ICT-601102 STP TUCAN3G

Wireless technologies for isolated rural communities in developing countries based on cellular 3G femtocell deployments

D23

*Parameters and basic conditions for the market research
and the business model*

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Abstract:

This document is the first step to develop a market research and a business model focussed in providing 3G services in rural isolated areas of developing countries. It starts by analysing the actors involved in providing this kind of services, trying to identify the research questions that should be addressed by the market survey. These research questions serve to select the methodological tools that will be used in the market survey. Based on this previous work the market research plan is designed. Finally, a structure and methodology for developing the business plan is presented.

Keyword list: Market Survey, Business Plan, research questions, research, tools, actors

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Executive Summary

This document is a preliminary approach to the market research and business model development. It starts by providing a perspective of the market situation in Latin America. An identification of similar experiences and a description of common barriers in rural scenarios of developing countries have been performed. Among these barriers, the most important ones are the geographical complexity, the lack of infrastructures and power energy and the low economic activity.

The analysis of actors is also presented, dividing the analysis in Public Sector, Business Users, Private Users, Operators and Manufacturers. This analysis should serve to identify the information that should be addressed by the market survey in work package 3 of TUCAN3G. The Public Sector influence in rural areas has two sides: social programs that increase the income of some households or communities, and public funds aimed to spread ICT access. Both, social programs and public funds are identified and described for Peruvian and Colombian case.

The analysis of public and private users shows the interest in communication services. A 45% of the Peruvian rural population lives in areas without cellular telephony coverage. In spite of the higher poverty levels found in rural areas, a roughly estimation shows that a 10% of rural population would consume similar services to the ones consumer in the capital. In the same way, the operator's perspective shows that the demand of communication services in rural areas is increasing. This fact, together with some technology developments and the support of the government is making the operators interest to grow.

The manufacturer's perspective shows the structure of the manufacturers market and identifies the main questions that should be addressed in the market survey regarding the former market.

After analysing the actors' perspective, methodological tools for the market research were studied as a first step to select the ones that could be used in TUCAN3G marker survey. The final decision about which tools will be used depends on WP3 work, but in this document a first proposal or research classified by actor will be presented. Based upon the choice of research tools mentioned, a market research plan is developed for each type of actor.

Finally, a proposal for the business plan development is presented with a description of the business model that will be used as reference, explaining in detail the main blocks of this model. This scheme will be detailed and improved in WP3.
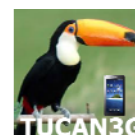
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List of abbreviations & symbols

2G	2nd Generation
3G	3rd Generation
3GPP	3rd Generation Partnership Project
BAS	Broadband for isolated villages
BBB	Better Business Bureau
CAGR	Compounded Annual Growth Rate
CAPEX	Capital Expenditures
CDMA	Code Division Multiple Access
CEPLAN	National Centre for Strategic Planning
CREP	CREPIC- Cauca Regional Centre for Productivity and Innovation, Colombia
EDGE/GPRS	Enhanced Data Rates for GSM Evolution - General Packet Radio Service
EHAS	Foundation Hispano-American Health Connection
FITEL	Telecommunications Investment Fund, Peru
FONCODES	Cooperation Fund for Social Development
GDP	Gross Domestic Product
GSM	Global System for Mobile communications
GTH	Gilat to Home
GW	Gate Way
HNB	Home Node B
ICT	Information and Communications Technologies
IDC	International Data Corporation
INEI	National Institute of Statistics and Information Technology
IPA	IP.Access Ltd., UK
ITU-D	International Telecommunication Union- Development Sector
IUB	Interface Unit to Node B
JUNTOS	National Program of Direct Support to the Poorest
Kbps	Kilo bites per second
KINNO	Kinno Consultants Ltd.- Knowledge and Innovation Consultants, Greece
LTE/LTE-A	Long Term Evolution / Long Term Evolution Advanced
Mbps	Mega bites per second
MEF	Ministry of Economy and Finance
MHz	Megahertz(s)
MIDIS	Ministry of Development and Social Inclusion
MIMP	Ministry of Women and Vulnerable Populations
MINEM	Ministry of Energy and Mines (Peru)
MPLS	Multiprotocol Label Switching
MTC	Ministry of Transport and Communications
MYPES	Micro and small sized companies
OA&M	Operation, Administration and Maintenance
OCDE	Organization for Economic Cooperation and Development
ODM	Original Design Manufacturer
OPEX	Operating Expense
OPI	Programming and Investment Offices
OSIPTEL	Supervising Organization for Private Investments on Telecommunication
PC	Personal Computer

PCB	Printed Circuit Board
PIP	Public Investment Projects
PNMC	National Program Cuna Mas
PUCP	Pontifical Catholic University of Peru
REGULATEL	Latin American Forum of Telecommunication Regulation Entities
RF	Radio Frequency
RNC	Radio Network Controller
RT	Rural Telecom
SCPC	Single Channel per Carrier
SLA	Service Level Agreement
SNIP	Public Investment National System
TDMA	Time Division Multiple Access
TdP	Telefonica del Peru, Co.
TUP	Public Use Telephony
TV	Television
UCAU	University of Cauca, Colombia
UE	Executive Units
UF	Formulation Units
UPC	Polytechnic University of Catalonia
URJC	University Rey Juan Carlos, Spain
USD	United States Dollar
USF	Universal Service Fund
USO	Universal Service Obligation
VSAT	Very Small Aperture Terminal
VSAT IP-VPN	Very Small Aperture Terminal Internet Protocol- Virtual Private Network
WiFi	Wireless Fidelity
WP	Work package

1 INTRODUCTION

Developing a business plan aimed to provide 3G services in rural isolated areas of developing countries is one of the most important objectives of TUCAN3G. The first step to accomplish this objective is to perform a market survey to analyse market needs and business potentialities. These tasks are part of WP3, but some previous work was planned in WP2 to share the information and perspectives of each partner. As result, this document presents a first approach to the market research and the business model design, based on the analysis of the market and the main actor's perspective.

In order to facilitate the reading and reducing the length of the document, part of the intermediate work has been collected in the Annexes, where complementary information useful to understand the current proposal is available.

It is important to note that this document is still proposal, so the results that are shown here should be updated in WP3, where the final decisions will be taken.

2   DESCRIPTION OF THE MARKET

Since 1990, telecommunications sector has started a big expansion in Latin America, detecting different rhythms depending on the technology and the territories. According to the International Telecommunications Union (ITU) in 2011 Latin America had the following ICT indicators:

Per 100 people	Panama	Latin America and Caribbean	Developing countries	Worldwide
Landline users	15,2	18,2	11,6	17,3
Cellular mobile service users	203,9	106,9	77,8	85,7
Wireless fix broadband users	7,9	7,3	4,9	8,5
Active mobile broadband users	14,5	10,6	8,0	15,7
Internet users (%)	42,7	38,8	24,4	32,5
Households with Internet (%)	20,7	28,6	20,5	34,1
Households with computer (%)	29,0	35,9	24,8	38,4
International Internet band width (in bit/s) per second	44121	8009	3531	10976

Source [ITU12].

