Cross-Case Analysis of the User Value Proposition for Next-Generation Mobile Service Platforms

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Abstract—**This paper analyses options for the strategic positioning of next-generation mobile service platforms in terms of the value proposition made to users, including service developers as well as end users. A cross-case comparison of the main value elements of existing and emerging platforms is performed, and the potential synergetic effects between these elements are taken into account and leveraged.**

Index Terms—**User value proposition, service delivery and execution platforms, service development environments**

I. Introduction

Platforms for mobile services creation and delivery are in full rise, with a panoply of industry actors focusing on developing technologies, middleware and platforms for service development, execution and delivery. From a user value viewpoint, three major assumptions are underlying this focus. The first is that end-users are increasingly consuming communication services that allow for a richer experience, through the addition of new elements to traditional voice or text communication. Furthermore, that users not only expect to be reachable anytime anyplace, but also to be able to transfer their familiar environment with them. And thirdly, that they are eager to create services and solutions themselves.

In response to this, the EU FP6 project SPICE [1] is focusing on a comprehensive mobile service development and execution platform, to exploit the promise of ubiquitous service creation and consumption, anywhere, anytime. One of the aims of the SPICE business analysis is to derive guidelines from existing and emerging solutions in terms of the user value proposition made by them. These solutions exploit different and often diverging value elements. Therefore, one of the relevant research questions in this respect is whether combining these different elements is a viable strategy for a next-generation platform, in order to create a user value proposition that eclipses alternative solutions. It has been often argued that creating superior user value, rather than competing on user value delivery, is the main source of sustainable competitive advantage (see e.g. [2]). This means that service platform vendors and providers should focus on how platform design can contribute to quantum leaps in user value creation.

This paper briefly analyses the user value proposition made by six present-day examples of platforms for service development and/or service delivery, and outlines a synergetic value proposition for next-generation mobile service platforms.

II. Service Platform Trends

The SPICE business analysis presented here focuses on selected cases of mobile service delivery platforms (a.o. enabling service roaming), and of service and application development environments. It highlights the main elements determining the user value proposition as well as a number of value creation issues encountered.

A. *Service delivery and execution platforms*

A service delivery platform is used to enable the deployment and delivery of rich communication and multimedia services in a timely and efficient way. Below, different capabilities related to the creation of user value are discussed: terminal and user mobility, service roaming, access independence, security, IP-based services, mobile and fixed convergence.

A first case highlighted here is CAMEL, which is a set of 3GPP standards used for offering services on GSM or UMTS networks. CAMEL links a common service language with the ability of service roaming, allowing network operators to offer services such as no-prefix dialing and pre-paid calling to customers roaming outside their home networks. Service roaming can be described as the ability of a telecommunication session to be maintained regardless of the end user terminal. This implies the ability of CAMEL to transfer services seamlessly between networks and devices with possibly different settings and characteristics, while maintaining the service state throughout the transfer. CAMEL is particularly used for rich communication services. It is expected that, if combined with enablers for fixed-mobile convergence, and with multimedia services, the concept of service roaming will offer more user value, as this allows new applications as well as new billing and charging models.

A second case that can be considered is IMS, which focuses on the delivery of rich, enhanced and tailor-made communication services and applications. An interesting element of IMS is its access independence, allowing it to function over a large number of networks, the fact that it enables terminal and user mobility (roaming between devices and locations) and that it introduces IP-based services to the mobile environment, which can be offered by both operators or so-called third parties. If IMS is combined with service roaming in a fixed-mobile converged setting, it allows users to access a very broad portfolio of rich services across different devices and access networks, with the promise of a seamless experience for transfers between the devices and networks, thus enhancing user value. Meanwhile, extensions to IMS have been proposed, i.e. A-IMS, which adds a comprehensive security platform and the uniform treatment of SIP and non-SIP applications, and TISPAN, which is an IMS extension mainly aimed at requirements for fixed networks and the support of non-SIP applications, such as HTTP and P2P applications. These extensions to IMS point to the business need for the support of the widest possible set of services and networks.

