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Finding Services and Business Models for the Next-Generation Networks

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1. Introduction

The growing demand in the use of mobile devices implies a huge investment by operators and infrastructure providers. However, these players have important questions when it comes to understanding how to finance these investments. ROI seems to be endangered by the new mobile ecosystem that has emerged during the last few years. Many factors threaten the potential of future income over the new infrastructures so there is huge need to find innovative ways of generating customer retention and traction, which in turn will lead to the generation of revenues that can build a profitable and healthy business around the next-generation networks.

This research should be carried out before any investment is planned to have a clear picture of the financial implications of the new deployments. There is a strong need to understand customers' new ways of technology consumption and plan how to provide this employing adequate services and business models.

As a result of the way that the mobile industry has been developed, investment in advanced networks must be acquired primarily through private companies, for example, the network operators. Other sectors, like health, civil engineering or even fixed telephony have historically enjoyed a stronger intervention from the public sector as governments take on the basic infrastructure for their countries population. However, this was not the case for the mobile telephone industry, which was regarded as a private initiative, in spite of the fact that there were many incumbent players at the beginning of the industries development. Even in those cases, the industry rapidly opened to competition and new entrants from the non-public sector came into this promising new industry.

Therefore, this established the basic condition for network evolution, all mobile industry investments must be aligned with clear business models to make them profitable. This has an immediate consequence; investments will not be forthcoming until there is a clear path to ROI. On the other hand, we are on the verge of a mobile infrastructure usage explosion. Customers demand more and more data services so that the old networks start to reach their limits or even collapse. Paraphrasing Shakespeare's Hamlet: 'To invest or not to invest? This is the question.' A natural response to this question should be a clear "YES" if we are to apply the industry standards from the 80's where unlimited booming was in place. But… things change.

In the present state-of-the-industry, the "who" that are making money out of the mobile networks has shifted from the operators exclusively to other companies like the device manufacturers and content providers who work outside the operators' networks, the main companies being Google and Apple. These companies are making huge profits by selling devices and services that rely on the operator's infrastructure with almost no financial paybacks. This means that the operator in is danger of becoming merely the transportation layer, instead of the value-added services provider, whose status in the industry is described as the "dumb pipes" (Wikipedia, 2011).

The network operators are at a crossroads. On the one hand, they clearly need to invest in the new networks to address the increase in customer needs, and to keep their position in the market. On the other hand, they are uncomfortable with the idea that those investments will be profited by other companies who will get the most out of the revenues generated without incurring any financial risks.

Some solutions are being drafted by the network operators, but they are receiving strong opposition from the rest of the players and even some of their customers.

These ideas revolve around making money directly from the infrastructure usage. One of them is the "tiered pricing" concept, already put in place by some US and European operators. The concept marks the end of the "eat-as-much-as-you-can" policy that has been in place for some years, and means that consumers will only be charged for the volume of data they really consume. (Telwares, 2011)

Other ideas which attempt to reverse the situation described above involve charging the content, software and devices companies for traffic crossing the network originated by them. For example, Telefónica announced their intention of charging Google for the traffic generated by consumers performing searches on their mobile devices. This move attempts to create a revenue sharing scheme between the infrastructure owners and content providers. (Boston, 2010)

All these initiatives are creating huge controversy as they are seen as an attack on the neutrality of the net, and on the freedom of the internet. In addition, companies like Google strongly oppose the idea of having to pay network operators for the volume of data requests sent to them by customers.

In a different approach to the problem, other industry players are trying to capitalise on a basic consensus in the industry. Most future network income will be derived from software. Device manufacturers like Nokia, Apple, Google and others have paved the way for a market of software and applications in the mobile market. The numbers themselves demonstrate the success of these initiatives, with almost 4250,000 applications available, and 15 billion downloads in four years of operation (Apple, 2011). New devices based on strong internet orientation and high usability have taken the market lead, shifting the industry from a hardware-based scheme to a software-based one. This success is based on both a new device concept oriented to the Internet more than to the classical telephony world, and a strong community of third-party developers who find easy ways of creating applications and selling them to the device users.

Operators have made a huge mistake in disregarding this market change. Their reaction has been slow and poor. They overlooked the device manufacturer's movements, thinking that they would never affect their position in the market until they realized the amount of money people were spending on applications in external App Stores. When they tried to react, they realised that they did not have the culture, development tools or teams needed to challenge the fast pace of new entrants coming from the pure software world. In

addition, the financial crisis which started in 2009 stopped their R&D expenditure capabilities and VAS creation programs, resulting in an even lower innovation pace. Operators will need a whole new paradigm to recover the market initiative and to avoid the risk of just becoming a commodity player who offers infrastructures that will hardly be of any value in the long term. This chapter proposes a strategy that could help operators to regain the market lead.

However, the model of App Stores needs strong revision. Many questions have arisen about whether it really is a healthy market. After the initial hype has faded away, some doubts have been cast over the future of the App Store concept. The main concerns are:

1. Mobile device market fragmentation. There is a clear need to overcome the market fragmentation created by the existence of too many different mobile iOS and devices. (Rajapase, 2008))
2. The need for advanced, expensive handsets that is widening the digital divide between wealthy and non-wealthy people and countries.
3. The fact that services are created for the device, not for the people. The services should be driven towards customer needs more than just a display of technical skills.
4. Universal reach. Wireless technology has the potential to be the technology that helps to bridge the digital divide. Therefore, players should be moving in that direction instead of creating more complex systems every day. Technology should be simple and affordable to allow the inclusion into the digital society of those segments that are usually left aside: the disabled, the elderly, and those citizens from emerging countries. "No phone left behind" should be the driver of the industry.

The main subject of this chapter is to show how to find a healthy model around software for the telephony industry.

A model that combines the existing R&D needs, with a lower time-to-market of the products so that research investment is better justified. A model that shifts from the actual "Some develop services for some" towards "Millions develop services for everybody". A model that provides operators and third-parties a way of creating useful services that fit into the new networks, and which helps to monetise investments at the same time as helping to bridge the digital divide and incorporate everyone under the principle of "Universal Design " (UniversalDesign, 2011).

This model should take into account the different topics that compose the subject:

- Application stores and device stores, current status.
- Mobile Apps vs. Mobile Internet (services encapsulated in small code pieces vs. in-browser services replicating the PC/Internet experience)
- Sociology of the mobile user and aspirations.
- Limitations of the above models especially due to market and technologies fragmentation which bring a new digital divide.
- The need to search for technologies that bring the world of the mobile internet to the existing 5bn devices worldwide, and future growing numbers.
- Bridging the digital divide.
- Apps and services for everyone: kids, the elderly, the disabled and non technical people etc.
- The use of Cloud Computing in the mobile industry. The computing world is shifting towards a cloud-like schema, not centred in the PC, but in remote execution and storage environments. However, in the mobile world this strategy is aimed towards the devices and not a cloud-centred schema. How can this paradox be solved?

Finally, we will examine which of the new technologies mentioned in chapters of this book, and others appearing in the industry, have the potential to drive business and revenues.
As happened during the 3G industry-wide deployment, where video and video-calls were thought to be the new killer services which would drive mass-adoption of 3G, the next-generation also needs to find the technologies which will drive its adoption too. And to succeed where 3G failed.
Could plain high-rate data access do it, as many operators would like to think? Is there is a need to rely on new standards for services like RCS or WAC, improved voice technologies like VoLTE or HD-Voice, or again is it the time for video-based technologies?