Table 1. Main Telecommunication Indicators 2011

Mobile phone was spreading until 2000, when its growth has slow down, being barely the 0.5% between 2006 and 2011. Also, in the mid-90s a notable growth of mobile phones started and would last for 10 years approximately. The result was that at the end of 2011, 20 (out of 33) countries in Latin America and the Caribbean region recorded more mobile cellular systems than population, such as Argentina, Brazil, Ecuador, Guatemala, Peru, Panama, y Uruguay [ITU12].
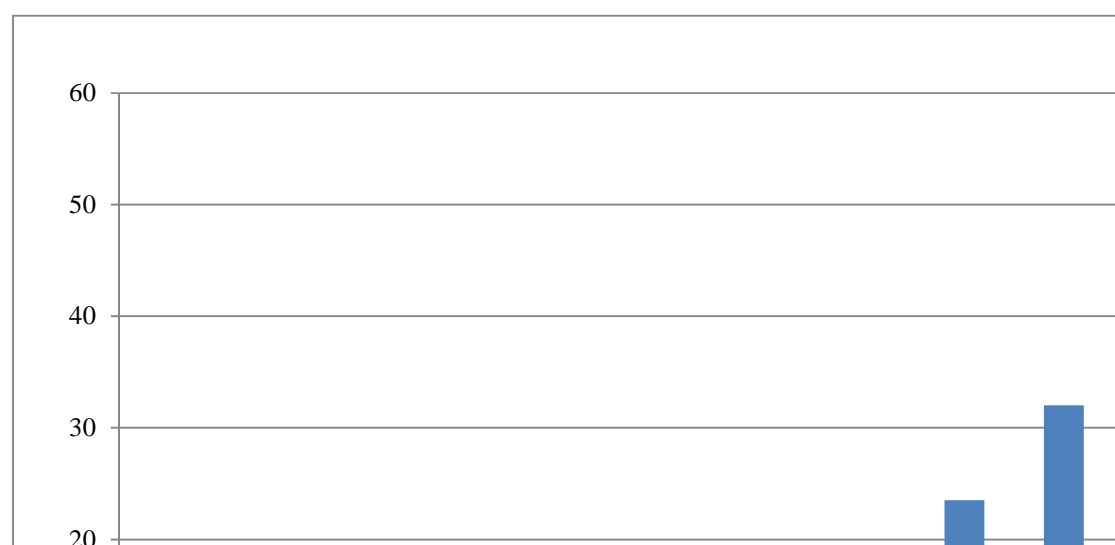
Source: Patricio Rozas, USI/DNRI/CEPAL database of ITU 2007/ ITU 2008 [Sánchez10].

Figure 1. Latin America and Caribbean Mobile phones indicators (1995-2007)

On the other side, Internet services started developing in Latin America in 2000, being at that point the second region with the highest growth of this technology, considering the low initial levels. In 2011, the ITU mentioned that the 29% of households had access to Internet, while the users of these services were the 39% of the population [ITU12]. Nevertheless, the density of Internet access still has low rates, like 5.19 connexions per every 100 inhabitants in 2006 [Sánchez10]. In terms of service quality, there are important differences within the region, for example an Internet user from Panama could connect with an Internet broadband ten times wider than another one in Bolivia [ITU12].
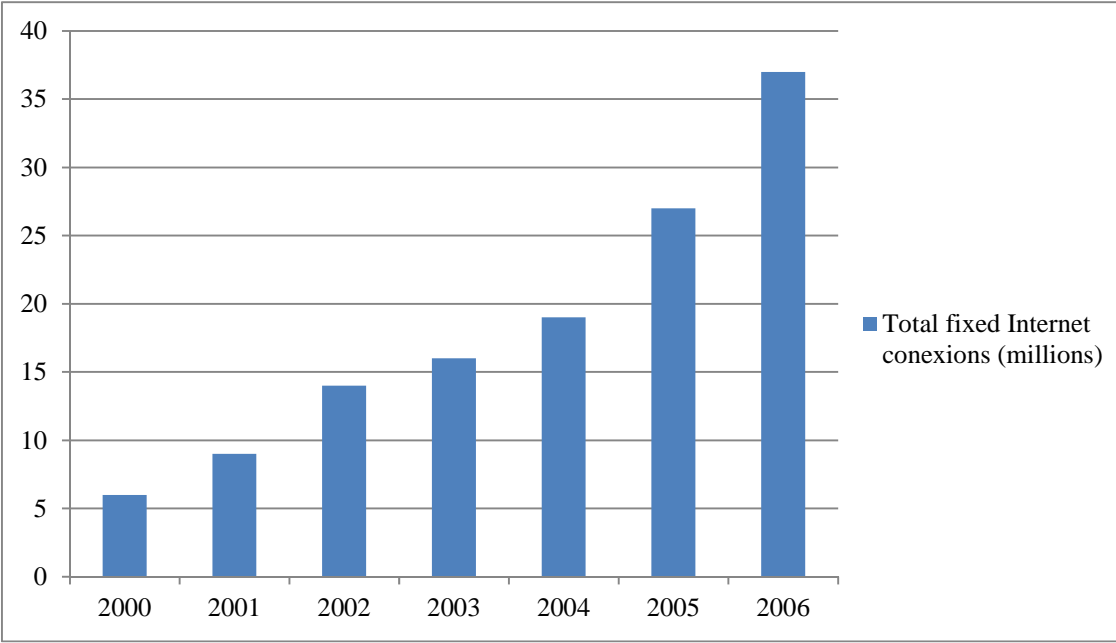
Source: Patricio Rozas, USI/DNRI/CEPAL database of ITU 2007/ ITU 2008 [Sánchez10].

Figure 2. Latin America and Caribbean: fixed Internet connections (2000-2006)

Since the deployment of mobile technology in the 90s, the privatization of telecommunications sector started in most of the countries, which also brought exclusivity periods for the operators that were beneficiaries of a legal monopolistic situation aimed to ensure the network expansion. Nowadays, it is a highly concentrated market, being Telefonica from Spain, both in the landline phone market and in the mobile phone market, the company that controls 4 (out of 10) of the telecommunication companies with more relevance in this region. The holding Carso Global Telecom and America Movil form the other group with more influence after the pullback of the American and European companies. Regarding to the prices, despite the reduction of the technology cost and the growth of the productivity, the final user is still paying expensive fares, with remarkable high prices for broadband connexions services by comparison to the price in the OCDE countries [Sánchez10].

Since the national companies were sold out, it started also the process to create a regulation frame for this sector, with the aim to protect public and private interests against the monopoly, to establish quality standards, to control prices and fares, and to confer inspection power. Aside the opening of this competence, one of the key aspects for the regulation frame is the Universal Service Obligation (USO) that is decisive in order to extend coverage to remote areas. Beyond the Latin American region, the development of ICT is a recurring issue as key tools to benefit the integration and growth of rural areas in the World Summit of Society of Information – Geneva 2003 and Tunisia 2005- and in the World Conferences for Telecommunications Development – Istanbul 2002 and Doha 2006- [Klein07].

Considering the heterogeneity of each country, several regulation frames and models are remarkable. While Colombia, Costa Rica, Cuba, Ecuador, Honduras, Paraguay and Uruguay have public ventures for basic telephony, other countries such as Argentina, Brazil Chile and Mexico have all

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telecommunication services provided by the private sector. The target countries of this study, Colombia and Peru, are samples for these two different situations.