From a business point of view, the main feature of IMS is that it introduces a horizontal control plane enabling operators to control and charge for various services and applications. However, it should be underlined that the user value potential of IMS will only be realised if it capitalises on network operator strengths such as identity management, security and context information, and thereby creates significant additional value over alternative solutions. It can be expected that user identity takes on a much greater role in an IMS environment and will be linked to security information, location information, and user profile information.

A third case to be mentioned is that of instant messaging and VOIP solutions and platforms. They offer a radically different approach based on an "intelligent edge and dumb network" paradigm. Companies such as Skype, Microsoft, and Yahoo provide instant messaging and VOIP clients that offer rich communication services in combination with presence information that mirror many of the functionalities offered by the service platforms described above. The competitive advantage of these solutions is based on a flexible and low-cost approach. They offer a user value proposition comparable to that of IMS with the exception of a number of important elements such as service roaming. The companies involved are clearly aware of the potential of service roaming and fixed-mobile convergence. Hence, some evolutions can be observed, with IM players extending their presence to OS-equipped mobile phones, in effect entering the mobile realm.

From the cases presented in this paragraph, it has become clear that service roaming can be expected to play an important role in next-generation service delivery platforms. Service roaming can exist in different forms, each of which poses different demands to the platform on which the services are being offered. It can be total (a subscribed/used service from one service provider is provided completed by another service provider), composite (parts/components of a composite service offered by one service provider may or even need to be replaced by a respective service component offered by another service provider) or dynamic re-composition of a service offered by one service provider with an equivalent / similar service offered by the same or even by another service provider. Service roaming of services would be an extension of voice roaming, although the delivery of data services and especially the re-composition of services using components from different sources implies a much larger level of interaction and adaptation between the actors involved. Considering the nature of service roaming, the key for its success will be a close cooperation between the actors included in the value chain.

This is even more so when these services are context-aware or personalized, as then sensitive information from different actors needs to be put together to create a comprehensive user value proposition. For example the re-composition of services in a foreign domain using some local elements (e.g. location-based information) generates extra requirements for quality of service, as users will not know who is delivering which part of the service and will allocate full accountability with some party, whether or not this is justified. Liability chains are thus added to the technical challenges that operators and service developers and providers are facing in order to provide the potential for service roaming. Moreover, service roaming not only requires alignment between actors on a technical level (e.g. through the use of standardized interfaces), but also on the level of revenue and revenue sharing models, as every party will require a clear view on what revenue is going to be earned from delivering services in a roaming context when certain components are offered by other parties.

In a world increasingly reigned by a convergence of fixed and mobile environments, service platforms need to support an integration of the fixed, mainly internet-based solutions and the existing and emerging mobile services. Moreover, emerging service platforms face an increasing competition of existing players in the fixed internet domain who extend their reach into the mobile realm and come with familiar solutions and brands (e.g. Google, Yahoo, PayPal). It can be expected that mobile service delivery and execution platforms will respond by creating integrated offers that provide the users with a seamless experience, creating additional value compared to internet-based hybrids that cross the fixed-mobile divide. The promise of seamless service delivery offered by service roaming, and the leveraging of identity and context information, as well as a security infrastructure, can be considered as a potentially viable way to create an offer that is attractive for users.

B. Service and application development platforms

Most of the existing and emerging services and applications are built out of software and often require tight integration with multiple and distributed software ecosystems. Creating these services and applications requires software development, from the custom-made large project to the end-user-generated tiny piece of code. Four types of service and application development actors can be discerned: large IT powerhouses (e.g. Microsoft, Adobe, Sun), leading internet players (e.g. Google offering APIs to their components), intermediaries (offering services under license or providing service development environments in which they cooperate with their customers, e.g. mWorks) and end-user oriented companies, (providing services to semi- and non-professional users, e.g. Ning, Nokia Widsets). User value in this case primarily means value for service developers.