2. The evolution of the telecommunication networks

Communication technologies have become the most ubiquitous service during the last decades. Among these technologies, mobile technology has become one of the fastest and broadest markets. Nowadays, billions of subscribers use a mobile device on a daily basis. Thus, the mobile telecommunications industry has nurtured an innovative market which has overcome the barriers of reaching every single person in the world.
Such barriers and limitations where deployed by the early lack of standards, which created boundaries within subscribers from different countries or even between different service providers in the same country. The first devices were based on early analogue systems, less flexible or able to be adapted to newer needs. One major drawback was their high cost, which moved service providers to bring competition and innovation into the industry. The tipping point, the digital era, allowed service providers to cope with their growing needs, allowing for better and diverse services. Nonetheless, digital communications brought major improvements into the transmission, switching and quality.

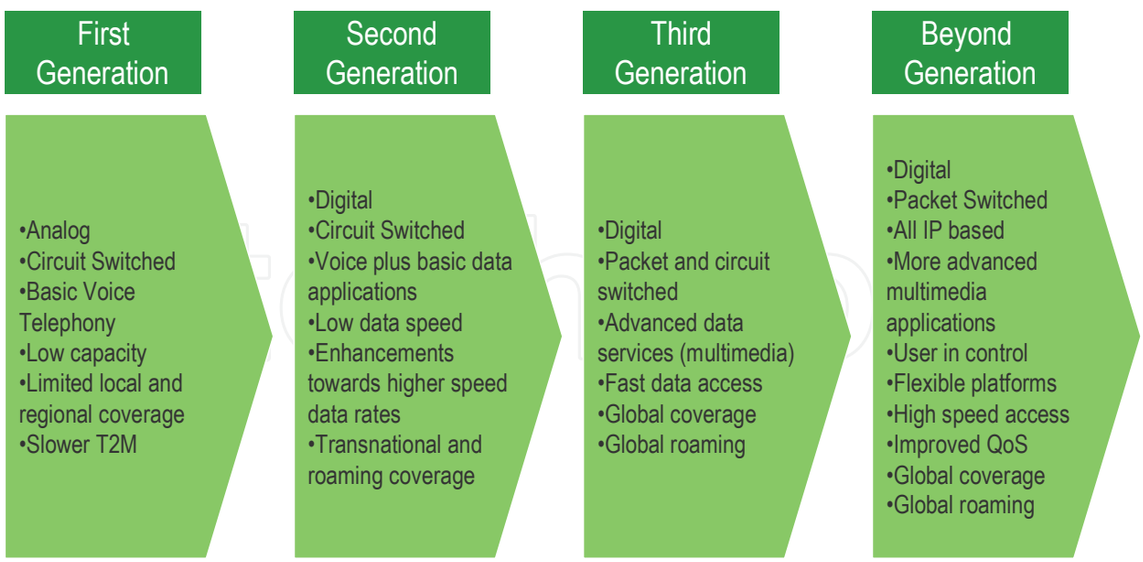

Fig. 1. The network evolution

At the beginning of the last decade, service providers were competing in newer markets as the technology evolved. The competitive landscape was changing year by year, forcing service providers to capture bigger stakes from the value chain. From pure voice

communication, they moved into the data services. Based on the findings that SMS was a cash cow, service providers decided to expand their portfolio to think about communications in a holistic way. The fear of cannibalization among different services is not important, as it offers consumers comprehensive services, and the lifetime value of customers can be increased, CHURN can be reduced, and the overall value proposition of the operator increased tremendously.

With this idea in mind, service providers started working on the next generation network. One network that could cope with their service, and which offered a myriad of comprehensive services to increase the value of each subscriber.

2.1 The previous generations

During the 80s and 90s, communication service providers deployed networks based on analogue technologies. These technologies allowed for reliable and secure voice communication, bringing solid foundations for the next steps. Service providers were used to investing millions of dollars on equipment because they were making billions of dollars every quarter. The reason why the equipment was so expensive was that it was built by hardware engineers to allow millions of communications on a daily basis, relying on very expensive hardware equipment that was built specifically for this purpose. However, all that changed radically with the dot com crash, moving service providers to invest wisely in newer equipment.

Early network communications equipment and standards were driven by a small number of companies, such as Ericsson and Nokia. They invested millions of dollars on technology that could allow service providers to deploy nationwide voice networks. Strict requirements for building such a reliable communication network blocked newcomers who could bring the much needed innovation.

It wasn't until the introduction of i-mode by NTT DoCoMo (Fransman Martin, 2003) in Japan that mobile data services arrived on the international scene in earnest. The explosive growth of data services in Japan forced executives in carrier organisations to take the data services seriously—at a par with voice—and subsequently to make significant investments in the evolution of the data services market.

2.2 Deploying richer communication services

The introduction of i-mode by NTT DoCoMo (Fransman Martin 2003) in Japan was brought to the attention of the European services providers. Based on the explosive growth observed in Japan, mobile data services were an attractive market. Service providers' executives were forced to take the bid seriously and to invest in the evolution of their communications network. The deployment of mobile data services fostered consumer adoption, which created a self reinforcing effect because more connectivity led to more services and greater innovation.

This was the first attempt made by service providers to increase their value chain outside the basic voice services. During the last decade, service providers launched a myriad of services, which emphasised the fact that service providers were merely network service providers, and they needed to create an ecosystem of content and application partners.

2.3 The standardisation bodies

The telephone communication network had a key important requirement: breaking boundaries. Achieving such an objective was a matter of standardising every single protocol

used in the network. For that purpose, many governments and private parties created committees to provide a unique standard. Players such as the service providers, system integrators, manufacturers, content providers and IT providers joined such bodies to present their vision. The crucial factor then was the vision that each party brought to the body, influenced by factors such as region and place in the value chain, etc. (Grøtnes Endre, 2008)
Although necessary, it proved to be bureaucratic, leading to a slower time to market. The time that elapsed between each new release was too long, which proved fatal for bringing the right innovation. Bodies such as the ITU (International Telecommunication Union), the ETSI (European Telecommunication Standards Institute), the 3GPP (3rd Generation Partnership Program) covered standards ranging from radio transmission, network protocols and features. The key finding was that those bodies discussed not only technical matters, but a great deal of business strategy. Competitors where sitting at the same table discussing how to enable a new feature, which could potentially, increase the gap among them. Although some of the key features were hidden so that they could have a key advantage over their competitors.

2.4 The next generation networks

Earlier experiences showed service providers that it was urgent to come up with new ideas and to embrace innovation. The key point was to achieve faster time to market because the internet was seen as a threat to their business. Specifically, service providers were concerned about new ways of generating revenue streams which were different to those that they had. The deployment of broadband services proved to be the perfect stimulus for the mobile service providers. At one point, users could participate in chats, send electronic emails, and download videos or images.
The 3GPP standardisation body assumed the role of leading the way towards more open and simple communication protocols. Their vision was to embrace a packet network that could transport any content through end points. That required migrating from a circuit switched network, to a packet based network, whilst at the same time assuring the same quality that was delivered with the old network. The protocol used for building the network was the IP protocol (Ajit Jaokar & Chetan Sharma, 2010), used my billions of computers around the world. The IP protocol had the robustness required by service providers while providing more flexible schemas. The new core network was called IP Multimedia Subsystem (IMS) (Bertrand Gilles, 2007). The IMS was to be built around IP, which was developed by the Internet Engineering Task Force (IETF). The 3GPP requested IETF for their help with building the necessary protocols around the IMS idea. If the 3GPP required any ability, the IETF was responsible for delivering such protocol.
The primary goal of the architecture was to enable launching richer services that could potentially be used by any customer. The voicemail is a perfect example of such a service. It was very common to have a voicemail for the fixed phone and a voicemail for the mobile phone. Bringing convergence was easy, decoupling the access layer from the service layer, so that no matter how you accessed the voicemail, it worked for both scenarios. By separating the access layer, the transport layer, the control layer and the services layer, service providers could provide seamless access to their service despite which device the customer was using.
As a result, service providers could increase their service mix because they were not tied to any specific access layer. Therefore, you could watch a video from your mobile phone, chat from your fixed phone, etc.

