area (e.g., semiconductors, software, wireless technology, etc.) or in an industry or market segment (e. g., Open RAN, Cloud, Network Equipment, Consumer Devices, etc.), beyond just telco-vendor supply interactions.

[1] While the present document focuses on the telecom ecosystem, we believe similar conclusions can be drawn for other industries reliant upon innovation in the supply chain.

[2] These activities may be “not for profit” where each participant contributes without charging other participants. However, collaboration agreements would typically define, for example, ownership of intellectual property

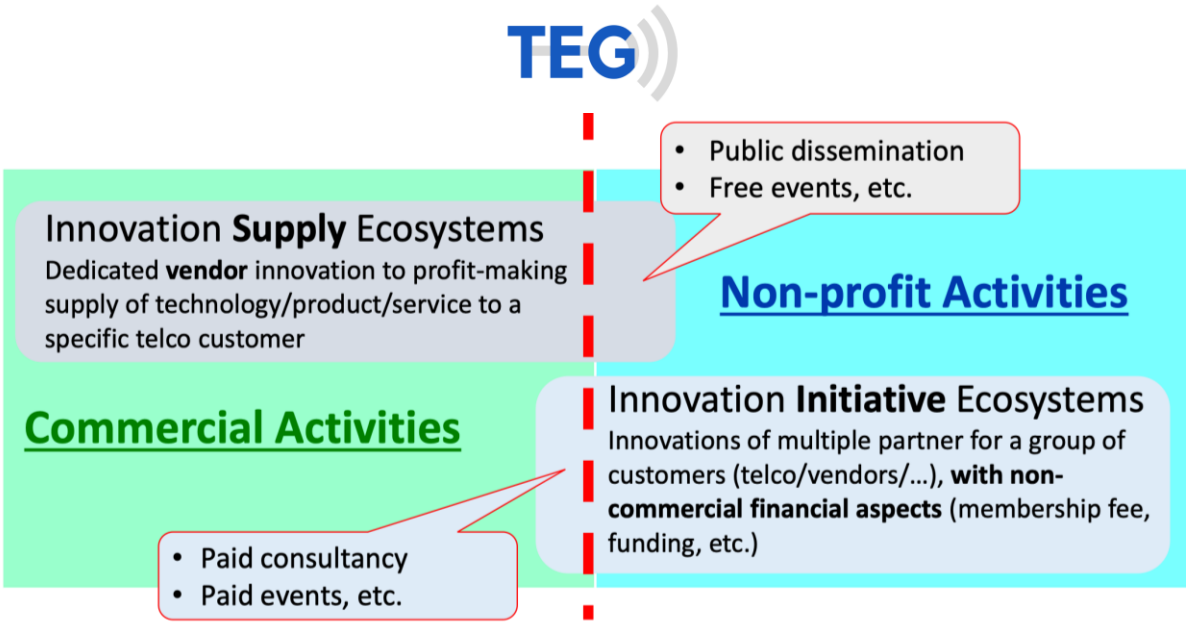

Figure 1: Differentiating Innovation Supply Ecosystems & Innovation Initiative Ecosystems

An effective ("healthy") ecosystem will comprise a diversity of organizations in different domains:

- *Ad hoc*: partners in a project within an **innovation supply ecosystem** addressing a specific customer problem or a customer-specific project, or a dedicated program within the innovation initiative
- *Institutional*: a dedicated organization for an **innovation initiative** in a certain innovation area (e.g., industry forums and associations).

Legal frameworks need to be put in place to define the roles of parties, particularly in relation to confidentiality and intellectual property rights (IPR). Avoiding perceptions that there may be anti-trust behaviors is an important concern, for example by not allowing sharing of pricing information. Legal frameworks may include ecosystem partnership/membership agreements, bilateral commercial agreements, etc.

The purpose of this document is to address innovation supply ecosystems. Of particular interest is how to encourage collaboration across the many markets that depend upon telecom; recognizing that innovation often occurs at the intersection of different disciplines/markets.

The Innovation Supply Ecosystem

The most common model with no ecosystem capacity is a product supply relationship where the telco buyer issues (typically) a large complex Request for Proposals (RFP) and procures the products and services it needs with little or no collaboration with the vendor to enhance their off-the-shelf offering. Enhancing this model, a vendor and a telco can enter into a bilateral partnership where the resources of both parties are combined to customize and possibly co-develop a tailored solution. However, startups and smaller vendors typically do not have the resources to respond to large complex telecom RFPs and neither of these models delivers the real diversity of expertise and serendipity that is required to achieve game changing innovations. What is needed is an enhanced ecosystem framework which specifically facilitates participation by startups and smaller vendors and brings together relevant multiple stakeholders with diverse expertise and skillsets.