In Colombia, the penetration -number of lines per 100 inhabitants- of landline is 17.0% and of mobile is 79.1%. The local basic service companies are still public, while there are many operators with long distance competence and mobile services. The Universal Service Fund (USF) is used by the Government to support the Public Telecommunication Access Centres, remarking the program called "Compartel" – telecentres, rural community telephony and national broadband infrastructure development- that has achieved to connect 83% of the rural localities in Colombia. Peru – with a current penetration of 8.2% for landline and 78.5% of mobile- privatised the national company that provided the basic telecommunication service in the 90s. Nowadays, despite of third party providers existing in rural areas, there is still a monopoly that controls the mobile and long distance services and the Internet access in this sector. Besides, the Internet access supply is considered an "added value" service, as in Colombia. The 1% of the operators´ income is provided by the Fund for Investment on Telecommunications (FITEL), whose goal is to subsidy telecommunication services in rural and socially interesting areas [Klein07]. More details about the situation in Peru and Colombia are presented in section 2.2.

"The main objective limitation to the access to telecommunication and ICT is generally the low income inside Latin America. Effectively, apart from Chile, Uruguay and Costa Rica, the presence of poverty and indigence is very high in Latin America" [Klein07]. In fact, the available resources are decisive to estimate the potential market of TUCAN3G technology. As we have described in D21, it is estimated that around 60 million of people in rural America Latina could demand this services [CEPAL12]. The institutional support and the private sector incentives are essential to overcome the digital gap in these areas. In this meaning, most of the Latin American countries have funds, as the ones mentioned in Colombia and Peru, in order to achieve the universal service. REGULATEL (Latin American Forum of Telecommunication Regulation Entities) mentions the positive impact of the designed policies to extend the public access to telephony and telecentres in remote communities at a low cost, and also the trend to the slight increment of the demand of mobile phones in these areas.

2.1 Similar business scenarios

This section identifies some experiences aimed to provide ICT services in remote areas of developing countries. In section 2.1.1 some relevant experiences have been identified and a general description is provided. An analysis of the barriers that this kind of initiatives should face is presented in section 2.1.2.

2.1.1 Some ICT experiences in remote zones

The initiatives collected in this section shown the interest that mobile communications and Internet access are awakening in rural areas of developing countries. In the south of Africa, numerous initiatives related to mobile phone and to the access to telecommunications are even talking about this access as a Human Right because of its importance for the socioeconomic development of people.

In Latin America and the Caribbean, most of the countries have national policies that promote and support the development of initiatives aiming to reach universal access to telecommunications, because it is very important in order to help the socioeconomic development of the people. The previous experiences for promotion of telecommunications in isolated rural areas, traditionally populated by indigenous people, have been clearly supported by these policies, positively encouraging education as a key factor for the appropriate development of the projects, and for the direct and indirect results achievement.

Among the previous experiences executed in Latin American and the Caribbean, we should remark the installation of telecentres as the most frequently resource to deliver telecommunication to these areas. These telecentres cannot be considered as a tool for the private utilization of telecommunication media, as these establishments are open for the common use of the community, providing a phone landline and sometimes Internet access.

Due to the large geographical diversity between different rural isolated areas in Latin America, a previous and concrete identification and diagnose process is very necessary in the selected intervention area, as the need of energy sources and telecommunication technologies could hugely vary according to the different characteristics.

Internet access has been brought to some remote areas with complex topography (such as jungle or mountains) through satellite communications (mainly through VSAT) thanks to its easy and fast deployment (when satellite broadband is available). On the contrary, the installation of landlines and signal repeaters requires set up new infrastructures which raise the price of the intervention. In several places, there are small phone operators who offer phone line connexion in remote areas but at a very high cost, cost that does not even let these operators a real margin necessary for the proper business development.

In some other regions of the world, other initiatives related to the spread of telecommunications in isolated and remote areas have been arranged, but we must remember that they have been developed in very specific contexts under concrete circumstances of those regions, so it is worthy to mention them but considering that to develop a project like this, the target area must be strictly identified and many variables must be evaluated in order to get positive results.

As the greater sample of previous experiences in this mobile technology field, we find the project developed by Grameen Foundation in Bangladesh, and the later spread of this intervention to some other developing countries. Mohamed Yunus, Nobel Prize on Economy and creator of the micro-credit, aside establishing the Grameen Bank, also considered few years ago the need to spread adequate telecommunications in the Bangladeshi context, in order to favour the most isolated areas of the country. This way, he established the Grammenphone Company [Gramephone11] that started being supported by the Grameen Foundation and the Grameen Bank, and launched the mobile phone to a 99% of Bangladeshi regions, with a cheap cost and affordable basic cellular phones available for everyone in Bangladesh.

Grameenphone operates through mobile digital network based in the GSM standard within 900 MHz and 1800 MHz band. Grameenphone network also set up EDGE/GPRS, so users can also access to high speed Internet and data service in any place under coverage. Anyway, we cannot forget that this is a specific experience conformed to Bangladesh context, not transferable to any other place without a previous deep analysis of the context.

Other sample has been developed in south Qatar with the support and collaboration of the telephony company Vodafone in 2010 [Romero10]. Isolated communities in Qatar are usually located in the dessert, characterized by being flat and with few geographical features. This project has installed several hybrid stations with solar and wind energy source, that provide GSM, 2G and 3G telephone access. According to the results, the intervention has been very expensive but the market analysis concluded that within 3 years the initial investment could be retrieved. Experts involved in that project identified the need of energy source as the main difficulty to bring telecommunications to isolated areas, because usually these areas don´t have any kind of permanent electricity source.

Also, Grameen Foundation from Bangladesh has developed a mobile phone project in Uganda in 2011 [Fox11], with the aim to improve communications and information capacity of agricultural communities in rural areas of Uganda. In order to do it, it has lent mobile smartphones to the local farmers so that they can receive environmental and agricultural information, emergency situations and relevant news, and spread it to their neighbours. In this project, some information from the farmers is

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also requested and recorded in Kampala to feed the databases of farming organizations and official food programs.

The intermediaries chosen in the rural areas to establish communication services were selected according to their skill to communicate in English, their position in their own community, and their knowledge and experience related to technology. Also, Grammen did a training on the use of *smartphones* and paid them an approximate reward of 20$ per month in *mobile money* for the information provided by the farmers, detracting a small amount to pay the smartphone, so that the farmer will own the phone within 2 years. As in many other places in the world, the main challenge to the success of the mentioned project is the electricity required to charge the phone battery. In many cases this energy is expensive and is obtained through a local community electricity service that takes advantage of its exclusivity to raise the price.

In Tanzania, the First Mile Project [IFAD09] has created market chains promoting the communications via mobile phones between small farmers, traders, processors, etc… impacting on some of these groups in a highly beneficial way. This project aimed to demonstrate that people from the poorest rural areas are able to create innovative solutions if they have the adequate telecommunication tools. These tools should be suitable to allow exchanging ideas and experiences between them, and to allow them to create a market access network, minimizing inefficiencies and increasing benefits.

Mobile phone in rural isolated areas goes even further increasing the application and optimization of telecommunications. For example, a mobile phone application called M-PESA (M for mobile and Pesa for the word in Swahili for money) [Cull10] has been developed in Kenia, and has also been extended to other African countries. This application provides the possibility to transfer money between people without using bank accounts. It allows users of the application to transfer money through their cellular phone instead of banks. This is a new way of economic and financial movement that makes more dynamic the trade and increase the access to services along the rural scenario in isolated areas. In the recent years, the application has grown increasing the types of services, offering now also the possibility to pay salaries and bills without a bank account.