2.5 The innovation trail

The service provider's strategy was to look towards other industries to learn from. At that time, the internet proved to be the best platform for launching new services. The internet was constantly evolving, bringing richer services to the end customers. This led to the conclusion that in order to bring innovation into the rigid mobile communications arena, a radical shift was needed. Building a worldwide communication network imposed certain conditions in terms of resilience and stability. Nonetheless, the internet at that time was a worldwide network; built from complex requirements that were able to cope with its demands. That reasoning allowed services providers to adopt the internet as their core protocol.

Adopting the IP family of protocols, service providers also brought the spark of innovation from the internet. Thanks to its architecture, the internet deploys its services at the endpoints, not at the core. The core is just responsible for the transport of data in the most efficient way. Therefore, small companies can innovate by creating compelling services at the endpoints. That schema was impossible with the core oriented architecture built by service providers.

The IMS is the perfect companion for service providers, as it can provide not only the quality needed, but also the innovation they are looking for. The trail lead by internet was used by the service providers as a guide for their networks.

2.6 The value of open systems

Early generations were built using proprietary hardware and software equipment, which blocked many companies from entering the market. With a few companies leading the innovation, service providers were totally dependent on their network providers. The shift made from circuit switched, towards packet switched networks enabled deploying standard equipment that any company could buy. However, there was still one barrier to overcome, and that was the proprietary software vendors.

The revolution came from the internet, as software was open, anyone could create applications over that software. The software required by service providers is now moving steady but slowly towards open systems. Consequently, innovation is open to any one with the desire to participate and bring in new ideas. The IT concept of SOA (Service Oriented Architecture), which is the based of the IMS network, is only possible if the protocol used to communicate is open.

2.7 Technologies and services built around NGN

The best way to show success is to lead by example. During the last years, many technologies have been created around the idea of IMS. Some of these technologies are based on the core, and others are based on the endpoints. This diversity enables service providers to come up with new and enticing services to offer their customers. The following are a few examples of very interesting technologies.

RCS: Rich communicate suite is an evolution of the typical basic services offered by service providers towards a complete and coherent service offering. Services such as instant messaging, presence and availability, video share, file share and others are defined at the handsets and the core network. The suite is built around many already standardised services and protocols, which allows faster definition and implementation. The success will come with the default inclusion of the client in every new handset sold.

LTE: Long term evolution is the next radio access for mobile devices. The UMTS (3G) provided speeds up to 2Mbps, then HSDPA provided up to 10 Mbps. LTE is a complete evolution in the way radio access works, providing speeds up to 300Mbps. LTE will enable mobile service providers to deliver richer multimedia services, with uncap video and audio.
HD voice: High definition voice provides double quality from its predecessor. During the last decades, the voice channel has not been updated to provide better definition. Therefore, the HD voice is not suited for the old analogue world, as it was designed for a narrow band voice. Once the IP shift has been deployed, HD voice will be a common service.
WAC: Wholesale Applications Community is a joint venture from many leading service providers to provide a unique set of APIs and storefronts to enable sales of handset agnostic applications. This initiative was started by JIL (Join Innovation Lab), which merged with WAC to provide a unique development platform. The idea behind it is to expose core network and device information to developers so that a developer ecosystem is created. That ecosystem will be equal to anyone deploying a WAC store.

3. The new R&D organization

Entrepreneurs have to face two different challenges when dealing with new technologies in new or existing markets. The first one is to become a renovator, which implies having a strong R&D to be able to create something new. The second is the business model. Most of the entrepreneurs do not have a specific profile, as they are not business development managers. Besides, business models hardly support any R&D effort. The need for immediate ROI wipes away the classical R&D models with long-term scope. Therefore, there is a need to find new ways of funding research activities.
This is the case of the technologies in the mobile industry which are opening the doors to new application scenarios that will revolutionize the way in which individuals have access to network capabilities anywhere, following the concept of "mobility". Now, the important and differentiating feature of this particular market is that delivery is not generated by the unilateral setting of a product or service derived from a company, but from the integration of interests from different industry players to establish "win-win" relationships where the management of reciprocity is the basis for viable solutions to end customers.
The group of agents that interact in this situation would be, in the first place, the network operators whose business is determined by the use or traffic that is generated on their network. This leads them to the need for multiple layers of value that are built to give meaning to their infrastructure. Therefore, one's business model must be very open to negotiation, even generating sponsorship of any R&D that may materialise in the context of the value proposition that reaches the end user, sometimes with their participation to create a system of "intelligent decisions". Later, we will detail the business model of these operators within the global system, related to the other agents that build that market reality.
Secondly, the technological start-up companies, who build the software that facilitates the further development of applications in the face of finding customers. This requires a bond of vertical integration forward and backward, i.e., approaches and liaison with operators and applications companies, they therefore, play the role of a "hinge" in the market. The business model will also be presented in a scheme shared with other agents.
And finally, content and applications companies generating opportunities and needs around a catalogue of applications that represent the "visible face" of the business described above, **and composing the "tip of the iceberg" (see Figure 2) where the accumulation of**

specific value proposition, with a layer of competitors nourished where creativity is crucial.

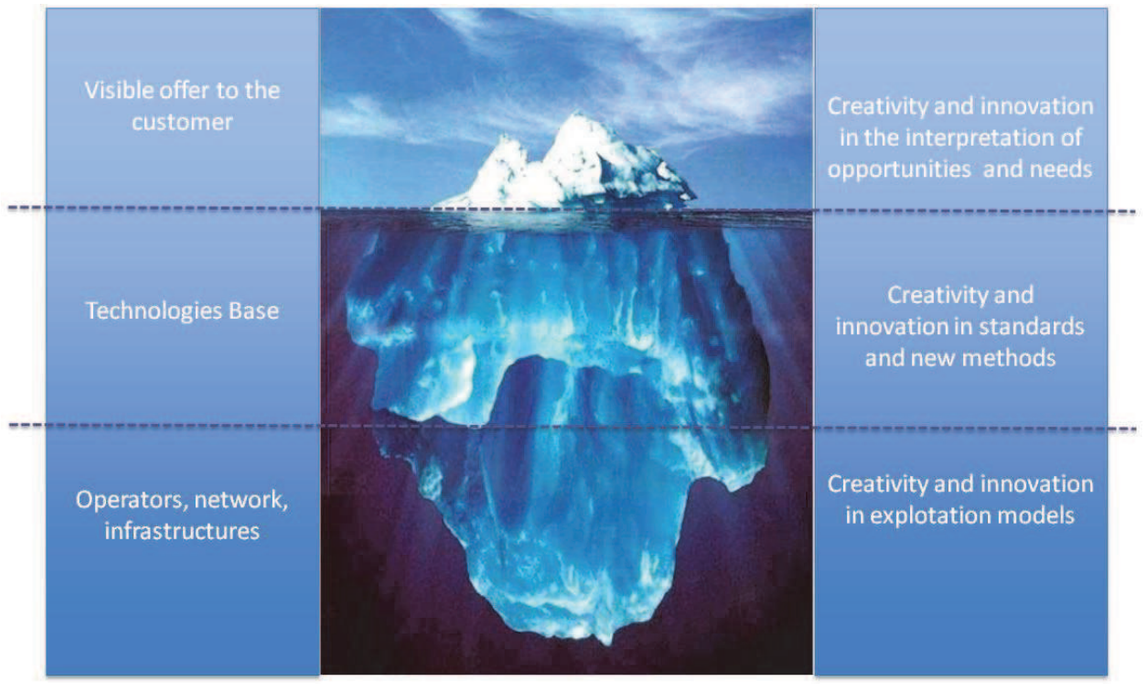

Fig. 2. The visible face

Furthermore, this scenario combines different types of organizations, i.e., large multinationals, large technology companies and the new technology-based companies phenomena arising from start-up or spin off, totally opposite in many aspects of their leadership and management, but similar in terms of the need to find common spaces of understanding that enable the development of value propositions in economic returns.