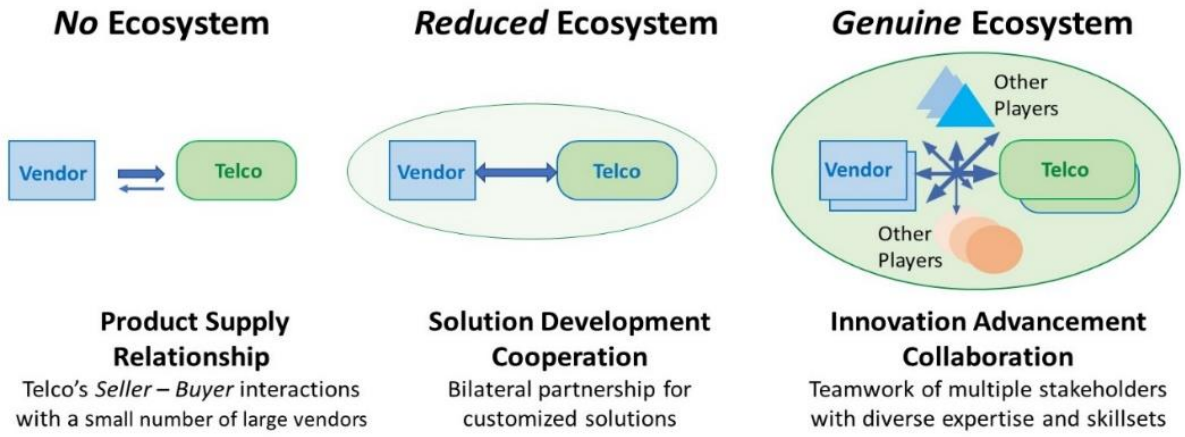

Figure 2: Evolution of Ecosystem Supply Model

Stakeholder Roles for Innovation Supply Ecosystems

It is critical to define the participant stakeholder roles that we consider essential for a successful innovation supply ecosystem. Table 1 lists those we consider important. Not all of these roles may be needed to progress a particular innovation objective, and this list may not be complete in terms of contributions.

Stakeholder Role	Contribution	Participants
Telecom Customer	Trials (technical, operational, commercial). Product & services validation. Implementation and mass deployment.	Tier 1/2/3 Telcos/Mobile Network Operators (MNO) and sub-organisations within them, e.g., CTO/R&D, Finance, Operations, Procurement, Marketing, etc. Other entities such as Mobile Virtual Network Operators (MVNO), Public/Private Cloud Operators, etc.
Telecom Services User	Participation in technical, commercial and operational trials. New services consumption & advocacy.	Residential customers, small-medium enterprise customers (SME), large corporate users, government.
Technology Supplier	Technology supply, know-how, IPR and patent rights.	Start-ups, systems integrators, academia & research institutes.
Product Supplier	Providing equipment and software.	All types of vendors.
System Supplier	Providing integrated custom and off-the-shelf systems. Systems integration.	Vendors, System Integrators (SIs).
Assistance Partner	Facilitate, assist, and empower with complementary products, specialist expertise, consultancy and services, etc.	Technology, software & hardware expertise, systems and services suppliers, consultants, cloud providers, test labs, etc.

Sponsor/Investor	Funding, providing relevant networking support and consultancy.	VCs, public and governmental funding programs, etc.
Legal	IPR and NDA management, anti-trust advice, regulatory impact analysis.	Patent agents and law firms.
Standards Development Organisations (SDOs), Open-Source Groups, Industry Associations.	Hosting specification and open-source development, evangelisation and promotion of new directions and solutions	BBF, IEEE, IETF, ETSI, ITU, MEF, TMF, etc. Apache Software Foundation, Linux Foundation, OpenStack Foundation, etc. ATIS, GSMA, ONUG, TIA, etc.
Government	Promoting innovation and competition.	Governmental agencies. Public policy advocates.
Influencers	Analysis, Vision advocacy, PR.	Analysts, Publications, PR/Marketing agencies, conference organisers.

Table 1: Stakeholder & Ecosystem Participant Roles & Contributions

Building Innovation Ecosystems: Approaches

In general, two approaches can be considered for building telecom innovation ecosystems**:**

1. **Top-down approach.** Creating a comprehensive *all-embracing* ecosystem that would serve as a common foundation for current and future innovation projects and activities; such an ecosystem might form/establish *ad-hoc* teams (*sub-ecosystems*) to better fit specific innovation targets.
2. **Bottom-up approach.** Building dedicated ecosystems for specific innovation use cases in order to tailor an ecosystem for a specific case; **its participants/partners, their capabilities/contribution and the collaboration format/model**. The granularity is defined by selecting several typical quintessential cases that should represent major innovation supply options. Such a typology would allow replicating ecosystem success stories and positive experience, as well as preventing failure due to better awareness of missing partners or capabilities.

   This bottom-up approach provides an operational method for accumulating broad field experience and proposing a justified basic model as a starting point or short-cut to forming an effective ecosystem for a specific case, rather than building it from scratch.

   In addition, a common view on multiple typical use case practices would facilitate general analysis of the effectiveness of ecosystem operation and provide additional guidelines for assuring effective innovation processes. Involvement and buy-in of Procurement to empower deviation from 'business as usual' processes is crucial.