In next section some conclusions from these experiences are extrapolated to identify the barriers that should be considered in this project.

2.1.2   Barriers

In order to guide our research perspective, we have studied some preliminary conclusions through the analysis of previous experiences, focussing on the description of its barriers. These preliminary conclusions draw up an approach to the Latin American context in isolated rural areas and the problematic of information and communication technologies (ICT) [Klein07].

On one side, the scarcity or lack of appropriate infrastructures or equipment able to apply new generation technologies is an obstacle, even more considering that land communications are difficult and the transportation roads are few and precarious. On the other side, another barrier that also other initiatives have found when introducing ICT in rural isolated context, is the lack of properly trained or skilled personnel with the appropriate and necessary technical capacities to develop the identification, the installation or the maintenance of new technologies.

Related to the communications problem, the geographical complex location is also an important issue in several places. This is not only a problem related to land and territorial communications, but a problem regarding the construction of appropriated low cost wireless networks. Geographical characteristics make projects more expensive because the necessary technologies and infrastructures are more complex and elaborated. Less important, but worthy to be mentioned, it is the fact that

weather conditions in specific areas might be a risk to the appropriate functioning of some equipment, needing then a higher prevention maintenance than in conventional scenarios.

From an economical point of view, previous cases have identified as a problem the low commercial and economic activity in rural isolated areas. Inhabitants of these areas are particularly focused in farming and handcraft, and have a very low income per capita, probably not enough to afford a high telecommunication cost. Population density is low due to the gradual migration and sometimes to the lack of social organization. As there is a low demand or request of telephone lines, the price per call is very expensive, and for this reason, they usually choose to have one telephone line per group or community.

These characteristics have been defined by other telecommunications development actors as barriers to develop an appropriate, sustainable and economically worthy communication service in isolated rural areas. Additionally, these development actors have found some other secondary difficulties, but not less important, such as the high illiteracy rate, the low employment rate, the increasing aging of population and the demographic reduction due to the emigration of young people to the city centres, and the scarcity of appropriate public services, especially regarding primary education and primary health assistance.

Finally, other difficulty found is related to the lack of a proper and steady energy source. The need of energy indeed affects the supply of telecommunication services, and for this reason, sometimes is necessary to look for a sustainable solution that makes even more expensive the phone connexion service.

2.2 Actors´ perspective

This section presents an analysis of the main actors involved in the business model of a mobile service in rural isolated areas. The objective is to have a general analysis whose conclusions could be applied in different countries or regions. In the sections related with the public sector and the users, specific information from Peru or Colombia has been used in order to perform a more realistic analysis.

2.2.1 Public sector

The analysis of the public sector perspective tries to understand social programs that help to increase the income in rural areas, and some public actors that could be interested in funding projects like TUCAN3G in order to improve the access to ICT services in these isolated regions.

2.2.1.1 Public sector in Peru

Regarding the development of telecommunications projects in isolated rural locations, the public areas of interest are basically those where the central Government has a presence, in order to fulfil its basic promotion work for equitable socio-economic development of rural population.

In this regard, there are some areas of interest that have been identified. On one hand, there is a permanent presence of the central Government represented by public institutions as health posts (Health Sector), Initial, primary and/or secondary levels schools (Education Sector), Police stations (Home Office) and local governments (municipalities).

On the other hand, there is a presence of the central Government through eventual social programs, designed to meet specific needs of population in situation of poverty or extreme poverty, which also constitute an area of public interest. The following section describes some social programs under the Ministry of Development and Social Inclusion (MIDIS) from Peru.

2.2.1.1.1 CUNA MAS program

The national program Cuna Mas (PNCM) is a social program that is led by the MIDIS, whose objective is to suport children less than 3 years old in areas of poverty and extreme poverty, in order to overcome the gaps in their cognitive, social, physical and emotional development.

The intervention scope of the PNCM is nationwide, and it works in 331 districts from urban and rural areas in poverty and extreme poverty. Its modalities of intervention are services of diurnal care and services of accompaniment to families.

The PNCM implements its services through the Management Committees (CG), organs formed by members of the community for the administration of the Cuna Mas services. On the basis of a model of State-community, the PNCM provides training and technical assistance on issues of health, nutrition, care practices, and children early learning. It also transfers resources to the CG for the provision of services.

2.2.1.1.2 PENSION 65 program

The National Program of Solidarity Assistance, Pension 65, which is led by the MIDIS, was created in order to provide protection to the especially vulnerable social groups, which includes adults from 65 years old who lack the basic livelihood conditions.

The purpose of Pension 65 is to provide a periodic income that attenuates the social vulnerability of adults over age 65 living in condition of extreme poverty, with the aim of improving their quality of life.

The extremely poor seniors were marginal for society, invisibles for the State. Pension 65 emerges as a State's response to the need to provide protection to a particularly vulnerable sector of the population, and gives them a financial subsidy of 125 Soles per month per person and this benefit helps them to be confident that their basic needs will be met, which empowers them within their families and communities, and also helps to boost local and small markets.

2.2.1.1.3 JUNTOS Program

The National Program of Direct Support to the Poorest – JUNTOS, is a conditional cash transfer program of the Government of Peru that is part of the social policy to against poverty, under the supervision of the MIDIS.

The JUNTOS Program aims to contribute to poverty reduction and to break the intergenerational transmission of extreme poverty. It also intends to generate human capital in poorest households with the collaboration of the Government. In order to do so, it provides incentives to access and use health, nutrition and education services. It works under an approach of restitution of basic rights, with organized participation and monitoring of social actors from the community.

This incentive is conditioned to the fulfilment of commitments, promoting this way the principle of co-responsibility. Target households are those ones on a situation of extreme poverty, with children under age 19 and pregnant women. In that meaning, JUNTOS takes on the complex role of delivering directly to the poorest households, monetary incentives conditioned to the fulfillment of commitments that assume mothers as representatives of the households. The commitment is to bring their little children to the Health establishments and schools of the areas where they live. This mission involves

JUNTOS on promoting and boosting the supply of social services, trying to restore the fundamental rights of a person.

2.2.1.1.4   FONCODES Program

The Cooperation Fund for Social Development (FONCODES) is a MIDIS's national program working to generate an increase of economic opportunities for rural extremely poor households. In order to do so, it facilitates the articulation between private demand-side and supply of goods and services required to strengthen the enterprises of these households, and contributes to the reduction of exclusion processes that determine these households cannot operate in these markets.

The capacity building strategy for generating autonomous incomes takes into account the following:

- Capacity building for strengthening family production systems and management of enterprises, and to facilitate learning, ownership and technology innovation as vehicles for opportunity generation.
- Household access to productive economic infrastructure services in order to improve their productivity and enable their insertion process.
- Improvement of management capabilities of local governments, participation and consultation from citizens, which are aimed to promote sustainable alternatives, to generate economic opportunities for rural poorest households and to improve public investment in infrastructure in order to support and enhance rural household enterprises.

