Software Business in the Telecommunications Sector

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Abstract. Operations and Business Support Systems (OSS/BSS) software of Communication Service Providers (CSP's) can be developed internally within the CSP or acquired from a Software Vendor. The software industry lifecycle model hypothesizes that software development is internal in the beginning of the industry's lifecycle, and that the share of external products increases when it matures. Empirical evidence shows signs of the OSS/BSS software industry approaching maturity. Current and future developments of the industry include the possibilities of utilizing the Software-as-a-Service (SaaS) model and Open Source software (OSSw). Both have gained increasing interest by the CSP's. However, the relatively small markets (number of CSP's), added with complex and proprietary interfaces of technology and software, seem to hinder this development. The results of scenarios on the future of the industry propose that the adoption of SaaS and OSSw could be motivated by general cost-cutting, by alliances within the industry or by a focus of CSP's business on either providing network capacity or value-added services.

Keywords: Software Business, Industry Evolution, Software-as-a-Service, Open Source Software, Communications Service Providers.

1 Introduction: Software Markets and Their Evolution

In the context of vertical software industry, software business takes place in a dyadic relationship between a vertical industry enterprise and a vendor providing software products or services [6][14]. The vertical industry enterprise usually has its own unit or employees to produce certain software-related functions. Alternatively, the enterprise may find it more efficient and flexible to outsource software development, deployment and operating to an external vendor. Unique applications are more likely to be produced internally, whereas common applications based on established technology are rather outsourced. A common development in vertical software industries is that once unique and differentiating software depreciate into a commodity [15].

The evolution can also be explained through concepts of vertical integration and horizontalization. According to the industry lifecycle model [14], a software market is vertically integrated in the beginning, but eventually disintegrates into horizontal layers of software vendors, whose software products are interacting over standardized

A.M. Hadjiantonis and B. Stiller (Eds.): Telecommunication Economics, LNCS 7216, pp. 148–155, 2012.

interfaces. There are, however, multiple factors that may hinder the above process of horizontalization. These include, among others, technological immaturity and the need to span innovation coordination across multiple software modules and layers, the need for customer-specific tailoring of the software, and the need to maintain compatibility with legacy systems.

The developments predicted by the commoditization viewpoint and the industry lifecycle model are observable in the domain of telecommunication and in the software market serving Operations and Business Support Systems (OSS/BSS) for Communication Service Providers (CSP). A majority of CSPs, who have traditionally themselves developed and maintained all the software needed to run their operations, have recently adjusted their business strategy to concentrate on their key competence areas, i.e. communications and customer intimacy. Thereby they have also outsourced software development and maintenance to the software vendors and system integrators providing OSS/BSS products and services [3].

Furthermore, empirical data suggests that this OSS/BSS software market is reaching a maturity phase: There are signs of market consolidation [3] and software applications like CRM and billing have commoditized to the level that they can be provided and deployed utilizing a Software-as-a-Service (SaaS) model [6]. On the other hand, the results also indicate that the market segments of the OSS/BSS software market might be in different evolutionary stages [3][6] and certain other software applications are developed customer-specific and deployed on-premise. Evidently, the factors hindering horizontalization are present at the software market.

In the following, the attention is focused to more recent and future developments of the OSS/BSS software market. We consider the Open source software and Software-as-a-Service phenomena, which are seen as ramifications of commoditization and horizontalization of the software market. First, we present findings on adoption of software-as-a-service and open-source software in the telecommunication domain. Then, we discuss obstacles of horizontalization. We conclude a presentation of trends and predicted future developments of the software business within this vertical industry of telecommunications.

2 Adoption of Software-as-a-Service and Open Source Software

Software-as-a-Service (SaaS) is a type of software-based service where a service provider offers access to highly standardized commodity software over the Internet to several end-users [6][2]. This is accomplished by running a single instance of the particular software on top of multi-tenant infrastructure [6][11]. The definition implies that SaaS in its pure form is a model characterized by high volumes, high scalability on both the technology and the business model and on-demand pricing [13].

Contemporary literature on SaaS is mostly conceptual, suggesting pros and cons of the model. The economic benefits, less need for internal IT resources, and lower initial and total costs, are associated with the deployment and distribution model of SaaS, enabling service provider to achieve economies of scale [5]. In addition, customers may gain flexibility advantages such as prompt deployment, scalability,

easily accessible updates and patches and, additionally, strategic benefits like increased bargaining power over vendors [11][16].

Open source software (OSSw) generally refers to software, which source code is made available to all users along with the usual run-time code and which has licenses with relaxed or very few restrictions. The recent literature has observed the adoption of OSSw in organizations, suggested benefits and problems of OSSw adoption and examined which kind of OSSw are deployed and through studying the antecedents of adoption [16][12][1][4].

Literature suggests that the advantages of OSSw are associated with reuse: customers gain value from reduced time to market, reduced R&D costs, improved process predictability and increased product quality [1]. Comparably, the decision making in end-user organizations culminates on assessing potential cost benefits, on opportunities to exploit communities' resources and knowledge, and on functionalities and maturity of the software under consideration [4].

