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# Creation of Value with Open Source Software in the Telecommunications Field

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**Abstract:** Creating value with open source software is a considerable challenge, but also a great opportunity for any telecommunications company. This paper proposes a new extended version of open source business roles model and evaluates the proposed framework for three pertinent and emerging scenarios. The Osterwalder methodology is used to describe and assess the application of the framework for each considered scenario.

**Keywords** – open source, business model, unified communications, VoIP, IMS

### I. INTRODUCTION

Open source is a popular term referring to software whose source code is freely available for consulting, modification and enhancement. Open source software can offer both cost reductions and improvements in software quality. Well-known open source software are infrastructure components such as Linux, Apache Server and the Eclipse development tool.

Over the last ten years, open source software has moved from a typical research and development environments to the enterprise sector, where it is competing against very successful proprietary software on a variety of domains such as Internet, industry and financial services. However, the uptake by incumbent telecommunications providers has been residual due to prior strategic investments made on proprietary software and perceptions over open source risks.

When we look to the world of telecommunications, we realize that it has changed immensely over the last decades of the last century and is continuing to change in this new century. There have been whole new multibillion euro/dollar industries created by the rise of the Internet

and mobile communications, which have contributed significantly to the economics of industrialized countries.

Currently, the telecommunications industry is facing several changes. Telecom service providers are looking to reduce their costs using commodity software and Commercial Off-The-Shelf (COTS) hardware building blocks. At the same time, the growth of packet traffic and the appearance of VoIP and ad-hoc technologies are pressuring the communication networks. To face these new challenges, telecom operators need to provide reliable and integrated solutions, address the worldwide market and increase their capability for fast delivery of new services by shortening new service development time and unifying platforms.

### II. OPEN SOURCE BUSINESS ROLES MODEL

The most important study about the use and impact of open source software in telecommunications was promoted by Eurescom [1]. The project analyzed the phenomenon of open source software from a telecom operator's perspective. Regarding the creation of a common open source business process, Eurescom proposed a business roles model with clearly assigned tasks and relationships.

The approach followed in this research work extends and instantiates the generic open source business roles model initially proposed by Eurescom in 2001 to take in consideration emergent technologies available in the market such as IPv6, IMS, VoIP and Ad-hoc networks; to facilitate the relationships between universities/research centers and private companies; and to be

easily explored by technological-based start-up companies.

The new extended version of open source business roles model encompasses ten roles and establishes certain key relations between these protagonists. These roles are described below:

- Open Source Providers – mainly develop, improve and release Open Source software;
- Open Source Support Service Providers – sell support services for Open Source products. *Open Source Support Services* encompasses Open Source product related failure handling, adding new features, versioning, among others;
- Open Source System Integrator – use Open Source software in order to build Open Source based system solutions. Apart from Open Source services also proprietary services can be implemented upon these systems;
- Open Source Consultant – provides consultant services about open source solutions based on his previous scientific and/or professional experience;
- Legal Support Providers – offer the necessary legal support for formulating, using and understanding Open Source licenses;
- Quality Certification Entity – provides certification in software and processes fields;
- Training Providers – offer training services to any company that wants to use and configure open source solutions;
- Portal Provider – manages the aggregation of specific converged services and technical open source solutions. This entity can also be responsible for the packaging and marketing of services for end users segments;
- Network Operator – carriers and delivers data and web content for the customer. It can encompass the role of a broadcasting networking operator or mobile network operator. Typically, it is responsible to provide network connectivity, access to billing systems, and manages quality of service;

- Customers – buy and use Open Source system solutions.

The study conducted by Eurescom in 2001, already considered the relations between *Open Source Provider*, *Open Source System Integrator* and *Open Source Support Service Provider* entities. They also introduced the idea of having a *Legal Support Provider* entity, but they didn't map this actor to the entities that would be responsible to assume this role. The others entities presented before were introduced by this research work for the first time. It is also important to notice that the Eurescom study considers that the *Customer* role of their model is performed by the *Network Operator*. In this research work, we separate these two entities and we give a special attention to the end-user needs for each considered application scenario.