Mobile operators are continuously trying to increase the ARPU they generate from non-voice mobile services. This means creating compelling service offerings to attract customers and generate revenue streams. The development of such services does however not need to happen in-house or in a walled garden setting. According to [4], only 20% of SMS services are walled garden, meaning that 80% is off-portal. This implies a large group of service providers and developers operating in an adjacent market, which increasingly results in operators shifting towards off-portal strategies [5]. Operators are thus becoming increasingly aware of the need to not only provide service delivery platforms, but also service development platforms, that bring easy service and application development tools to third parties, to help them create compelling offerings and augment user value.

Not only easy service and application development itself is important, but also the development timeframe. According to [3], only 20% of the development time for mobile applications is spent on developing, testing and debugging the application, leaving 80% of the development time for porting and tweaking the application to cater for multiple handsets and operators. This implies that there is a substantial potential for efficiency gains and thus cost reductions. Development environments that allow easy combination of pre-developed components, as envisaged by the SPICE project through the use of a component repository, could reduce development time, and result in faster time-to-market and lower development costs.

Again a number of real-life cases can be highlighted here. The first is Flash, the authoring tool and client for rich media content and applications by Adobe. Flash is interesting in this context as it is progressively moving towards mobile phones, portable consoles and other mobile devices with end-user interfaces. One of the attractive points of Flash as a service and application development tool is that it is not hindered by steep learning curves, meaning that Flash developers do not need to be highly trained software engineers. This enables a larger group of people to use Flash for development, resulting in a large established developer base. Moreover, Flash also benefits from the growing number of smartphones, as several of the operating systems running on these phones come with Flash Lite (the version of Flash developed for the mobile environment). This last element however also presents a threat, as these phones also contain their own interfaces.

Another interesting case from the point of view of service development environments and the potential gains for service developers that could be realized with them, is mWorks. This platform, developed by mFoundry, offers developers easy development, distribution and management of mobile applications and services. mWorks offers its users a so-called cookbook of pre-existing components that can be used to develop customized applications, using basic HTML and XML skills to compose the services. According to mFoundry, this approach substantially reduces the application development lifecycle. mFoundry also offers mPortal, a platform that is build to assist its customers in creating, developing and managing their mobile applications across multiple devices and networks, offering managed services, based on partnerships with the customers, but also professional services and application development services. Its value proposition is leaning towards providing a solution for the existing technical and operational difficulties in building mobile applications.

A third and last group of cases presented here is that of Ning and Nokia Widsets. Ning is an initiative still outside of the mobile realm, but it provides a relevant example of a "Web 2.0" approach, in which non-professional, fairly unskilled end-users can create their own services and even syndicate them, elevating them to the same level as professional application developers. Ning allows end-users to build web sites, emphasizing media sharing and relationship mechanisms. It provides users with ready-to-use templates and enables them to adapt these to their wishes and needs, even allowing for own branding. Moreover, Ning is essentially an advertising supported service, with only premium services being charged for. The Ning model provides value to end-users, as it allows them to create their own services for free or a limited cost using pre-established elements, and providing the opportunity to make their applications in turn available to others for re-use. An example of a user-oriented application development platform that is emerging in the mobile environment is that of Widsets, offered in beta-version by Nokia. Widsets allows users to customize their own mobile widgets using templates available on a platform and to publish them for others to use, in a way very comparable to Ning. Widsets is also experimenting with a development environment that allows users to tweak their own widgets, giving them much more flexibility to tailor to their needs. The relative success of Ning (over 14K applications created) [6] and Widsets (over 1K applications, 90% of which created by end-users located in over 120 countries) [7] demonstrates that there is considerable value in involving non-professional, relatively unskilled end-users in the application development process, if provided with easy-to-use tools that all interoperate correctly with one another.