The TEG considers that the **Top-down** approach is more suitable for **innovation initiative ecosystems**, while the **Bottom-up** approach is a better fit to the **innovation supply ecosystems.**

Benefits of the Ecosystem Approach

An innovation strategy focused on the ecosystem has many benefits compared with alternatives. The TEG view of the benefits for ecosystem stakeholders is summarised in Table 2.

Benefits & Values	Ecosystem Stakeholders				
	Telco	Vendors	End Users	Investors	Government
Bringing together complementary expertise and capabilities	✓	✓			
Sharing of development costs - increased profitability	✓	✓		✓	
Facilitates sharing of best practices - what works, what doesn't work	✓	✓			
Reduced time to market	✓	✓	✓	✓	
Solutions a better fit to telco needs and requirements	✓	✓			
Increased telco competitiveness – more innovative solutions and services	✓		✓		✓
Increased telco revenue - more compelling services and better end-user experience	✓		✓	✓	
Increased likelihood of achieving economies of scale	✓	✓		✓	
Improved linkage between technology development and productisation and commercialisation phases	✓	✓		✓	
Increased startup motivation to collaborate with telcos	✓	✓			
More attractive justification for innovation funding	✓	✓		✓	✓
Better innovation visibility and showcasing/public awareness	✓	✓	✓		✓
Easier ecosystem expandability and adjustment to market changes	✓	✓	✓		

Table 2: Ecosystem Stakeholder Benefits

Proposed Methodology to Build Effective Innovation Supply Ecosystems

Currently there is no widely accepted methodology to build and assess the effectiveness (i.e., "health") of telecom ecosystems, or to measure the impact of activities/actions intended to improve the ecosystem to better meet telco and industry needs as well as the requirements of the evolving market.

With the focus on the **innovation supply ecosystems** domain, the TEG proposes a model based on the following principles:

- Recognition that there are a variety of ecosystem forms to fit different specific innovation targets and scope (i.e., there is not *one size fits all*).
- Taking a proactive bottom-up approach to define specific innovation supply ecosystems for particular typical innovation use cases, rather than defining an innovation supply requirement and then reactively figuring out what ecosystem players will be needed to fulfil it.

Such innovation supply ecosystems can develop incrementally with some steps that call for only a few ecosystem partners or sub-ecosystems to adapt rapidly, while others leave/join over time, commensurate with the innovation phases as well as new market dynamics.

To aid in the development of a practical bottom-up approach, the TEG has identified several typical or generic "external" (i.e., not related to internal telco processes) innovation use cases and described their case-specific ecosystems within a generic types/class ecosystem taxonomy. The cases outlined include examples where ecosystems have succeeded or failed.

To make the Bottom-up approach even more effective/operational, the TEG has introduced **the hourglass model** shown in Figure 3 as being more suitable for facilitating engagement of startups and smaller vendors than the traditional innovation "funnel" model. The hourglass model better characterizes the distinct vendor roles in different phases of the innovation lifecycle.

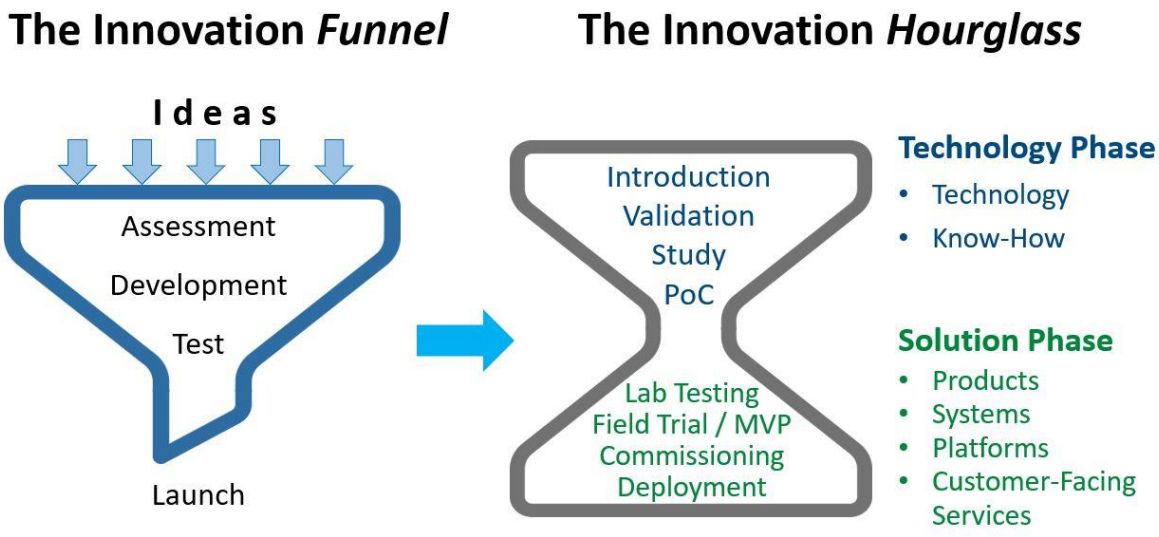

Figure 3: The Innovation Hourglass Model

- **Technology Innovation Phase**: start-ups and innovative smaller vendors should be incentivised to play a significant role. For a technology innovation case, not all steps may be performed; for example, only Introduction or PoC.