### III. BUSINESS MODEL ANALYSIS METHODOLOGY

#### a. Literature Revision

Several authors give a definition of a *business model* and propose a brief list of components that should be included in that description. Recent literature proposes the decomposition of the *business model* into components and describing each of them in more detail. There are many scholars naming components to the business model, but Osterwalder and Pigneur [2] version is one of the most complete and comprehensive work. First of all, they build their main building blocks based on well accepted strategy literature, such as Hagel and Singer [3] and Markides [4], and second, they have gone through all the other scholars lists of components to reveal the total amount of nine components [5]. A comparison of the components of Osterwalder and Pigneur [2] and two of the most cited and distinguished research groups on business models, Afuah and Tucci [6] and Chesbrough and Rosenbloom [7] is illustrated in table 1.

**Table 1. Comparing components of business models**

<b>Chesbrough and Rosenbloom</b>	<b>Afuah and Tucci</b>	<b>Osterwalder and Pigneur</b>
Value Proposition; Market Segmentation; Revenue Mechanisms; Value Chain; Cost Structure; Value Network; Competitive Strategy	Customer Value; Scope; Revenue Source; Execution; Pricing; Connected Activities; Sustainability; Capabilities	Customer Segments; Value Proposition; Com.Channels; Distrib. Channels; Cust.Channels; Key Resources; Key Activities; Revenue Streams; Partner Network

Based in table 1, we can confirm that there are many similarities. There are some differences in components name and the *Customer Relationship* and *Distribution Channels* are components included only by Osterwalder and Pigneur. Another component that differs is the *Competitive Strategy* or *Sustainability*. This component can however be defined as a summary of the competitive advantages hidden in the rest of components. Thus, the competitive strategy component should be removed. This view is also supported by Magretta [8]: “when a need model changes the economics of an industry and is difficult to replicate, it can by itself create a strong competitive advantage”; and also supported by Christensen [9]: “the business model can be a source of competitive advantage that is distinct from the firm’s market position”.

**b. Osterwalder Approach**

The Osterwalder methodology is used to describe the value chain and analyze the business model that supports each scenario. This methodology follows a three tier approach: first, it decomposes the business model into nine components; second, it assesses the business model using the SWOT analysis and a package of pertinent questions; third, it tries to identify the potential innovation and improvement paths.

Following the Osterwalder vision, a business model can be described by

looking to the following set of nine blocks, as presented in table 1.

Consecutively, it is important to evaluate the business model. One common tool used to evaluate the business model is the SWOT methodology. SWOT analysis entails portraying a business’ internal context in terms of strengths and weaknesses and scouring its external context for opportunities and threats. Yet despite its popularity and longevity, the SWOT approach is sometimes ineffective, since it promotes superficial scanning, improper categorizing and doesn’t consider subtler aspects of modern strategic theory, such as trade-offs [10]. To address this problem, Osterwalder proposes a key of pertinent and flexible questions that assessed the business model in its nine components.

Finally, after assessed and described, the challenge of a business model remains in its renewal. The business model innovation can be seen as a strategic initiative to configure and reconfigure various elements of the nine components of the business model ontology presented by Osterwalder to enhance value creation potential of the firm and sustain it over a longer time.

**IV. APPLICATION SCENARIOS**

The proposed extended open source business roles model is instantiated for three representative and emergent scenarios: unified communications solution, VoIP solution and IMS based services.

**a. Scenario I – Unified Communications Solution**

In the first scenario, the *Network Operator* introduces a Unified Communication (UC) solution in the market. The concept of UC is recent and can be considered a successful approach, especially when addressed to the Small and Medium Businesses (SMB) market. UC communications have the potential to dramatically simplify and improve enterprise communications, reducing costs and improving revenue opportunities. The proposed architecture for a UC solution based on open source technologies and

open standards will provide firms with a platform with lower costs of ownership, faster time to deploy new solutions and greater flexibility. At the same time, it will also enable greater mobility and functionalities for end users.

The *Network Operator* can adopt two different levels of involvement with the software development process: lighter involvement and deeper involvement. In a lighter involvement strategy, the *Network Operator* would spend few resources in the community; in a deeper involvement strategy, the *Network Operator* would spend more resources in the community, eventually, participate in the production of the source code, testing various pieces of software in various environments, tracking and fixing problems reported by the user community.

There are other two entities that deploy important roles: the *Open Source Support Service Provider* and the *Quality Certification* entity. The former, will be responsible for the monitoring of IT networking and detection of the origins of failures, due to maintenance procedures, power outages and congestion or malicious attacks. The latter, could help the *Open Source System Integrator* to guarantee a high level of interoperability between the several different OS components that composes the UC solution.