C. Summary

The domains of service execution and delivery platforms and service creation environments were considered to present two essential elements for next-generation service platforms. Within the field of the service delivery platforms, the control layer approach of IMS-like platforms allows security, roaming, context-awareness and identity management. The case of the instant messaging clients on the other hand demonstrates the advantages of an open, flexible and low-cost approach. It has been argued that from a user value viewpoint it would be advantageous to combine the value-adding elements of IMS and CAMEL, such as seamlessness and identity management with an open, neutral and modular approach. It was also argued that service development needs to be greatly simplified, in order for network operators to get access to a wide range of off-portal content and service items. This implies insuring interoperability between all components, reducing porting time and effort, and reducing development risks through the use of standardized practices. Attaining these goals will require a very close tie-in with the service delivery and execution environment, especially if the goal is to open up service development to different types of developers such as non-professional parties, who will require a simple porting link between the environment in which their services are created and the environment in which they will be executed.

A combined approach would provide a platform on which to offer, distribute and manage services and applications for a large group of users, the service creation environment that enables easy service composition and re-composition based on the integration of ready-to-use, pre-developed components as well as new, tailor-made components through the use of standardized interfaces, and these for both professional and non-professional service developers.

III. User Value Proposition of Next-Generation Mobile Service Platforms

The main value of next-generation mobile service platforms for users has been identified taking into account the lessons drawn from the cases in the previous paragraph. Users can be divided in service developers (both professional and non-professional), who will create new services using service enablers and modules to be found on the platform, and end-users, who will consume those services. Of course, other stakeholders such as service providers and platform operators will also derive value from the platform, but this lies beyond the scope of this paper. An overview of the main value domains discerned for SPICE can be found in the table below.

Table 1: User Value Elements of Next-Generation Platforms

Service developers (Professional and non-professional)	**End-users**
Device neutrality	Service roaming: Network, as well as device choice during the same session (seamless service roaming)
Enabling service developers to access service components, security features, and other components, currently only available to operators	Larger offer of services (increased competition between service providers will increase the choice options for end-users), which could lead to cost reductions
Inter-domain service composition	Increased customer intimacy with the home platform operator
Enable easy service creation and/or publishing: SPICE cookbook solution (repository of components), potential cost reduction	Better personalized/customized services
Diminshed lock-in to proprietary platforms of network operators	Context-aware & profile-aware services
Brokerage of knowledge (e.g. context understanding) service elements	
Added value of combining these elements	

A. Service developers

Service developers compose services by creating components and/or recombining and reusing modules available in the SPICE repository. They can be professional as well as semi- or non-professional entities such as users.

Important value elements for developers when looking at service development environments on next-generation service platforms as SPICE are:

- *Device neutrality*: This refers to the possibility provided by the platform to transfer services between devices, with subsequent service adaptation to fit the requirements of the alternative device left to another party, such as the platform operator.
- *Enabling service developers to access service components, security features, etcetera, previously only available to operators*: The use of a repository with a wide range of service components and services allows service developers to access features previously only available to platform operators, spurring the creation of new types of service offerings with greater autonomy and independence of proprietary platform solutions.
- *Inter-domain service composition*: The service component repository mentioned in the previous bullet will provide the possibility to allow easier creation of services spanning multiple domains, thus allowing for the creation of comprehensive services that incorporate service delivery, service update, billing, and other functionalities.
- *Easy service creation and/or publishing*: One of the focal points of the SPICE project involves easy service creation and publishing hereof on the platform. The SPICE cookbook or service component repository allows easy and fast service composition, through recombination of pre-existing, ready-to-use components. This leaner production cycle could result in cost reductions for service providers, which could be seen as an incentive to adopt the platforms and their enablers.
- *Diminished lock-in to operator proprietary platforms*: Present service platforms are mostly proprietary solutions, often run by operators. This leads to a high level of lock-in effects, resulting in lower levels of competition and lower levels of new service composition. Platforms covering a substantial territorial footprint, such as SPICE envisages, combined with a greater level of openness, provide service developers with much needed additional flexibility. A service platform with standard interfaces will spur innovation in services and create new market dynamics. Additionally, the repositories with ready-to-use components allow service developers to be more independent from proprietary solutions and create more flexible services. Independent actors are also able to create new modules that can compete with other modules, even those modules previously mainly offered by platform operators (e.g. charging and billing).
- *Brokerage of knowledge service elements*: The creation of distinct components for the easy creation of new services creates new business and service opportunities. Brokerage can extend from the field of consumers and information sources to the field of service composition, bringing together component components and putting them together in a new comprehensive service.