- **Solution Innovation Phase**: the most realistic scenario for involvement of start-ups and innovative smaller vendors would be to establish partnerships with large vendors in some "*coopetition"* relationship, although it is recognised that this is not without pitfalls and roadblocks for the smaller vendor.[2] Therefore, effective ecosystems have provision for start-ups and smaller vendors to play a leading role in deployment as they have in the evolution of the Cloud, etc.

  For most successful solution innovation cases, all steps would typically be performed, from Lab Testing through to Deployment.

Using the **bottom-up** approach we will analyze and consolidate the best practices for multiple specific micro-level innovation supply ecosystems based on several typical or generic "external" (i.e., not related to internal telco processes) innovation use cases with their case-specific ecosystems. These proto-typical ecosystems are representative of the various forms of ecosystems in terms of the players/stakeholders and their roles and relationships.

The TEG approach is applicable to all ecosystem types and enables the health of a case-specific ecosystem to be assessed.

Typical Ecosystem Use Cases & Examples

Some typical use cases are now given for the hourglass model innovation flow. The use cases are illustrated with real-world examples where innovation ecosystems have worked or failed - a kind of "health assessment"; the overall intent being to develop a taxonomy to create effective innovation ecosystems.

The use case examples given here come from many years of TEG contributor experience in telecom industry technology innovation, deployment & operations. The use case examples have been selected because they best illustrate the innovation challenges faced by veteran contributors. The ecosystem viewpoint has been used de-facto already for quite a while, but it was never clearly defined as a methodology and articulated as a practical approach. The examples provided clearly prove the practicality and efficiency of the approach in the long run. We invite industry colleagues to share additional typical use cases and/or examples which specifically address recent technology and business trends, including disaggregated architecture, cloud solutions and new business models, etc. Guidelines and contact details are at the end of this document.

1 Technology Introduction Use Case: Creating PoCs to Demonstrate New Technology Feasibility

1.1 Use Case Description

A challenge for telcos is how to respond to changes in user demand or respond to competitors with more service capability. In the telecom domain, new communications technology is typically first tested in the lab as a Proof-of-Concept (PoC) project to validate its feasibility and performance under simulated and real-world conditions. New technology prototypes that are incremental upgrades to existing infrastructure are typically provided by large vendors who are already partnered with the telco.

Startups are typically engaged to contribute prototype technologies that may be several years away from productisation and commercialisation.

In either case, it is often challenging to bring together the parties needed to create a PoC in order to validate technology feasibility and to use it as a tool to explore/validate market need and investment implications. Barriers include availability of prototype technology, investment and skilled resources.

1.2 Use Case Example: DSL-based Access Solution

1.2.1 Overview

Following a market and competitor analysis, senior executives within a large European telco had become concerned that cable network operators had developed high-speed internet technology that could operate over their existing cable TV access network infrastructure with a relatively simple upgrade. Whereas, at that time, the telco was offering relatively slow consumer internet services based on "dial-up" voice-band modem technology operating over the existing telephone network. What was needed was an innovative technology solution that would leverage the telco's existing wireline access network infrastructure.

A startup had independently identified a market need and had pro-actively developed a novel high-speed Digital Subscriber Line (DSL) modem technology offering far higher speeds over the existing copper telephone wires than hitherto. The startup was willing to provide a small number of modem prototypes free of charge to be tested in the telco's lab.

1.2.2 Actual Ecosystem

The perceived benefits for the startup included validation of performance on a specialised telecom network testbed along with access to telco subject matter experts.

The following ecosystem roles and capabilities were identified, in particular a technology supplier with capabilities aligned with the telco requirements and timescales was identified.

Stakeholder Role	Contribution	Participants
Telecom Customer	Specialised testing infrastructure and skilled staff. Expertise to analyze and position results in terms of telco access network investment strategy. Legal agreements governing confidentiality, use of test results, IPR protection, regulatory impact, etc.	Tier-1 European Telco: R&D/Labs, Network Engineering & Operations, Marketing, Procurement, Legal, Executive stakeholders/decision makers.
Telecom Services User	Important users (as a focus group) were shown demos to indicate future competitive capabilities of the telco.	Large corporate customers.
Technology Supplier	Technology prototypes. Support of telco standardisation effort.	Technology startup. Startup lawyers
Sponsor/Investor	Development funding, staffing, travel, product purchases.	Third party funding entities.
Standards Development Organisations, Industry Associations.	Hosting specification development, evangelisation and promotion of the new direction and solution.	Telco & vendor experts attending the elevant groups in IEEE, ETSI and ITU-T Broadband Forum (BBF)

Influencers	Publicity for both startup and telco to evangelize and promote the new technology, Analysts and Investors.	Telecom industry publications, analysts, conference organisers.

1.2.3 Ecosystem Performance

The laboratory test results were impressive due to the advanced capabilities of the startup which had pro-actively and correctly identified a market and developed its technology to the prototype stage (this fits the "Technology Innovation Phase" in the hourglass model depicted in Figure 3).