At the base are operators or network providers characterised by their large size, with an investment framework that supports high-volume. Because, there are not a large number of these operators worldwide they need geographical locations too large to meet the return of investment. The way to get the desired return is determined by the acquisition of shares in the business carried out by organisations that build technology and services based on the use of their network infrastructure.

Thus, we propose certain benefit rates that apply to the volume of usage of these networks, making it a partaker of the stakes associated with the success of all stakeholders seeking to develop businesses supported by such infrastructure.

Entering the business layer are agents who respond to the challenge of setting "base technologies". These are large organisations from several domains, usually general practitioners in implementing ICT in a multidisciplinary way with entrepreneurial projects, namely, new technology-based businesses, with value propositions in constant renewal, whose business model is eligible for funding the "interests" of the operators and the scheme of "fee" or revenue sharing as may be agreed with the companies that develop applications for the final customer in the market**. However, the importance of public support for this phenomenon and entrepreneurial risk, should be noted. The uncertainty of these**

companies' proposals, which need a longer process of maturation, means that operators are unable to take it "as it is".

Finally, the companies generating such applications are continuously trying to develop creative thinking based on both their talent in the use of several items: outside involvement, assuming the challenge of the launch, choosing the right powerful dynamic advocacy, communication, etc., and taking the risk of the entrepreneurial phenomenon. This is where the market cash is generated, the turnover that pulls the strings of agreements in the value chain, the basis for all the efforts that capitalise new planning.

These terms and conditions for viewing the "business" are the premise that should generate a structured approach to construct a formal system usually composed of elements that become a "business model". These may well relate to the reference named "business ontology" (Ostenwalder, 2004). However, this approach challenges some points of this document, namely:

a. Value proposition.

In this case the value proposition is tied around the needs that have been discovered in the context of mobility, by providing a variety of ubiquitous features that accompany the customer. Therefore, the needs of the professionals are increasing as they are linked to market needs, which is the reason why companies create compelling applications. However, one issue is the value proposition, and another is the supply, i.e., conditions that make it attractive and viable. It should support the whole chain of technology and infrastructure, making feasible some of the developments that the companies make to be in the innovation portfolio.

b. Elements that support the value proposition.

Among the elements that make the value proposition, we can distinguish key components, namely the constraints associated with the relational structure of the agents involved in the setting of the offer. Given the level of integration required, fundamental policies should be in place, forming cluster type development strategies and even setting up "joint ventures". These branches also require a management model for sharing information and knowledge to develop ways in which to coordinate the relational framework, establishing certain protocols and formal processes. Moreover, the relationship is considered a distinct expertise in which each party assumes a specific competency framework. There are three clear areas, on the one hand, infrastructure and investment, on the other, the technology base, and finally, the creativity around the applications.

c. Projection of the value proposition and stakeholders.

Looking into the market value, is important to note open and participatory dynamics that must be established within outsiders, trying to identify needs and specifically, segments where the feeling of belonging or clan, might allow the development of a branding and future development. To carry out this task all relevant information is channelled through different channels of communication that are inserted into the social networks, websites and networks and events, responding more to a relationship with information, and more people-centred experts.

d. Schemes of costs, revenues and results.

With all these variables, achieving a model that supports the revitalization of the value proposition is sustained in the cross-cutting activities that are determined by the cost structures that must be supported, namely, infrastructure and personnel etc… These activities are clearly linked to the flow of income, outside sales and within the "base technology companies". It is clear that this relationship of income and expenditure is

associated with a control scheme that enables the progress of activities, the status of critical assets that sits on the competitiveness of the organization and its derivative in a control panel that can generate a scheme of "input-output" or "cause and effect" very enriching for directing and managing the task.

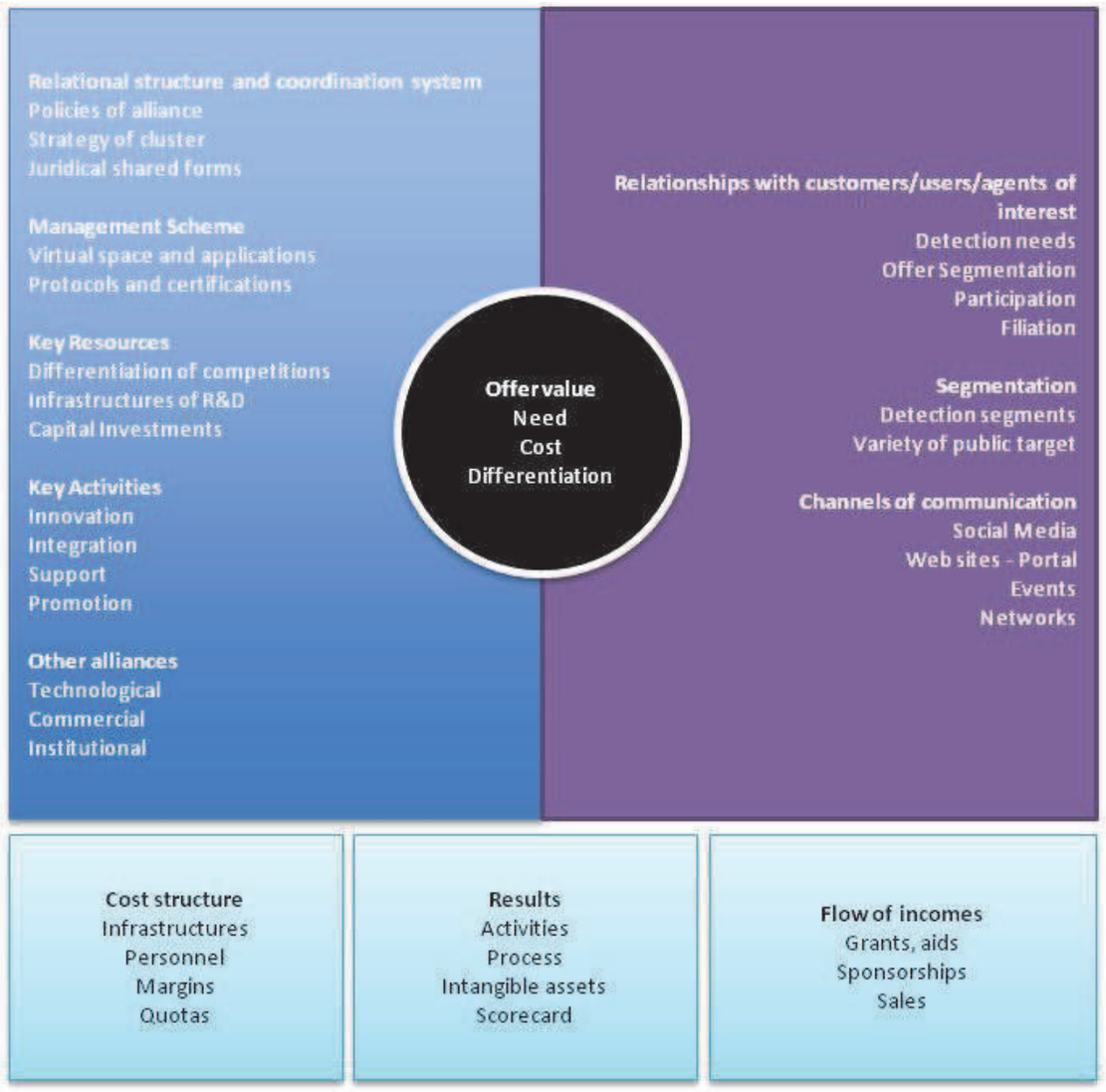

Fig. 3. Business Model Canvas

Therefore, the model provides a number of key considerations that must be taken into account when it comes to the strategic thinking that is required to organise the initial premise, and thereafter to realise the vision.