Using empirical data, we studied the adoption of OSSw and SaaS models in the telecommunication industry [6]. The study applied case research approach including a total of eight companies, six communication service providers and two software companies serving the vertical software industry. We wanted to find case companies of different sizes and breadth of operations and finding markets within telecommunication industry with different phases of maturity. Consequently, European and Chinese communication service providers were selected as the target group of this study. The case study was executed in the year 2010, using two main sources of information: public documents and interviews.

In the examined domain, SaaS adoption is mostly connected to the cost benefits and principally to the flexibility of SaaS offering. Many interviewed service providers suggested that the ease of procurement, ease of maintenance and fast time-to-market are the most important benefits of this mode of deployment. The Chinese service providers are not currently applying SaaS, but the software systems are acquired as custom deployments. This was explained by the interviewed software vendors; software vendors currently have a strong customer lock-in and, thus, low motivation to offer SaaS [6].

Common worries related to SaaS included integration and security issues [6]. For instance, CSPs are obliged by law to apply high data security measures on call data records, which SaaS vendors are not able to comply with. Problems with integration are related to the properties of SaaS offering. The mode of deployment assumes standard processes and interfaces, which does not match the attributes of industry-specific software.

Despite the problems, the SaaS mode of deployment has already been adopted in several companies in the telecommunication industry. Deployed software are horizontal, e.g. for financial management and customer relationship management. SaaS is also in use in the business support systems. However, in the companies interviewed, SaaS is not applied for industry-specific software [6].

With regards to third-party software, both the European and Chinese CSPs see their role in the value chain as reseller and operator of the services, and have already taken such role. One strategy in providing third-party software is to increase customer

lock-in, by providing a combination of IT and communication services, and envisions operating in both intermediating and aggregating roles, having already launched product concept to do so. Another strategy is aiming for an aggregator role, where CSP offers multiple SaaS products for end-users. Such role is seen as a natural one, and CSPs are expected to take such role in its ecosystem [6].

The perception and attitude towards open source software is getting more positive in the domain, and the OSSw alternative is analyzed against similar criteria as proprietary alternatives when acquiring software systems. Nevertheless, the current adoption of OSSw among interviewed CSPs could be described as moderate. The OSSw alternatives are used mainly in infrastructure software, including operating systems, application servers and databases. We found that only a few applications specific to this industry exist, namely in service monitoring tools and in voice communication servers built on IP networks [6].

Also, the CSPs are cautious in using OSSw components in systems visible to masses of subscribers and in systems that are otherwise critical to the business, i.e. in systems that require carrier-grade quality and performance. In such systems, the proprietary alternative is often preferred. The main reasons for using proprietary software systems were the lack of capabilities and the required support services. Especially the European CSPs informed that they had outsourced most of their software-related activities. This has led to the organizations not being able to maintain internal capabilities on OSSw. If CSPs deploy OSSw, they will need to contract comprehensive support services from the vendor. As a result, a major share of the cost advantage of OSSw is lost [6].

3 Obstacles to Horizontalization in Telecommunications Software

The need to tightly control the innovation spanning multiple software modules is one of the factors hindering horizontalization. Whenever technology is changing frequently (consider e.g. network technologies advancing from GSM towards LTE and incurred changes in the OSS/BSS software), or whenever the network of inter-dependencies in the system is complex, improvements at the system level require coordinated efforts on changing and refining individual modules in the system. These efforts are easier to coordinate when the modules are under the development in and control of a single company. As a result, the software vendors are reluctant to outsource interconnected modules, and therefore the software development keeps largely concentrated in individual vertically integrated firms, thereby delaying the process of OSS/BSS software market horizontalization [10].

The OSS/BSS software market has also a restricted number of customers, limited by the global base of CSPs. The OSS/BSS software systems are relatively complex and usually need to implement a number of interfaces – both the proprietary protocols of specific network equipment vendors and standardized protocols. Due to this, the costs of developing and maintaining such systems are relatively large, too. These costs are even higher for the software vendors who develop the software products,

due to the extra expenses of making the software unified and reusable among different customer CSPs. Furthermore, the software vendors need to add a margin on top of its costs. In the OSS/BSS software market, characterized by high complexity and large number of interfaces to integrate, the revenues from the restricted number of customer CSPs may not be sufficient to recover the large costs of development and maintenance incurred by the software vendors. As a result, the process of vertical disintegration in these segments is unlikely to happen [8].

The complexity of OSS/BSS software systems, and the number and heterogeneity of interfaces to conform with, have also an implication for the type of the software vendors that are capable of providing such systems. For instance, for OSS/BSS mediation software systems, the efforts for implementing interfaces used by an incumbent CSP are an order of magnitude greater as compared with the efforts of implementing the interfaces for commencing CSPs who may require only a standardized subset of interfaces to be implemented. The high efforts required for serving incumbent CSPs are likely to create a barrier for the small software vendors entering the OSS/BSS market. Therefore, the sub-market of incumbent CSPs is likely to be served by large software vendors, who, due to the restricted size of the sub-market and high development costs are likely to remain vertically integrated. On the other hand, the small software vendors will likely serve the sub-market of commencing CSPs where, due to the presence of few standard interfaces and lover costs, vertical disintegration is more likely to take place [9].