To help transition the technology to the solution/deployment phase of the hourglass model, the telco created compelling proof-of-concept demos which showed how internet download speeds over the existing network could be dramatically increased compared with dial-up. These demos were provided to key stakeholders across the company to obtain their support for the necessary network upgrade investment. External stakeholders and influencers were also provided with demos to show the future competitive positioning of the telco in the emerging broadband market.

The telco established a formal collaboration with the startup to help commercialise DSL technology for scale deployment and initiated a standardisation effort across the wider supply ecosystem to ensure competitive supply and multi-vendor interoperability.

The company survived entirely on revenue, went public in 1995 and was #2 growth stock on NASDAQ for about one year until it was acquired by a leading semiconductor company.

Main takeaways: *Innovative startups with adequate funding and good understanding of telecom infrastructure can position telcos to rapidly respond to competitive threats and new services opportunities. Telcos need to collaborate to converge their technical requirements for new technology to achieve economies of scale and startups need to be willing to license their IP and work collaboratively with telcos and large vendors to standardise their technology to ensure competitive supply and multi-vendor interoperability.*

2 Technology Study Use Case: Innovation with Pre-Standard Technology

2.1 Use Case Description

Introducing networking hardware and software products based on emerging technologies into the telecom domain is a significant challenge for vendors, especially smaller ones. Resources are in short supply and costs rapidly escalate due to the complexity of the telecom operating environment and the need for compliance with the detailed specifications issued by telcos. Very few startups and smaller vendors succeed in the face of these challenges.

2.2 Use Case Example: Deploying Proprietary Telecom Infrastructure Software

2.2.1 Overview

A Tier-1 European telco was telling incumbent vendors that it needed multi-vendor orchestration. The vendors claimed that it was impractical, so the telco engaged startups to prove that it could be done. A startup proposing to sell innovative proprietary software to telcos received Angel seed funding, built a business plan and started looking for VC investment which was very challenging as most VC's were not interested in a venture focused on the telecom industry. However, one VC was interested in due diligence to establish feasibility of the proposition and challenged the company to show how it would get through the barriers to entry created by telecom standards groups and industry associations. The startup initiated a significant effort to prove feasibility and market demand.

2.2.2 Actual Ecosystem

The following ecosystem roles and contributions were identified:

Stakeholder Role	Contribution	Participants
Telecom Customer	Provision of test infrastructure & expert resources. Hosting public demonstrations of the PoC.	Tier-1 European Telco
Technology Supplier	Emerging technology supply and providing a PoC prototype.	Start-up
Sponsor/Investor	Seed funding	VC
Standards development organisations & Industry Associations.	Venues for the start-up and telcos to initiate and collaborate on standardisation.	3GPP (SA5), TMF NGMN

2.2.3 Ecosystem Performance

The startup went through two rounds of seed capital funding over an 18-month period, including joining and traveling to standards meetings and paying hosting fees to demonstrate the PoC. However, in the follow-up dialogue to establish the next steps towards a business relationship, it became clear that while the telco was happy to support the creation of a PoC, it was not willing to buy from a startup.

While the experience enabled the start-up to access telco infrastructure and resources to prove its technology, the end result was that the telco exhausted the startup's funding which proved to the VC community that there was no point in investing in startups to serve telcos. Without access to funding to commercialise the product, the startup folded.

Main takeaways: *Telcos are reluctant to buy from startups but are happy to use them to demonstrate feasibility of new capabilities without providing any funding for PoCs or any commitment to procurement. This has signaled to investors that the telecom industry is a hostile environment for startups with little prospect for returns on investment. A potential solution here would be a royalty paid to the start-up that rewards its efforts and its investors' for ther support.*

3 Technology PoC Use Case: New System Solution Assessment in a PoC setup

3.1 Use Case Description

Telcos often need to introduce new services solutions that combine existing products from an incumbent vendor(s) and new technologies from innovative new startups or mid-size vendors. Proof of concept demonstrations are an important tool to establish feasibility and demonstrate new services capabilities.

3.2. Use Case Example: Pioneering Application-Aware Networking with SLA Assurance

3.2.1 Overview

A mid-size network equipment provider offered a new technology to a large US telco to monitor applications at business customer sites. The idea was initially introduced to the telco R&D team to obtain initial feedback on the capabilities and to determine the required functionality to meet their needs. The R&D team provided detailed

feedback which became the basis for a PoC setup in the telco lab. The PoC included another vendor who provided a central site DPI (Deep Packet Inspection) engine.

3.2.2 Actual Ecosystem

The following ecosystem roles and contributions were identified:

Stakeholder Role	Contribution	Participants
Telecom Customer	Championing the PoC. Clarifying the required functionality. Providing human resources and lab space for evaluation. Arranging meetings with incumbent vendors.	Tier-1 North American Telco: CTO/R&D Organisations.
Technology Supplier	Initiating customer interest. Education on the new solution. Adapting the PoC functionality to the telco case. Providing the PoC equipment. Participation in brainstorming sessions.	Mid-size Network Equipment Vendor
Assistance Partner	Providing a complementary DPI solution. Participation in brainstorming sessions.	DPI Equipment Vendor
Assistance Partner	Consultancy on implementation in the existing platform.	Incumbent CPE vendors

3.2.3 Ecosystem Performance

The telco team spent some time experimenting with the PoC solution and fruitful brainstorming sessions were held with incumbent CPE vendors on possible enhancements to the current CPE solutions, including add-on capabilities provided by the technology supplier's pluggable devices.