2.2.1.1.5   QALI WARMA Program

Qali Warma is a Quechua Word that means "vigorous boy". As its name implies, the National School Nutrition Program Qali Warma, aims to provide quality food service to children in the initial level (from 3 years old) and primary public education institutions along the country.

Qali Warma is a MIDIS's program that provides food service as educational support to children enrolled in public educational institutions, preschool and primary level. This program aims to improve the attention during the class time, school attendance and feeding habits, promoting the participation and responsibility of the local community.

Qali Warma is an efficient, effective and articulated National School Nutrition Program, which promotes human development through quality food service, co-managed by the local community, with the following objectives:

- Ensure food service every day during the school year for program beneficiaries, according to their characteristics and the areas where they live.
- Contribute to improve users' attention during the class program, encouraging their attendance and persistence.
- Promote better feeding habits among the program beneficiaries.

According to the public policy of Peru, particularly interesting localities for the Government to invest in are those reflected in the poverty maps that are elaborated by different Government institutions as FONCODES, INEI (National Institute of Statistics and Information Technology), MEF (Ministry of Economy and Finance), among others.

The Ministry of Women and Vulnerable Populations (MIMP) has as a target population: girls, children, adolescents, older persons, people with disabilities, and displaced and internal migrants in

vulnerable situations. Inside its National Plan of Action for Children and Adolescents, the MIMP has the specific initiative to communicate rural localities in the upper Napo River (Department of Loreto).

2.2.1.1.6   Public investments funds

Public investment funds are aimed to support the phase of investment on telecommunication projects in isolated rural locations, which also may include the costs of operation and maintenance.

The operation and maintenance costs that could be funded are those that are essential for the implementation of telecommunications projects and only during the investment phase, such as Internet access service. Operation and maintenance of the implemented telecommunications networks are assumed by the operator responsible of the project, which is selected through a public selection process.

The requirements, criteria and mechanisms of public selection process to choose the operator in charge of the project are stipulated in the National Procurement Law, which defines the type of selection process to be followed, depending on the acquisition (good or service) and the reference value.

The public funds can be used exclusively by public investment projects (PIP), whose formulation has accomplished the requirements of the Public Investment National System (SNIP) and has the proper viability in the competent body.

The PIPs are time-limited interventions in order to create, expand, improve or restore the productive capacity or provision of goods or services of one entity.

The SNIP is an administrative national system through a set of principles, methods, procedures and technical standards that certify the quality of the PIP. Its purpose is to guarantee:

- Efficiency, for the use of investment resources.
- Sustainability, for the quality improvement or expansion of public services provided by the projects.
- Higher socio-economic impact, i.e. greater welfare for the population.

The SNIP established that all PIP must follow the project cycle which comprises the steps of Pre-investment, Investment and Aftercare. There are different actors in the SNIP and all them are responsible for performing particular functions along with the preparation, appraisal, prioritization, implementation and ex-post evaluation of a project. The SNIP is formed by:

- Resolving body or the highest executive authority of the unit (Mayors, Presidents of Regional Governments, Ministries, etc.).
- Formulation Units (UF) or bodies responsible of the formulation of pre-investment studies.
- Programming and Investment Offices (OPI), responsible for the evaluation and viability statement of the PIP.
- Executive Units (UE), responsible for the execution, operation, maintenance and ex-post evaluation of PIP in different public entities at all levels of the Government.
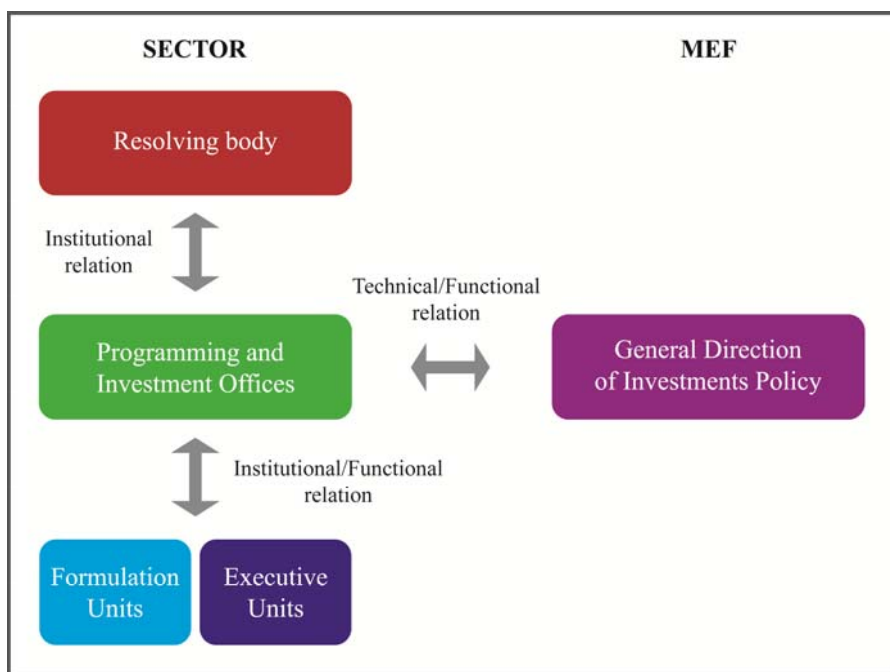
Figure 3. Investments cycle

As part of the policy of the National Modernization and Decentralization, the SNIP has been decentralized and now Regional Governments and Local Governments can declare viable the projects within their competency. Only debtor projects, or those requiring endorsement or guarantee from the Government are evaluated by the MEF, considering its implications on macroeconomic and fiscal discipline.

The Telecommunications Investment Fund (FITEL) is a public fund for the provision of universal access to telecommunications services, understood as a nationwide service to provide essential telecommunications access, capable of transmitting voice and data. Telecommunications projects funded by FITEL must have been formulated according to the SNIP.

The scope of intervention of FITEL includes rural areas and priority places of social interest, which do not have any essential public telecommunications service, considering the following definitions:

a) Rural Areas. Those populated areas that meet one of the following conditions:

- Do not belong to the urban areas according to the National Institute of Statistics and Informatics (INEI).
- District capitals and populated areas of 3,000 inhabitants or less, according to the latest population census of the INEI or to the current official projection, if this is more recent.
- With a tele-density less than two lines of telephone service per 100 inhabitants.
- Capital of province or district that does not have any basic public telecommunications service.
- The group of target rural areas cannot have more than a 10% of the total fixed lines installed in the country.

b) Places of Priority and Social Interest. Those considered in that way by the Ministry of Transport and Communications (MTC), according to the effective criteria on this subject. The funds received by FITEL come from:

- The 1% per cent of the income perceived by the provision of telecommunications services, including the income from correspondents and / or international traffic settlement; net of interconnection charges, General Sales Tax and Municipal Promotion Tax.
- A percentage of the collected fee by the MTC for the use of radio spectrum for public telecommunications services, which is never less than the 20% of the proceeds for this item. This percentage will be decided before March 31st of every year, by a Ministerial Resolution.
- The resources transferred by the Public Treasury.
- Financial income generated by FITEL.
- Contributions, allowances, donations or transfers through any deed, from natural or legal persons, national or foreign.
- Other established by Presidential Decree.

An important actor is the Supervising Organization for Private Investments on Telecommunications (OSIPTEL), which is the responsible of regulating, monitoring, supervising and penalizing the intervention of the telecommunications operators. It is important to mention that OSIPTEL does not fund projects.