4 Trends of Software Business in the Telecommunications Sector

The communications industry has been consolidating mainly through mergers of established CSPs. Simultaneously, new competitors from IT and software industries have penetrated the market, along with Virtual Network Operators (VNO) competing with innovative business models. As a consequence of declining revenues from the traditional business especially in the mature markets, the CSPs' strategic focus is partly on operational efficiency and partly on new sources of revenue through compelling new services. On the other hand, traditional Mobile Network Operators (MNO) are still committed to building and developing their basic network infrastructure, as mobile Internet is increasing the demand for capacity [7].

In line with attempt to achieve efficiency, a clear trend has been that CSPs outsource development, deployment and operating of software systems. The network element manufactures have a strong position in selling software closer to the network interfaces. However, the market for these operations support systems is slowly declining and commoditizing. For business support systems, like Customer Relationship Management (CRM) and billing, new software vendors have appeared to compete with the existing ones. Thereby, analogously to the host industry, the OSS/BSS software market is affected by price competition leading to cost pressures. As a result, the vendors are striving to keep their positions and searching for new ventures in service-based businesses. To strengthen their positions, network element

manufacturers and software vendors are engaging in long-term managed service contracts with the CSPs. New sources of revenues are being sought from cloud computing and related services [7].

Both in mature and developing parts of the telecommunications industry, outsourcing of activities related to software systems has increased over time. By outsourcing software activities, the CSPs intended to lower costs and software vendors obviously must produce the services at an even lower cost. According to a CSP interviewee, these cost pressures influence the quality of the software negatively. The CSP may thus lose in competitiveness due to substandard software and services, whether it shows as more limited functionality, a less faultless implementation or poorer performance. In the future, CSPs may therefore make a more prudent evaluation on which activities are outsourced and rather in-source those that they see critical for keeping customers and creating new competitive benefits [7].

Moreover, some of the CSP respondents stressed the skills and capabilities related to different network technologies, while others emphasized understanding customer needs and customizing technologies to match the present needs. Adding capabilities for providing new services was also mentioned. It is consequently natural to observe the CSPs' attempts to create competences through both product innovations and business innovations: In the future certain CSPs may build their competences by developing network assets, technologies and internal resources. These companies may seem inactive, but may maintain their positions by offering network capacity efficiently. Also, certain CSPs may instead choose to compete with contemporary and diligently segmented services built on existing infrastructure [7].

5 Conclusions: Future Scenarios on Software Business in Telecommunications

The adoption of SaaS in only certain types of software, and non-adoption in certain others, indicates that there are factors in the operating environment and in the software business setting, which simultaneously drive and inhibit adoption of SaaS model. The case research [6] revealed that the decision-making on software procurement in communication service provider firms is presently business-driven. There are concurrent pressures to reduce expenditures on software and to deliver compelling services of highest quality. Such pressures drive both adoption of OSSw and SaaS offering and acting as sales channel for third-party SaaS offering. On the other hand, it can be stated that OSSw mode of development and SaaS mode of deployment is not harnessed in industry-specific software, i.e. operations support systems. Reasons mentioned by the CSPs for using the existing systems included specificity of processes and technology interfaces. The standardization and proprietary nature of interfaces is likely to hinder the horizontalization and affect the market structure of software vendors in the OSS/BSS software markets [10] [8] [9].

The trends and developments in the telecommunications and software industries are likely to create pressures towards increasing outsourcing of software-related activities whereas simultaneously CSPs consider in-sourcing certain functions they

deem important. Likewise – both product and business innovation – shall be important to achieve and sustain a competitive advantage. Therefore, as alternative or also coexisting future developments one can consider the following scenarios [7]:

1. Cost-cutting scenario: This scenario assumes a continuous increase of outsourcing. This baseline scenario occurs as a result of consolidation in both the host industry and the communications software market. Consolidation enables economies of scale, and both CSPs and software vendors are focusing on lowering operational expenditures. In this scenario, the main driver for OSSw and SaaS adoption is cost efficiency.
2. Alliances scenario: In contrast to the first scenario, operators may become more active by increasing internal software development and related capability in order to benefit from the available standard solutions, OSSw and SaaS mode of deployment. One of the software vendors will attempt to gather its customers into an alliance, which will share software development resources and related costs. In such setting, parties may also share software code and use a standard application developed in the alliance and deployed as SaaS.
3. Bundles scenario: In this scenario the service providers will evolve into two basic types: one focusing on providing network capacity ('bit pipe operators') and the other exploiting their brand to sell value-added services on top of their existing infrastructure. The CSPs profiling them with value-added services will organize their service delivery platforms in a way that third parties (e.g. software vendors) may utilize the platform in a flexible and agile manner. Cloud computing technologies will be in a central role in providing new services efficiently. In cloud computing, mature and widely adopted OSSw solutions already exist. Present considerable projects include e.g. Eucalyptus, a software platform for the implementation of private cloud computing, and Hadoop enabling the creation of data-intensive distributed applications.

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