Unfortunately, the priorities of the telco changed and this otherwise successful and promising project was put on hold. About ten years later, such application awareness functionality was required by telcos including novel SD-WAN solutions.

Main takeaways: *Innovation projects consume significant resources but are vulnerable to shifts in telco strategy. Vendor participants should undertake a broader market study, including probing whether other telcos see the same potential. Commitment for a joint marcom activity would be beneficial for vendors to mitigate the risk.*

4 Product Trial Use Case: Improving Network Operations for Mass Deployment

4.1 Use Case Description

Telcos often face scaling problems when moving from pilot/limited trials to mass deployment. New and innovative add-on solutions may be required to mitigate/address this problem. Often, the quickest way to prove

feasibility and evaluate the operational impact and economics of a proposed solution is to trial a third-party product and then undertake a cost-benefit analysis to inform the strategy for development and procurement.

4. 2. Use Case Example: Improving DSL Access Network Operations

4.2.1 Overview

A European network operator with a large installed base of DSL links needed to improve network operations and customer experience by more effectively managing the links, particularly troublesome ones. The network operator initiated a project with a US-based startup to trial a potential solution.

4.2.2 Actual Ecosystem

The following ecosystem roles and contributions were identified:

Stakeholder Role	Contribution	Participants
Telecom Customer	Installation and trial of a demonstration system. Legal framework for IPR protection.	Tier-1 European Telco: Operations & Legal. Courts
Product Supplier	Developed and demonstrated a product prototype. Legal framework for IPR protection.	Startup & Legal. Courts

4.2.3 Ecosystem Performance

The product trial was very successful and the telco concluded that such a system would significantly improve DSL network operations. However, they decided they could develop their own product in-house and did not pay the vendor to license the technology beyond the trial. After years of trying to obtain payment, the vendor sued the telco. Judges within the telco's jurisdiction found that the telco had abused the startup and violated its IPR, but only after nearly 10-years of appeals was the telco fined for bad behavior. The telco eventually settled for an 8-figure sum and undertook not to sell their in-house product to the startup's other customers.

Later, the telco did sell its in-house solution to the startup's other customers and devastated its revenues in that country. Moreover, the telco continued to create issues for the startup behind the scenes by encouraging others to boycott them.

Main takeaways: *Telcos cannot always be trusted to not copy or otherwise abuse a vendor's IP and can use their far greater legal resources to exhaust the vendor's resources in the courts. A solid legal framework needs to be put in place to protect the interests of both parties, in particular, well-defined clauses which prevent unauthorized use or copying of the startup's IP are essential.*

5 Product Innovation Use Case: Network infrastructure Innovation Based on Existing Technology

5.1 Use Case Description

It is often required to extend/broaden already implemented technology within existing solutions and incorporate it in solutions for a different application or domain. For example, to integrate backbone network domain technology into access network domain products.

A turn-key solution from a single vendor may be too expensive and not sufficiently optimised for the new application or domain.

5.2. Use Case Example: ATM-based Access Solution

5.2.1 Overview

A mid-sized vendor, referenced here as the "innovation partner", introduced a dedicated ATM access CPE solution for business services to a large European telco. The solution extended ATM performance monitoring and traffic management capabilities to the customer premises. The technology was not new to the telco as its R&D division had co-invented the technology which was already deployed in the nationwide backbone network. In parallel, the innovation partner was co-developing the solution with another large European telco.

The solution was discussed in-depth with the telco's R&D and Engineering and Operations teams to make sure that it met their needs and requirements. Separate meetings were held with the telco's Marketing people who were interested in enhancing the existing ATM connectivity services for business customers.

5.2.2 Actual Ecosystem

The following ecosystem roles and contributions were identified:

Stakeholder Role	Contribution	Participants
Telecom Customer	Championing, evaluation, testing and certification. Joint fine-tuning and bug fixing. Identifying new emerging needs and requirements. Co-defining new solutions and services. Providing supply forecasts.	Tier-1 European Telco: R&D/Labs, Engineering, Operations, Marketing, Procurement, Legal, etc.
Technology Supplier	Promoting customer interest. Education on the new solution. Providing equipment and human resources for extensive testing and experimentation. Fine-tuning and adapting the required product functionality. Co-defining new solutions and services. Level 2/3 technical support. Product supply.	Innovation partner (mid-size vendor).
Assistance Partner	Consultancy on integration with the existing ATM backbone network and other networks. Level 1 technical support.	Incumbent ATM Equipment Vendor
Influencer	Support with promoting ATM advanced traffic engineering and performance monitoring capabilities.	ATM Forum

5.2.3 Ecosystem Performance

After telco acceptance of the solution, the incumbent vendor supplying the ATM backbone equipment became a channel partner for the innovation partner's ATM CPE. The procurement was via the incumbent vendor supply contract, while a monthly-updated forecast was provided directly to the innovation partner. The incumbent vendor provided Level 1 technical support, while Level 2/3 support was provided by the innovation partner.