The National Plan for Broadband Development in Peru, issued in May 2011, considers the following goal in 2016 related to the implementation of rural connectivity: "100% of the districts of Peru have broadband coverage connected at least to the larger municipalities, the schools and the public health facilities of the district, at a minimum speed of 2 Mbps".

The achievement of this goal is based on the successful factors reflected by the strong macroeconomic indexes of the country:

- PIB growth between 2003 and 2010 and favourable expectations.
- Stability of inflation, as one of the lowest in the region.
- Steady decrease of the "country risk".
- Recognition of the main rating agencies about "investment scale" in the Peru.
- Steady growth of the overall and selective indexes of Lima Stock Market.
- Recovery of the commercial balance surplus.
- Steady increase of public investments and of the provision of favourable conditions for private investment and infrastructure development.

2.2.1.2 *Public sector in Colombia*

In Colombia, three main programs aimed to spread ICT services in rural areas of the country have been identified. These programs are described in this section.

2.2.1.2.1   Compartel program

The national government, through the Ministry of Information Technology and Communications in conjunction with the Financial Fund for Development Projects (FONADE), has been developing, since 1999, the Telecommunications COMPARTEL Social Program. This program is primarily aimed to expand the coverage of telecommunication services in low income areas (rural or urban) throughout the country, to ensure access to telephone and Internet service for low-income Colombians and disseminate and expand the use of information technology throughout the country. To meet this objective, the program advances the structuring of projects through which telecom operators are contracted with state support and resources in the form of Contribution Agreements. This commit operators to provide telephony and Internet services under criteria of quality and service levels. The main action is the Compartel Program, promoting universal access in rural areas, while encourage

competition in the sector and link new capital in the provision of Internet telephony and social. The main program inside Compartel and its characteristics are:

- Rural Community Telephony: There was two phases, in the first one 6,745 locations in all municipalities and departments were connected through 37 community telecommunications solutions. Responsibility for the implementation of this phase was awarded to the operator Gilat Colombia SA ESP. On the second one, during 2002, phone coverage was offered in 3,000 locations such as townships, police posts, hamlets and villages of over 150 people, who did not have this service. The operator responsible for the execution of this phase is Gilat Satellite Networks Colombia SA ESP.

- Social Internet: The objective was to provide Internet in rural areas. The first phase started in March 2000 with Gilat Colombia SA ESP, operator of the first phase of the Community Rural Telephony Compartel, and it aimed to establish 670 telecentres in the smallest municipalities (population of less than 8,000 inhabitants). These telecenters have 2 computers with Internet access and a telephone. The second phase was directed towards the establishment 270 telecentres in the largest municipalities (population over 10,000). The third phase, again with Gilat Networks Colombia SA ESP in November 2002, was aimed to establishing 500 Telecentres in municipalities and towns of over 1,700 inhabitants.

Unfortunately, in spite of the official information, the real experience from the rural communities was not pleasant. Several reports from mass media [Semana03], control institutions [ControlCol10], educational programs and projects, indicate several problems and mistakes, like for example:

- Lack of real planning, designing installations in places without considering energy, security or environmental aspects.
- Low training to the local personal.
- Nonexistence of real appropriation processes.
- Low quality service.
- Low capacities installed.
- Insistence on satellite connections when in many places Compartel facilities operated with alternatives from other vendors.
- High costs.

2.2.1.2.2 Live Digital

Live Digital (Vive Digital in Spanish), is the technology plan for the national government during 2010-2014, which aims to give the country a technological leap by extending the use of Internet and the development of the national digital ecosystem. The new ecosystem has 4 basic axes: infrastructure, services, applications and users.

The general objectives of the plan are:
- Reach 50% of Households and MSME1 connected to the Internet.
- Multiply by 4 the number of Internet connections.
- Triplicate the number of Municipalities connected to the information Highway through Optical Fiber Networks.

About infrastructure the strategic objectives are:
- Have adequate international connectivity to support the Internet traffic, multiplying the current capacity by 20.
- Build a national fiber optic network to reach at least 700 municipalities, in which 90% of the Colombian population is located.

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- Ensure that 100% of the urban municipalities have wireless Internet access, with 3G service and at least 50% with the latest generation service (4G).
- To achieve that all rural towns with more than 100 people have access to a public Internet place.
- Define a new model for Compartel program.

About services the strategic objectives are:
- Double the penetration of Internet access terminals.
- Define a converged regulatory regimen that allows the promotion of new services, the efficient use of the infrastructure and the access to the ICT by the population.
- Strengthen the broadcast television services by providing access to the public digital terrestrial television signal for at least 75% of the Colombians
- Reduce import taxes on Internet terminals.

About Applications the strategic objectives are:
- Achieving greater efficiency, transparency and citizen participation, by making that 100% of entities of national order and 50% of the local entities provide government services online.
- Develop applications for the MSMEs so that 50% use Internet.
- Triple revenues for the creative digital industries, generating a positive impact on employment and on the country's exports
- Create mechanisms of public and private financial leverage for the Colombian companies that develop applications and content.

About users the strategic objectives are:
- Create a new operating model through the community access centers, to provide connectivity, training, entertainment and service to the people from the lower social strata.
- Certify at least 45% of the public officials in the use of the ICT.
- Decrease in 40% the RCCs to increase the user's satisfaction level of the ICT services, through the issuance of a convergent regime.

2.2.1.2.3   Digital Dividend

By Resolution 668 of December 12, 2012, the ANE (National Agency for the Spectrum management) designates the 700MHz band, also known as Digital Dividend (Dividendo Digital in Spanish), for the exclusive use of mobile telecommunications services 4G. It considers that this portion of spectrum can be useful to provide Internet coverage to remote rural areas of the country, as well as to facilitate the deployment of networks and efficient telecommunications services at low cost. This situation is potentially positive for countries like Colombia that have large areas with low population density. A study for GSMA indicates that in Colombia, Internet access could be increased from 55% to 90% if 700Hmz band were used. At May of 2012 this call for bids is in process.

2.2.2   Business users

Companies and public institutions keep growing in the rural areas of Peru, due to the sustained economic growth observed in these areas all over the country and to the development of infrastructure that reduces cost and improves productivity. The users require ICT (voice and data) services, to support their operations.

Business clients can be classified as follow:

- Government: all governmental institutions offering services to rural communities, mainly:
    - Health: health centers, nursery.

- Police Station: National Police Station of Peru.
- Education: Public school (primary, secondary and university).
- Regional or local Government.
- Other: National Bank, development and inclusive projects, etc.

- Natural Resources: companies that use natural resources; this group is demanding the most currently due to the growth of their investment in rural areas, for resources such as:
  - Strip mining.
  - Hydrocarbons, mainly oil and gas.
  - Timber industry.
  - Agriculture, Animal rearing.
  - Other.

- Services and Commerce:
  - Wholesale and retail trade.
  - Transportation and distribution services.
  - Accommodation, restaurant and tourism services.
  - Other.

- Education, High Schools and Universities.

- Bank and Finance.

- ICT.

- Utilities.

- Manufacture.