4. Finding the right services and business models

As described in the previous sections, the telecommunications industry needs to reinvent itself at this point in time to find new ways of maintaining its pre-eminent position in the market.

Now that we have reviewed the technologies and the current state of R&D, it is time to propose a new model, which in the authors' opinion, should be adopted and used by the industry in the years to come.

Application Stores have shown how the software market for wireless devices can be driven from outside the operators walls and gain a significant market share and the customers attention. Operators have shown little or no reaction to them, because they do not have the right tools to do so, and they have lost their position as the wireless software providers of preference for customers. Some of them have even abandoned the battle and assumed that they will be just data transportation media and make money from this traffic. Others have surrendered to the device manufacturers and integrated their Application Stores into their offers, and got a small portion of the revenues generated.

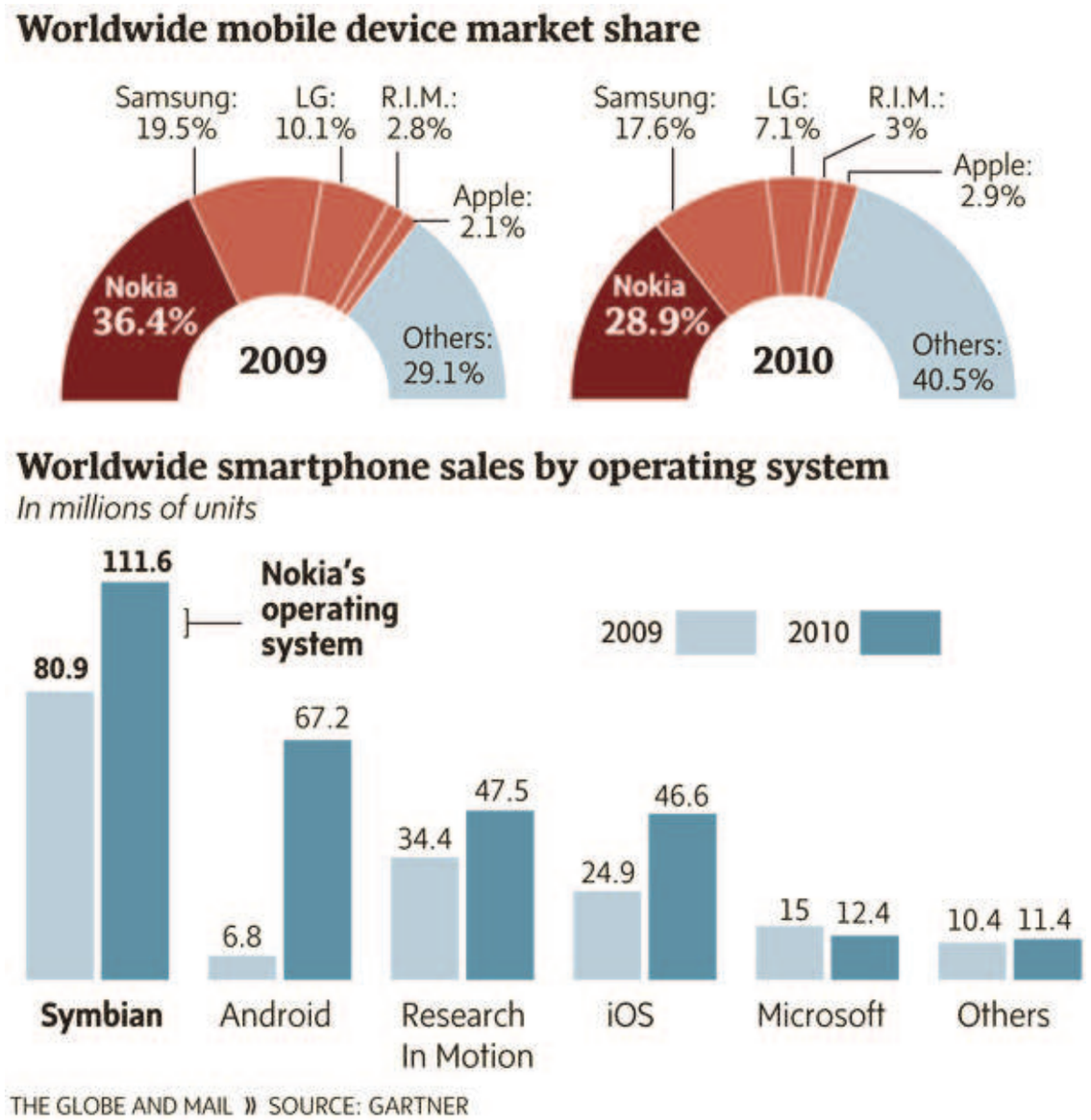

Fig. 4. Worldwide mobile device market share

Application Stores though, have a severe problem of fragmentation. As of March 2011 the new smartphones represented around 19% of the worldwide wireless devices market OnlineMarketing (2011). Growth is enormous and will continue in the coming years, but many factors point to the fact that smartphones will never take 100% the market. Sales figures point to around 200 million units being sold in 2011 (Celularis, 2011), (Moconews, 2011). But the wireless devices base is around the 5 billion mark. At this pace, it would take 25 years to achieve a full smartphone market. Therefore, and despite all the news coming from the industry, which talks about a smartphone world, the numbers show that this is not the case and there is still a huge market for non-smartphone devices that might shrink with time, but will never go away. Paraphrasing Geoffrey Moore in "Crossing the chasm" (Moore, 1991), the smartphone is a market of an Early Majority nowadays.

Additionally, many smartphone sales are being driven by huge subsidies from the operators, so that the numbers of smartphone sales and adoption are hugely distorted. We should not disregard the fact that although many customers do not really want to own a smartphone, they are not given an alternative. Therefore, what we are actually seeing is the birth of a new mobile consumer specie: the "dumb smartphone user". This kind of user owns a smartphone but hardly uses any of its advanced features. Besides the basic voice and texting features, they will possibly use e-mail and might access their social networks. But most of them do not seem to be willing to pay for the applications, being entangled with device downloads and technical tweaks.

One of the keys to the huge success of the Application Stores is the third-party developers' model. Developers have been given a clear model with development tools, certification process and access to an identified market. But again, some obstacles limit this model. First of all, competing against 350,000 applications is a severe problem. Reaching customers is not an obvious task, and a lot of money must be put in applications marketing and promotion, changing the initial low-cost model for a more costly one. Some applications have been a huge worldwide success, Angry Birds being the paradigm of this model as they have sold many millions of applications without any big promotional effort and their developers have become multi-millionaires. But the numbers show that this case is one in a million. The average application developers hardly make any money out of them. For a ten applications set, reports say that 1-2 are successful, 3-4 recover the investment or make some money, and 4-6 just do not make it.

As it can be seen from the figure below, developers wanting to create applications have an additional problem in the market fragmentation due to the presence of multiple operating systems.

Developers wanting to create a service have to choose to which operating system and therefore to which market share they are aiming. Developing multiple versions is an expensive exercise and raises the financial risk of the development. Multiple versions mean multiple developments to create and maintain, almost doubling development costs. Although some companies are creating development frameworks to develop applications that run on any operating system, experts in the field recognize the unfeasibility of the idea, both from a technical and a political point of view. There are some approaches, but the facts suggest that having a unique development that works in any device is just not possible, and will never be. Apple and Google, the main players in the domain will never get to an agreement of a common framework because their interests do not match. Apple especially believes in its own closed market and is not ready to communicate with others. But reaching broader markets is crucial to allow an easier monetisation of the applications.