In the very beginning, the focus of the collaboration was on pure ATM business services, later it was broadened to more retail and wholesale services and large customized projects.

This was a highly effective collaboration ecosystem that resulted in $100Ms sales until ATM technology was displaced by IP and Ethernet technology in the access networks.

Main takeaways: *An effective supply ecosystem based on meticulously-organized trustful professional partnership is sustainable and provides good opportunities to evolve towards new solutions and domains. Flexibility of a smaller vendor capable of providing carrier-class products is a strong advantage.*

6 System Innovation Use Case: Improving Network Operations in a Multi-vendor Environment

6.1 Use Case Description

Telco network infrastructures are multi-vendor environments which require integrated and interoperable solutions to improve service delivery and operations, particularly in the network & service management domains. Typically, solutions are developed by a telco's in-house team partnering with a dedicated systems integrator and/or incumbent vendors.

The challenge for telcos is to motivate incumbent vendors to innovate and invest in product roadmaps which meet their evolving needs. Hence, they are interested in engaging start-ups and innovative smaller vendors who may be more flexible and responsive to accommodate new requirements.

6.2 Use Case Example: Creating an Umbrella Network Management System

6.2.1 Overview

A large Mobile Network Operator (MNO) in Asia struggled with "swivel chair" network management in their network operations centre. Each of the incumbent vendors provided technology domain specific Element Management Systems (EMS). An urgent need was identified for an "umbrella" Network Management System (NMS) to consolidate fault reporting across all domains and all vendors. The MNO initiated a multi-vendor project to solve the problem.

6.2.2 Actual Ecosystem

The following ecosystem roles and contributions were identified:

Stakeholder Role	Contribution	Participants
Telecom Customer	Ordered and facilitated development of the new umbrella solution. Persuaded vendors to share their proprietary interface specifications. Assisted with the new product integration. Assigned a senior project manager to champion the development.	National MNO supported by Global Group MNO

Technology Supplier	Developed the new product.	Small Independent Software Vendor
System Supplier	Provided cell site sensors and a centralized dashboard for reporting and analytics.	Network Equipment & Management Software Vendor.
Assistance Partners	Provided their proprietary specifications for relevant deployed interfaces.	Incumbent Network Equipment Vendors

6.2.3 Ecosystem Performance

The Independent Software Vendor successfully demonstrated alarm collection from an existing incumbent vendor EMS and a project was started to consolidate all the alarms for all domains on one dashboard. This resulted in significant improvement in MNO operational efficiency and customer experience.

Unfortunately, the global MNO did not follow through on the promise to introduce the product to its other opcos.

Main takeaways: *Telcos can, with persistence, influence their suppliers to achieve multi-vendor integrations. Startups should not rely on one customer as the vector to follow on sales.*

7 Platform Innovation Use Case: Entering New Service Domains with Innovative Solutions

7.1 Use Case Description

Telcos are interested in how their services can be enhanced to better meet end user needs and how services can be adapted for entirely new market segments using existing technology solutions and existing or new partnerships.

7.2. Use Case Example: Public-Private Partnership for City Wireless Services

7.2.1 Overview

A wireless Internet service provider struggled to find cost effective solutions to “last mile” access for suburban housing developments where no wireline outside plant existed and wireless service from existing mobile network operators was either too slow, expensive or unavailable. With low revenue potential in the target market, the cost of customer premise equipment and backhaul made most projects economically unfeasible.

It was determined that a small residential area could be covered by locating wireless access points on street lights. This solution allowed an equipment cost low enough to make the business case feasible but pole attachment rights and access to electricity would be required for a complete solution.

An opportunity was recognized to create a compelling offer for housing developers and municipalities where the wireless internet service provider would offer to replace the current incandescent lighting with power saving LEDs. The combined power consumption of the lighting and wireless equipment would be significantly less than the existing incandescent lighting, thereby saving electricity costs. Value-added capabilities to provide future Smart City services were also described in the offer to make it attractive for municipalities.

7.2.2 Actual Ecosystem

The following ecosystem roles and contributions were identified:

Stakeholder Role	Contribution	Participants

Telecom Customer	Provider of residential Wi-Fi services. Partner in public-private partnership with facility provider and municipal government.	Wireless Internet Service Provider
Product Supplier	Manufacturer and provider of wireless access points with smart city capabilities.	Network Equipment Provider
Assistance Partner	Facility owner and operator of street lighting infrastructure.	Housing developer.
Assistance Partner	Potential provider of Smart City services.	Municipal government

7.2.3 Ecosystem Performance

The solution seemed like a clear win for all stakeholders, but the wireless internet service provider had to develop a viable business case and sell it to the lighting infrastructure owners; only then could marketing begin. A key problem was a lack of understanding within the wireless internet provider of the roles and requirements of the different stakeholders resulting in the project never getting past the feasibility study phase.