According to their size, Companies in Peru are classified in large, medium-sized, small and micro companies. Large companies are considered those that turn over 25 million dollars. According to a study published in 2012, in Peru there are already 1,270 large companies, and by 2013, the number will increase to 1,500. Medium-sized companies are those that turn over 2.5 million dollars but less than 25 million dollars. According to the same study, at the end of 2012 in Peru there were 8730 medium-sized companies. Small companies are those that turn over 250 thousand but less than 2.5 million dollars. In Peru, at the end of 2012 small companies were about 65000. Micro sized companies turn less than 250 thousand dollars, but they are the 95% of all Peruvian formal companies. At the end of 2012 Peru has registered about 1.3 million of micro size companies. However, there is a total of 3.5 million of micro sized companies considered formal and informal enterprises. Micro and small sized companies (MYPES) in Peru mean the 45% of the Gross Domestic Product (GDP), and their growth during the past three years has been very important for the dynamism of the Peruvian economy.

Regarding the use of telecommunication services in rural areas, business users keep requesting better and faster telecommunication services as they keep growing and developing inside the country. The main requested services in rural areas are mobile telephony, Internet and access to private data networks.

The **mobile telephony services** used by large and medium-sized companies, are mostly hired as a post-paid service with a fixed fee, bought by bundles (usually more than 10 cell phones), and with discounts off the price, depending on the volume of minutes and on the duration of the contract. This service is used in areas where mobile coverage is available. In the rural areas of Peru, mobile coverage has grown very fast. Nevertheless, **only the 55% of the Peruvian rural population live in towns with cellular telephony coverage**, due to the great dispersion of rural population in Peru (65,000 communities of less than 200 people), to the geographical barriers to develop infrastructure, and to the

high poverty level in these areas. The mobile technology coverage developed in rural areas is mostly supported by GSM networks, which does not provide mobile broadband service. The mobile coverage expansion is basically supported by telecommunications operators in rural areas due to their commitment with the Government in order to obtain licenses or contracts, and by projects funded by the Government through the FITEL Fund or by local government funds. Exceptionally, large companies have granted some ICT operators´ mobile coverage projects in some areas due to their interest in those areas, such as mining or oil extraction camps. Due to the long distance between these rural communities and the operators transport networks, the interconnection between cellular base stations, which provide mobile service to the operator network, is mainly done by satellite or, very few times, by microwave transmission.

Internet and data services used in rural areas are mostly based on satellite transmission, and they are provided by national and international operators. The main suppliers of these services are *Telefónica del Peru*, the Israeli operator *Gilat to Home* and Claro of the business group *America Movil*. According to a study developed by the IDC (International Data Corporation) in 2012, the satellite service market in Peru reached an approximate number of 5500 satellite connections installed, with more than a 50% set up as dedicated services. These satellite services reached a market value of 48 million dollar, of which the 74% was provided by these dedicated services.

The satellite services commercialized in Peru for the business sector are:

- VSAT Internet is an Internet access based on VSAT transmission technology on Ku satellite band. It offers a speed up to 1Mbps, a 15% of guarantee and traffic priority on demand. The cost of 1Mbps is between 800 and 1200 US dollars per month, depending on the duration of the contract.
- VSAT IP-VPN is a service that provides the interconnection of several headquarters in different geographic emplacements through an IP-VPN private network based on VSAT access on Satellite Band KU. It offers a speed up to 1 Mbps and a 30% guarantee. The cost in Peru is between 4.5 and 6 thousand dollars per month, depending on the duration of the contract.
- The Clear Channel National Service allows the interconnection of headquarters in different geographic localities through a dedicated circuit, with a dedicated and symmetrical SCPC satellite access on Band C with a speed up to 2.5 Mbps.

According to a research developed by the IDC in Peru in 2012, the next figure shows the market value of the satellite services by sector. Figure 4 shows that near the 50% of the market value of satellite services is concentrated on resources and services sectors.
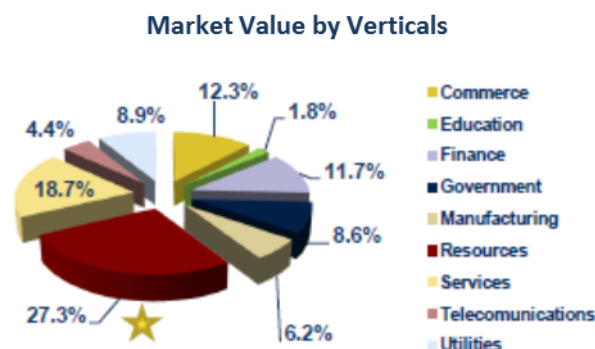

Figure 4. Market value distribution of satellite services by different business sectors.

If we consider this by the size of the companies, the distribution of satellite services market results as in Figure 5.
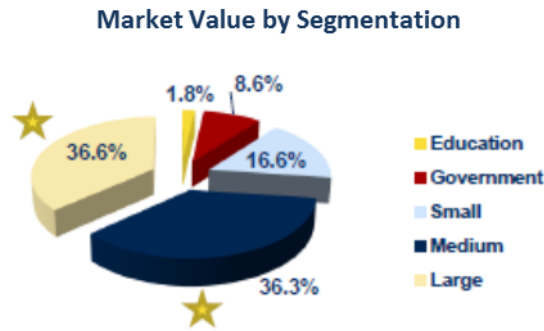
Figure 5. Distribution of the market value of satellite services by sectors and company size.

Large and medium-sized companies sectors concentrate more than the 70% of the market share. If we observe the distribution of the access speed as shown in Figure 6, we can see that satellite connections are more concentrated in the speed range 512Kbps to 1Mbps.
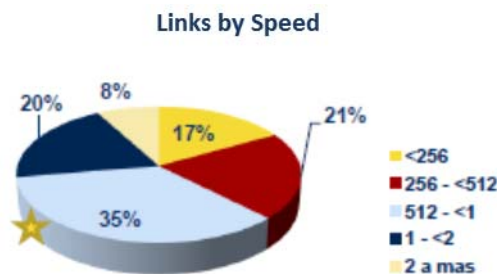

Figure 6. Distribution of the market value of satellite services by speed range.

2.2.2.1 *Potential growth in rural areas*

According to the IDC study, the satellite service market will grow on a CAGR (Compounded Annual Growth Rate) of 9.8% until 2016 regarding to the number of connections and the 7.8% in terms of market value. The estimations done by Telefonica are a bit more optimistic because they consider an approximate annual growth of 15%, since 2013 to 2016.

The trends observed in Peru are clearly favourable to the expansion of this market for the final enduser who demands better services, for the government and its technological strategies, for the technology itself and satellite capacity of the region, boost by the enterprise connectivity and the typology of its operations:

- Trend is towards convergence to use only IP networks combining voice, data and internet services.

- Necessity to ensure the business continuation and backup.

- Growing and sustainable economy, and a greater acquisition power in rural areas of the country can generate the variety of products offered by the companies requiring satellite services to support the new operations.

- Mining and utilities' companies invest on the exploration and exploitation projects, thus this accelerates the need for satellite services.

- Customers demand a better attention to their satellite requirements with SLA, better support and higher speed.

- The current regulation increases the fee/tax to local and regional governments, allowing then larger budgets to improve the services offered to communities in areas where there are not landline networks.

2.2.3 Private users

In this section we describe the private users, focusing on the Peruvian rural communities; in order to achieve this, we also include some official data of Peru regarding to socio-economic indicators and information obtained from rural services of TdP.