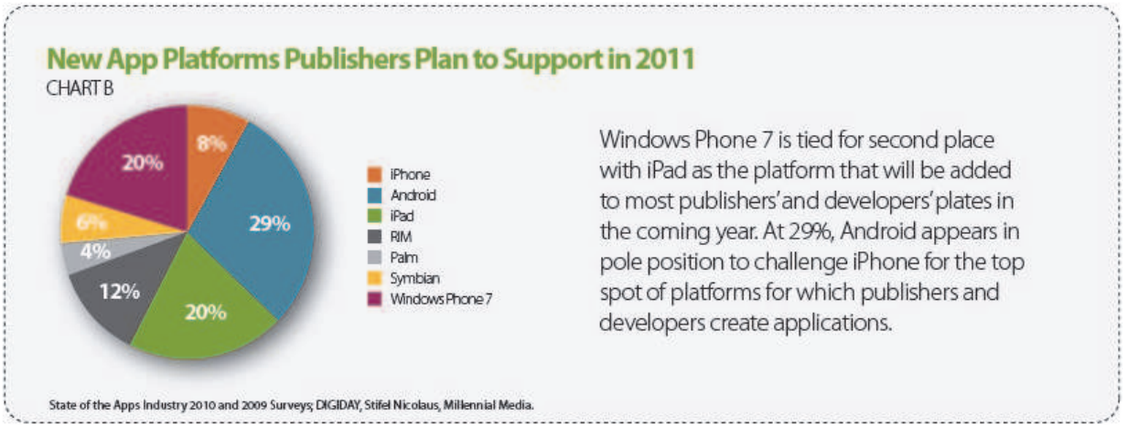

Fig. 5. App development platforms

We have reached the crucial point of the chapter, which has been the object of the R&D work developed by Almira Labs with the collaboration of the UAM over the last four years. It is: "How do I create a service that I develop once and reaches all or most of customers in the world? How do I overcome the fragmentation problem? Why do I have to choose a closed and limited market? How can I create applications that are useful for anybody regardless of their technical skill, budget, geography, cultural status or personal abilities? How do I overcome the R&D lower budgets in Operators? How do I develop rapidly low-cost services to match Internet industry pace?"
All these points have been addressed and the solutions found are proposed in the next section.

5. The case of Almira Labs

The Spanish regional government's current conviction about the benefits of supporting the creation and development of New Technology-Based Firms (NTBFs) is quite evident. An enterprising culture, training, funding, infrastructure and assessment services compose the entrepreneurship field and reveal a traditional strategic approach which has been followed for the last few years (see Figure 6), even more so when the consolidation undergone by science and technology parks is taken into account (MTI, 2007; European Commission, 2006; 2003; Rubiralta, 2003; Belso, 2004; GEM Project, 1999; Butchart, 1987).
This scheme shows a multidisciplinary reality which is shaped as inputs for the creation of a support plan for entrepreneurship and, more precisely, for what turns out to be the most attractive segment of companies for most regions – that is, NTBFs.
Thus, the reality of the NTBFs is among the strategic priorities of regional governments due to the impact on competitive updating around business networks and their potential for generating employment.

5.1 New technology-based firms

The conceptual framework and the characterisation of the collective of NTBFs have already been widely covered and studied (Bueno, 2003; Fariñas and López, 2006; Storey and Tether, 1998; Shearman and Burrell, 1988; Bollinger et al., 1983), in a dual perspective: on the one hand, the differentiation derived from the moment or stage in which the business project is, and on the other hand, the widespread consideration of the resources and capacities

available, which involves the management of both the tangible and intangible, and the internal and external assets.

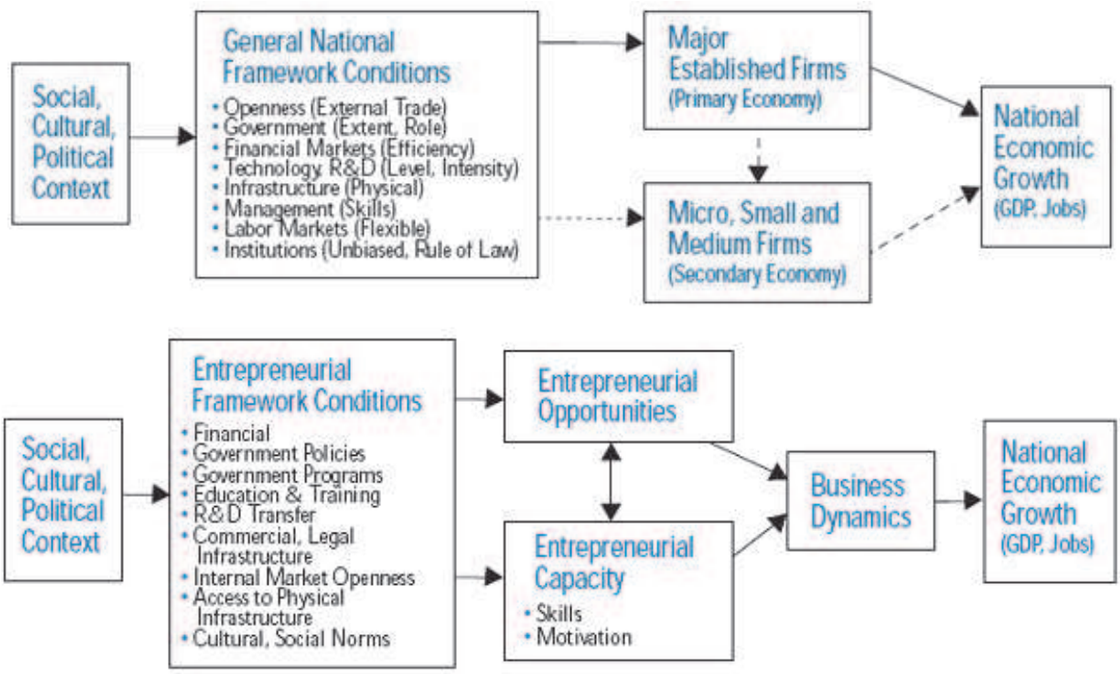

Fig. 6. Conceptual framework of the GEM Project for the analysis of the enterprising phenomenon *Source: GEM Project (1999)*

In turn, the temporal component is influenced not only by the traditional sequence idea–business plan–start–consolidation (Veciana, 2003), but also by the specific context derived from the sector to which the firm belongs.

In this case, the field of Information and Communication Technologies (ICTs) shows a clearly differentiated profile, especially regarding its maturation period and terms of supply. Undoubtedly, we face a reality of quick incubation that involves a rapid strategy creation with a clear orientation and the configuration of a dynamic organisational development (McQuaid, 2002).

Within the frame of ICTs, the life cycle of a new project shows a special, almost unique profile, especially for the following reasons:

- knowledge globalisation allows any firm or interest group with basic academic knowledge to have access to the latest novelties in applied engineering through the internet
- both barriers to information transmission and the difficulty of intellectual property registration increase investment risks
- the existing difficulty of establishing a project with wide objectives within a long-term period
- the low-cost competition from developing countries

All these factors force ICT business projects to gather the following basic features:

- a highly specialised niche with scarce competition
- an enterprising professional team highly specialised in the field and with previous experience

- the strategy of short-term projects/services and products, and R&D as a differentiating factor for medium- and long-term survival
- highly qualified personnel to assure productivity
- short time-to-market as a way to replace traditional methods of intellectual protection (entering the market first becomes a key factor).

In general, ICT projects appear as extensions of the entrepreneurs' work in previous companies, discarded working lines, etc., taking into account a small set of degree projects or PhDs studies.

The characteristics mentioned so far make the life cycles of projects extremely intense and concentrated within a short time period. Their average life oscillates between three and five years, and the most common objective is the sale of the product or service (and even the company) to a larger competitor, in order to apply the capital gain to a new business idea.