Main takeaways: *While multi-party business agreements can have significantly better outcomes for all stakeholders, the additional complexity taxes existing processes and skill sets making it a non-starter if any one party does not surmount these challenges.*

8 Service Innovation Use Case: Enhancement of Services to End Users

8.1 Use Case Description

Telcos continually seek ways to innovate their product offerings to end users but find that large incumbent vendors are often reluctant to invest in management enhancements to existing products, develop new product offerings in a timely way, or develop products optimised for the needs of an individual telco because they need economies of scale (i.e., by selling essentially the same products to multiple telcos).

8.2. Use Case Example: PBX Distribution Service Enhancement

8.2.1 Overview

Senior telco executives had observed that a large incumbent vendor, the supplier of private branch exchanges (PBX), was not delivering on smaller applications which customers were requiring in RFPs. Senior executives of the PBX vendor recognized that their organization wasn't well positioned to deliver value-added services software applications in either a timely or profitable manner.

8.2.2 Actual Ecosystem

A start-up was formed, as a joint venture with the PBX vendor, to develop a network management system (NMS) specifically for the PBX products. A technology transfer agreement ensured no element inside the incumbent vendor would be permitted to limit the start-up's access to the incumbent's technology. At first this worked well with the start-up receiving both hardware and a steady stream of pre-release software from the incumbent vendor to enable it to develop a multiuser application which would considerably simplify operations and management of PBXs.

The following ecosystem roles and contributions were identified:

Stakeholder Role	Contribution	Participants
Telecom Customer	CPE Distribution services (sales and technical support), PBX equipment and the new NMS product to enterprise customers.	Tier-1 North American Telco
Telecom Services User	Purchasing and operating PBX equipment and network management software.	Enterprise customers
Technology Supplier	Producer of new network management software to configure & control incumbent vendor PBX products. Technology transfer licensee.	Start-up software vendor
Assistance Partner	Manufacturer of PBX equipment, technology transfer licensor. Provider of an alternative NMS that failed.	Incumbent Network Equipment vendor

8.2.3 Ecosystem Performance

The new product was announced to the incumbent vendor's distributors and their north American telco customers, and it was well received due to there being no competitive products on the market at that time.

However, the reaction within the incumbent vendor organisation was much less enthusiastic due to a "*not invented here*" mindset. Moreover, sales and marketing people within the company were uncomfortable with a third-party product being offered by their distributors and although innovation continued, technology transfer slowed with friction between the parties.

The incumbent vendor found another partner whom they could better control and introduced a competing product to the market. However, with endorsement by telco customers, a successful track record and continuous innovation, the startup's new product dominated the market and the incumbent's competing product was ultimately withdrawn due to poor sales.

Main takeaways: *Large vendors are less agile and less incentivized to meet niche requirements than start-ups. Enabling a start-up to handle peripheral applications can better meet customers' total requirements, but maintaining structural separation is imperative for continued success.*

Applying the Ecosystem Approach: Preliminary Guidelines

As described earlier in this document and with a focus on the **innovation supply ecosystems** domain and taking a **bottom-up approach**, the TEG proposes a telco innovation procedure according to the following steps:

1. Define the target and scope of the innovation project.
2. Assess and select which of the defined typical use cases is the best fit (i.e., most relevant) to the project.
3. Using the ecosystem description of the selected typical case as a basis, decide on the relevant ecosystem participants/partners, their capabilities/contribution and the collaboration format/model. The example takeaways, along with other information on the typical use cases, may be useful. If required, plan for incremental ecosystem development to quickly identify missing capabilities and potential partners who

can provide them. As a support tool, an up-to-date database of potential solutions providers (including niche suppliers and startups) could be maintained to assist with this step.

4. Establish a partnership governance framework within the target innovation supply ecosystem with well-defined roles underpinned by appropriate legal agreements.
5. Facilitate and support progress within the ecosystem by putting in place effective program management with monitoring, metrics and budgetary provision for royalty payments.
6. Ensuring ecosystem coordination and "internal" facilitating activities are critically important. [3]

Invitation to Provide Feedback and Additional Use Cases/Examples

For feedback and questions about this document or to share additional uses cases with examples or to express interest in participating in the follow-up discussions, please email us at Enquire@TelecomEco.org

We are specifically interested in additional typical uses cases and/or examples which address recent technology and business trends including disaggregated architecture, cloud solutions and new business models, etc. Please use the following format to share additional use cases with a real-world example, or additional examples for already presented typical use cases.

1. Typical Use Case [Title]

1.1 Use Case Description [Describe the motivation(s) for the Use Case]

1.2 Use Case Example: [Title]

1.2.1 Overview [Provide an overview of the example]

1.2.2 Actual Ecosystem [Identify and describe the roles as per Table 1]

1.2.3 Ecosystem Performance [Describe the outcomes and summarise ecosystem learnings]

References

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[3] **Telecom Ecosystem Group Blog, P.W. Willis, "Tips on Selling a Technology to a Telco"**
https://www.linkedin.com/posts/telecom-ecosystem-group_teg-blog-post-on-selling-technology-to-telcos-activity-6963932373684027392-znpi/