#### b. Scenario II – VoIP Service

In the second scenario, the *Network Operator* introduces a VoIP service, to provide to its customers a VoIP solution taking into account the required features such as voicemail, call forwarding, call blocking, and guarantee of a certain Quality of Service (QoS). Besides that, the offered solution should be vendor independent, highly reliable and developed with minimal costs. Attending to these specifications, the available proprietary VoIP products are not the best choices and an Open Source product should be chosen instead. Among the Open Source VoIP solutions available in the market, Asterisk provides a complete PBX solutions being one of the most promising software in the field of IP-base telephony.

Typically in this scenario, we can consider that two entities will play an important and distinct role regarding the generic framework presented in this research work. The *Training Providers* can offer two types of VoIP training course: platform and non-platform specific. Seldom, the *Training Provider* will have conditions to give only formation and training session in OS solutions. A more realist situation will be the simultaneously inclusion of formation courses in proprietary and open source solutions. The *Quality Certification* entity should provide an IT certification that addresses the two most important issues in an IP-based communication: QoS and security.

#### c. Scenario III – IMS based Services

In the third scenario, the *Network Operator* wants to be able to provide a converged fixed-mobile solution to its customers composed by a wide range of applications, like Instant Messaging (IM), IP Centrex, Video on Demand (VoD), gaming and Location Based Services (LBS). Offering all these services together can be achieved using an IMS architecture, which is the best suited for blending real-time and non real-time multimedia services. In fact, the potentiality of IMS architecture allied with the flexibility of the framework proposed facilitates the creation and deliver of open source based services.

The *3rd Party Service Provider* can exist separately or can join the *Open Source System Integrator* to provide value-added services based on OS solutions. Therefore, the *3rd Service Provider* can act as a small integrator of OS solutions in specific domains of the overall IMS architecture, such as mobile entertainment and location based services. In this scenario, the customer would pay for the data transport and for *3rd Service Providers*.

The introduction of the IMS architecture will decrease the time-to-market of these solutions, considering that the application developers are no longer hampered by multiple integration and deployment efforts. The presented IMS architecture significantly reduces the complexity of the system decreasing Capital Expenditure (CAPEX) and Operational Expenditure

(OPEX), and will allow the *Network Operator* to increase its value chain control. Besides that, universities and R&D centers with advanced knowledge in networking and telecommunications fields can participate as *3rd Service Providers* or as *Open Source Consultant* entities.

It was also studied in this scenario, the introduction of new revenue streams from Web 2.0 and Mobile Web 2.0 concepts to an IMS-based approach. The combination of IMS and Web 2.0 may introduce operators to new business models which can stand-alone or be used in various combinations. Each of these business models reduces operational costs or increases the top-line revenue. The business models that result in cost savings are outsourcing, wholesaling, asset-sharing and hosted services, while content aggregation and brokering, advertising, user-generated content increase the top-line revenue.

## V. CONCLUSIONS

This project proposes an extended version of open source business roles model with ten roles and certain relations between the actors and their instantiation. The *Open Source Consultant*, *Quality Certification Entity*, *Training Provider* and *Portal Provider* roles were introduced in this paper.

Three different scenarios were proposed on this paper. In the first, an UC solution addresses the SMB market. It defines important roles for *Open Source Support Service Provider* and *Quality Certification* entities. Besides, the proposed solution explores the open innovation paradigm to establish a close relationship between private companies and universities/R&D centers.

The second scenario suggests the use of Asterisk platform and identifies a relevant role to be performed by *Training Providers* and *Quality Certification* entities.

Finally, the third scenario uses the IMS approach to deliver a converged fixed-mobile solution encompassing a wide range of applications that will reduce the time-to-market of multimedia solutions and will reduce significantly the complexity of the system decreasing CAPEX and OPEX.

## VI. FUTURE WORK

There are numerous opportunities for research on the entire value chain of the proposed open source business roles model. Besides that, for each considered scenario, innovation paths of improvement could be studied in more detail.

In a first instance, the quality concerns in open source software as driven by industrial adoption could be analyzed in more detail. Moreover, it would be interesting to review the major quality evaluation models and analyze the challenges of open source quality assurance of certification. It would also be interesting to analyze the establishment of a metric to evaluate the impact of UC in a corporate environment.

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