5.2 Almira labs as an NTBF in Madrid science park

Almira Labs is a company which was founded in 2006 with the clear vision of developing a technology allowing fast and low cost development of services for the telecommunication networks. After working in the industry for several years, the founders were convinced that developments for those systems should be made in a completely new way, bringing to the telecom space the practices of the software engineering world, with special attention to the SQA (Software Quality Assurance) principles, with technologies allowing the rapid development of services over open standards and programming languages that could be used from any device.

A new technology, Next-Generation Network (NGN) or IP Multimedia Subsystem (IMS), and a new programming standard called JAIN SLEE (JAINSLEE, 2009), based on Java, appeared to dramatically change the industry panorama. The services developed with this technology for the telephony network, work universally on the network nodes of any manufacturer, as long as they are compliant with the standards described above, either for mobile or fixed networks. This technology allowed the birth of a new concept: Fixed-Mobile Convergence or FMC (see Figure 7).

With this new paradigm, the number of possible service providers for operators increased, as it was no longer limited to the manufacturer of the network equipment acquired, but opened to service providers who were able to program with standard JAIN SLEE and had a good knowledge of the telephony network. Nevertheless, this situation still involved a certain degree of restriction for operators, since they were dependent on suppliers with certain specific knowledge of software development.

Almira Labs went a step beyond this. It positioned itself ahead of its competitors in this space, offering a graphical tool to create NGN services, reproducing the concept of a Service Creation Environment (SCE) that existed in the classical intelligent network for this new NGN paradigm. With this tool any non-technical member of a product engineering or marketing department can develop these kinds of services without programming, in a fast and efficient way and at a reduced cost.

To complete its offer to operators, Almira Labs has a catalogue of plug and play network services that were developed using its own technology and which can be deployed on any NGN node of any operator (see Figure 8).

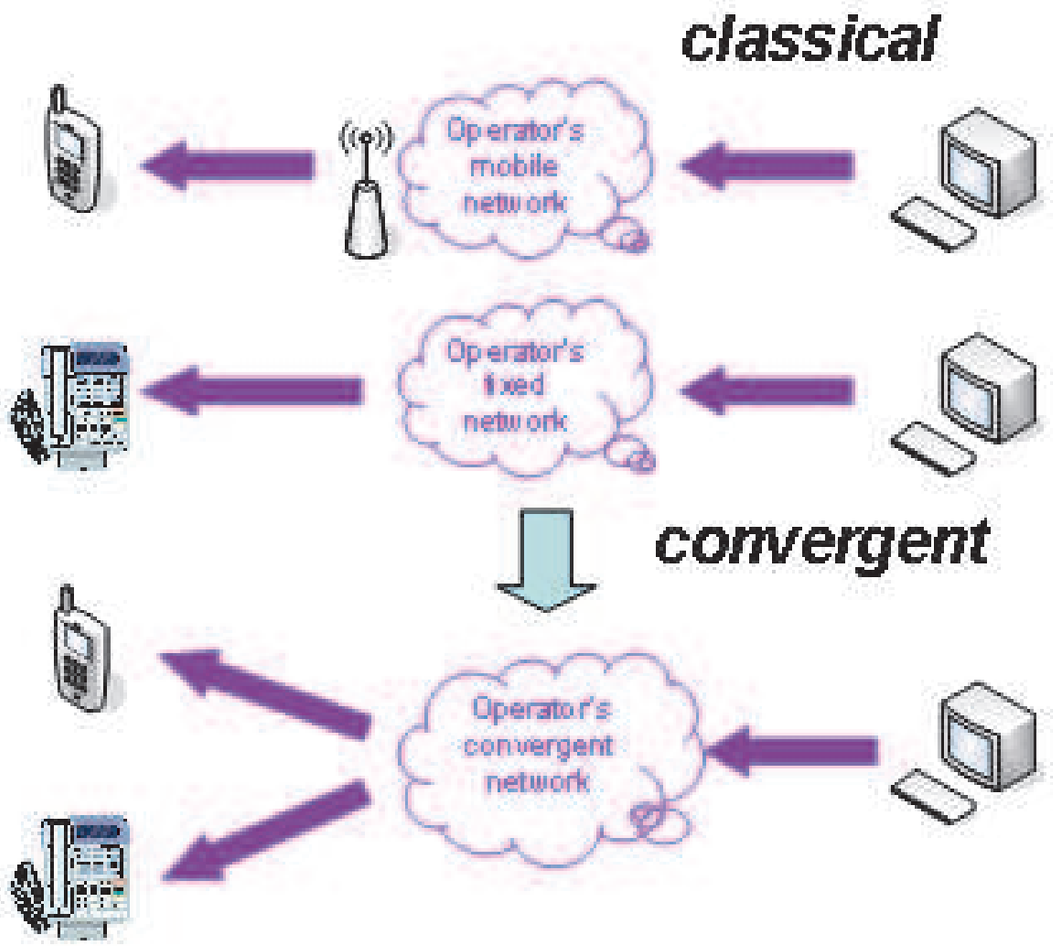

Fig. 7. Intelligent network evolution

In summary, Almira Labs defines itself as a next-generation product and services provider for telecom operators' next-generation converged networks. The main aim of the company is to become one of the key providers within this area at a global level, as its target market is composed of all telephony operators worldwide. Its go-to-market will be undertaken by a direct sales force in both geographically and culturally similar areas such as Iberia, Northern Africa and Latin America, and by a strong partnership with JAIN SLEE network node manufacturers in the rest of the world.

The results of four intense years of R&D effort are condensed in The Five Billion Store Concept (www.fivebillionstore.com). It is an Application Store with services that can be used by any person, from any operator, with any mobile device or fixed line. Useful services at affordable prices. And it is complemented by a developers framework that can be used both by developers (using a JAVA-based library with all the telecom components) and non-technical people who can create complex telecom services using a graphical tool (in prototype stage at the point of writing this book). Developers are offered a typical revenue sharing schema on a site where a single development addresses a huge market of consumers.

This ambitious plan has been developed by a very strong team of professionals with wide experience in this domain. The founders have accumulated a total of more than 25 years experience in working with operators. In addition, they have put together a team of software engineers who have previously cooperated and worked together for many years in the same area.