B. End-users

End-users access and consume services and content offered on the platform. They have a profile on the service platform and are as a result recognized by the platform and can be offered subscribed services as well as customized or personalized services according to their profile.

The main end-user value elements for next-generation service platforms are:

- *Service roaming*: This can be described as the ability of a telecommunication session to be maintained regardless of the end-user terminal. This implies the ability to transfer services seamlessly between devices with possibly different settings and characteristics (e.g. a movie being transferred seamlessly from a mobile phone to a television set), while maintaining the service state throughout the transfer. Service roaming can be conducted within one network or across different networks. This also implies a transfer of the state of the service and saving this information to be recovered in case of service disruption. Service roaming also requires extensive authentication or single sign-on features, to allow for users to roam between different networks and operators.
- *Larger offer of services*: New service delivery platforms could bring a larger set of offers to end-users, a result of the easier service creation and publishing mentioned before. A larger number of service providers on the market would presumably increase the competition, resulting in a larger and more diversified supply of services towards end-users and possibly cost reductions.
- *Increased customer intimacy with the home platform operator*: Increased intimacy between the home platform operator and the customer enables closer relationships between both parties and creates opportunities for tailor-made and personalized or customized service offerings.
- *Better personalised and customised services*: Context-aware and profile-aware services will enable platforms to provide end-users with services tailored to their wishes and needs, based on their profiles and preferences. The combination of both context and profile awareness improves the ability of service providers and developers to target specific needs.

C. *Synergetic effects*

A distinct user value proposition is of utmost importance for the commercial success of any product. It should be noted that the elements discussed in the previous section should not be seen as stand-alone elements, but rather as building blocks in a larger constellation. In fact, it can be argued that most of the value to be generated by next-generation service delivery platforms will be derived from synergetic effects of combining the various value elements that are already individually present in the market, as was witnessed by the cases.

Synergetic effects can be said to exist if the combination of value elements leads to network externalities on the supply side (e.g. easier service creation resulting in a larger supply of services) and the demand side (e.g. more services will attract more users, which will initiate a virtuous cycle in which both reinforce each other continuously). At this point, three reasons can be identified why synergetic effects can be expected:

- As service developers are increasingly also non-professionals including end users, synergetic effects can be expected when addressing the value proposition to end users in their quality of consumers and of service developers at the same time.
- It can be expected that there will be not just a combined effect of better hosting and offering existing fixed and mobile services, but that also new types of services will arise that cross these distinctions. This can constitute a significant competitive advantage given e.g. the lack of peer-to-peer and user-generated services support in most current mobile service platforms.
- Added value can be foreseen of interoperability between all components, reducing porting time and effort, and reducing development risks through the use of standardised practices.

In sum, a combined approach is likely to benefit from synergetic effects if it offers a seamless experience with rich services being transferred over devices and networks, both fixed and mobile, while at the same time providing the tools to both professional and non-professional players to create and manage such cross-domain services in a simple and inexpensive way.

CONCLUSION

This paper has analysed options for the strategic positioning of next-generation mobile service platforms in terms of the value proposition made to users, including service developers as well as end users. A cross-case comparison of the main value elements of existing and emerging platforms was performed, and the potential synergetic effects between these elements were taken into account. A comprehensive user value proposition for next-generation mobile service platforms was constructed resulting from the analysis.

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