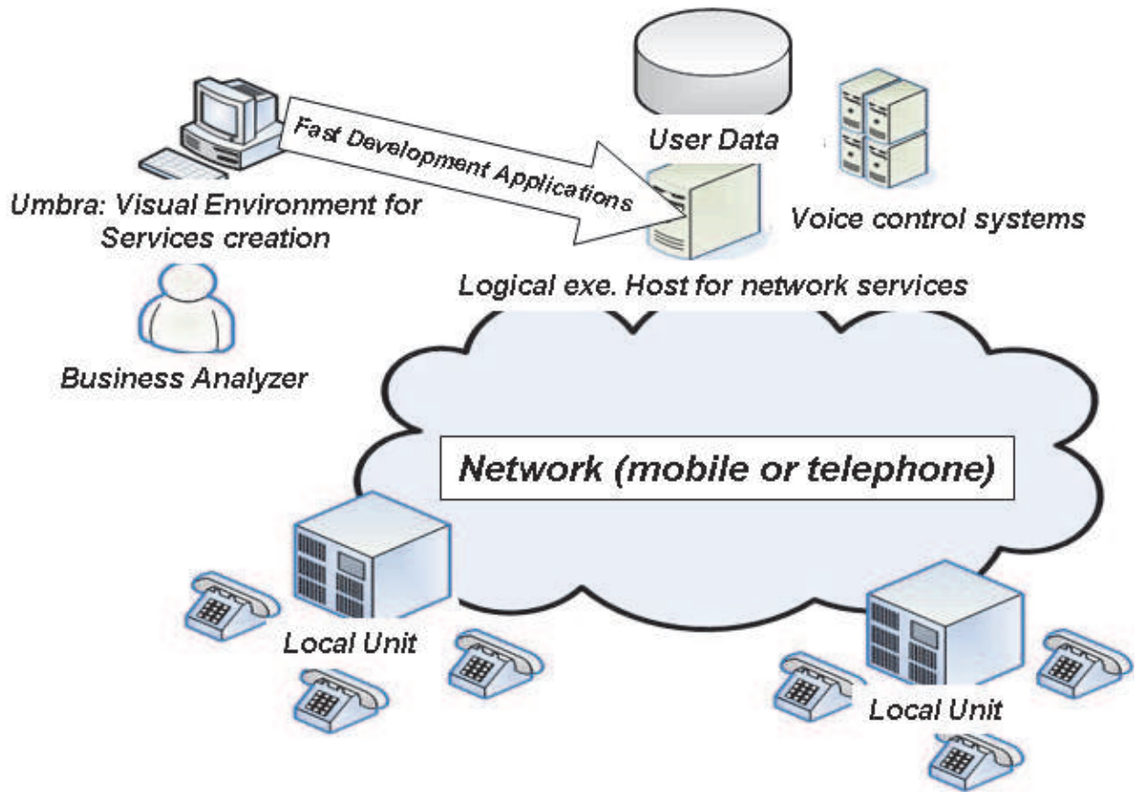

Fig. 8. Almira Labs technology schema

The members of the founding team have a remarkable university involvement. The company's entrance into the Madrid Science Park (MSP) is due to the team's remarkable research profile and its ability to transfer basic university research to an industrial application within a strategic field.

For Almira Labs, the advantages of belonging to MSP are innumerable, but may be summarised in the following points:

- the MSP brand – a prestigious, nationwide-acknowledged brand which raises the Almira Labs project to a higher level, since it ensures the quality of the business project
- associated services, employment service, grant management, marketing management, etc.
- physical space at a reasonable price and with a flexible scheme, which reduces the enterprising risk by controlling fixed expenses
- international services

In brief, the objective is the creation of a product for the development of services for telecommunication operators, which involves a great deal of research in leading fields

within the new trends in computing technology; for instance, Modern Driven Architecture (MDA) (Miller and Mujerki, 2003; Kleppe et al., 2003; Meservy and Fenstermacher, 2005), and Design of Object-Oriented Applications or Product Lines. In fact, these fields are currently being studied by the postgraduate members of Almira Labs. Fostering schema from the Madrid Science Park has proved key in allowing such a long research period for current industry standards and Venture Capitalists schemas that prime short-term results.

5.4 Market implications and conclusions

The world is becoming a global market. The globalisation process implies that products can be sold all over the world with the help of new technologies such as the internet, or by using partnership schemas which help a company reach all its potential customers.

However, globalisation also broadens competition. Nowadays every company in the world working in the same domain can sell its products globally, in an efficient way regardless of its geographical location.

This fact involves high risks for Western companies, since an effort in R&D to create a new product or technology can be rapidly copied by companies in emerging countries, especially in Asian countries such as India or China, where labour costs are much cheaper and the workforce is quite large. These countries specialise in adopting technologies and processes and giving them out as services to companies all over the world at a lower price than the Western companies, where those technologies originated.

Almira Labs has identified this risk from the very beginning and has centred its strategy on being a small company with high R&D skills and attempting to always be ahead of competitors in developing countries. In addition, the study of intellectual capital conducted by IADE2 reinforces these ideas and sets the basis for a valuation of Almira Labs' intellectual capital and its market strategy, which is implemented by having a product orientation and keeping a highly innovative profile:

- The product orientation will be the competitive differentiator in our current markets.

Almira Labs is one the first few companies in the world involved in intelligent network services for NGN environments. It is a difficult market to enter, because of the very high-level skills that are needed, but – with time (two years maximum) – more competitors from all over the world will enter the market, thus bringing prices down and improving market conditions. When that happens, Almira Labs products will be ready, so we will be able to compete with new entrants by reducing the costs of our products and, therefore, becoming more competitive.

Keeping a highly innovative profile is a key issue to identify new markets to which Almira Labs could look for the diversification of its activities. Markets evolve very rapidly in the new global economy, especially in the sector of new technologies. When they start maturing and the risks are lower, competition increases – mainly from low-labour-cost countries – and, therefore, business profits tend to shrink in a short lapse of time. An occidental technological company like Almira Labs needs to carry out constant research in order to find the next new market or technology with the aim of maintaining its competitive advantage against such competitors.

To implement the market approach described above, Almira Labs is creating partnerships with players in the NGN area, mainly global providers or integrators with an international

presence. These partners can sell Almira Labs products all over the world using their already established commercial networks and be in charge of pre- and post-sale processes, including first-level support. This schema alleviates Almira Labs' workload and allows us to concentrate on our core value identified in the study: intellectual capital regarding software creation.

6. Conclusion

The authors have described the current state of the telecommunications market and its shortfalls regarding the generation of a future-proof business model that can give both market and financial sense to the new investments planned for the creation of the Next-generation networks that will drive to 4G and beyond.

The case of Almira Labs has been presented showing how an adequate fostering program can help to develop a long-term R&D plan when the industry is not ready to support it, and that this effort can generate new paradigms for the Telecommunications industry.

A new approach to the VAS market is proposed, putting together the rapid low-cost development of services that are accessible to all kinds of people, regardless of their device, technical skills, geography, age or physical ability. A technology that makes sense from both financial, and social points of view, and which provides innovative services for the population worldwide, at an affordable cost and ease of use.

Operators have the chance of adopting such a consequent technology and to again fight effectively the proprietary Application Store from the device manufacturers, regaining the market share lost and their innovation pace.

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Acronyms

UAM: University Institute of Innovation and Knowledge Research (Universidad Autónoma de Madrid, Spain).
VAS: Valued Added Service
RCS: Rich Communication Suite
WAC: Wholesale Applications Community
VoLTE: Voice over LTE:
LTE: Long-term Evolution

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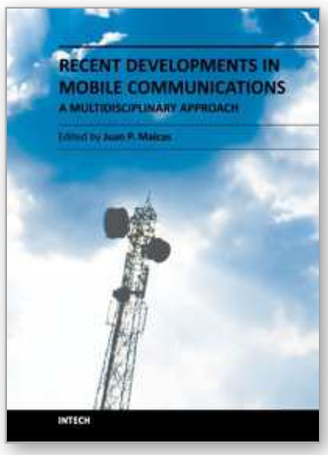

Recent Developments in Mobile Communications - A Multidisciplinary Approach

Edited by Dr Juan P. Maícas

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Recent Developments in Mobile Communications - A Multidisciplinary Approach offers a multidisciplinary perspective on the mobile telecommunications industry. The aim of the chapters is to offer both comprehensive and up-to-date surveys of recent developments and the state-of-the-art of various economical and technical aspects of mobile telecommunications markets. The economy-oriented section offers a variety of chapters dealing with different topics within the field. An overview is given on the effects of privatization on mobile service providers' performance; application of the LAM model to market segmentation; the details of WAC; the current state of the telecommunication market; a potential framework for the analysis of the composition of both ecosystems and value networks using tussles and control points; the return of quality investments applied to the mobile telecommunications industry; the current state in the networks effects literature. The other section of the book approaches the field from the technical side. Some of the topics dealt with are antenna parameters for mobile communication systems; emerging wireless technologies that can be employed in RVC communication; ad hoc networks in mobile communications; DoA-based Switching (DoAS); Coordinated MultiPoint transmission and reception (CoMP); conventional and unconventional CACs; and water quality dynamic monitoring systems based on web-server-embedded technology.

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