Peru is politically and administratively divided into departments or regions, which are also divided into provinces, and at the same time these ones into districts; now a days Peru has 24 departments or regions, 195 provinces and 1831 districts. According to the last official population census conducted by the INEI (National Institute of Statistics and Information Technology) of Peru in 2007, there were 98 thousand towns with more than 28.2 million people. Currently the total Peruvian population is approximately more than 30 million people. Towns, according to the census criteria, are those locations or sites of the national territory, identified by a name, where people, usually gathered by family, live with character of permanence. Households could be one beside another, becoming blocks, with squares defined by streets, such as in the cities; but households could also be spread or gathered in small adjacent groups, as in the case of hamlets, villages, etc.; and households could be also spread as cattle farms and ranches in rural areas.

According to this census, **the 24.1% of Peru population live in areas that are classified as rural**. The criteria consider urban centres as those that have at least 100 dwellings grouped adjacently; as an exception, all district capitals are considered as urban areas, even if they do not meet these requirements. In the same criteria, rural areas are those that have less than 100 dwellings grouped adjacently, or those that even having more than 100 homes, these ones are too spread.
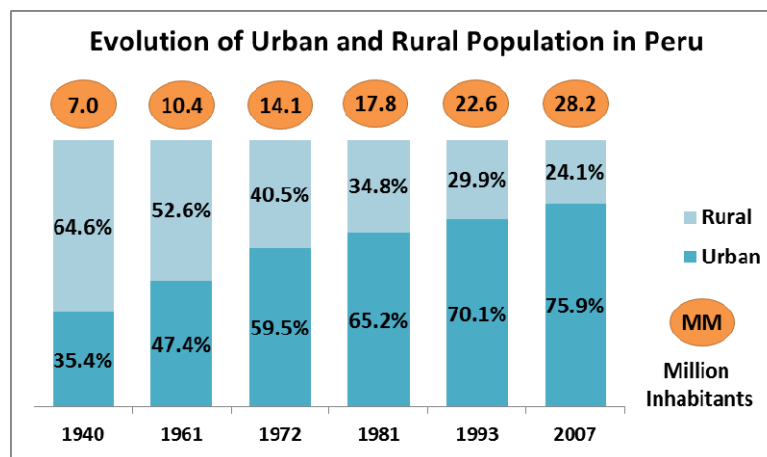

Figure 7. Population evolution in Peru according to the resident area

According to the Figure 7, during the last 50 years, Peruvian population has been growing and gradually concentrating in urban centres; however, still a quarter of the total population live in rural communities that are spread along the territory, mostly in the mountain chain. Peruvian territory is traditionally divided into three geographical regions: the coast, to the Pacific Ocean; the mountains chain, with the Andean heights, and the forest, which is located at the East, in the leafy jungles of the Peruvian Amazon. The coast is 10.6% of the territory; the mountains chain is the 31.5% and the jungle

is the 57.9%. However, the coast concentrates the 54.6% of the total population, 32% in the mountains and only 13.4% lives in the jungle.

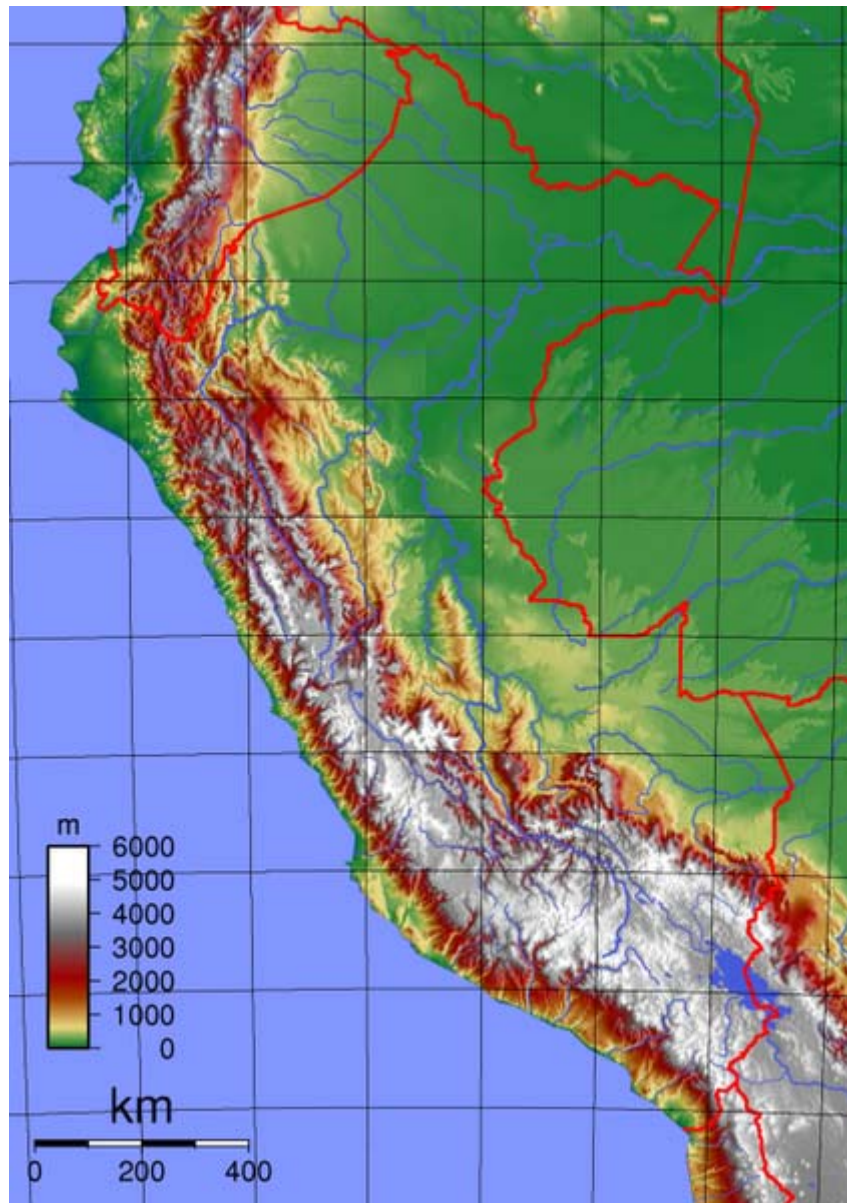**Figure 8. Peruvian map according to the altitude**

Figure 9 shows the dispersion of population according to the number of people by the type of residence area; as you can see, and according to the census in 2007 in Peru, nearly 80, out of 98, thousand areas have less than 151 inhabitants, of which almost 61 thousand (around the 80%) are located in the mountains, 12 thousand in the jungle and 8 thousand in the coast.

Figure 9. Population dispersal

The high population dispersal in Peru, which means a high number of towns with few people, is one of the main challenges that the Government and the private companies need to overcome by bringing cost-effective infrastructures and services to this population. This obstacle is even worse due to the distance between towns which makes more difficult the concentration of services and infrastructures. This is shown very clear in Figure **10**, showing the geographical density by inhabitants per square kilometre, being the coast, on the West side of the country, the one with higher-density, particularly on Lima, meanwhile the mountains have a lower density, and in the jungle there is just the lowest population density in the country, even rating one inhabitant per square kilometre.
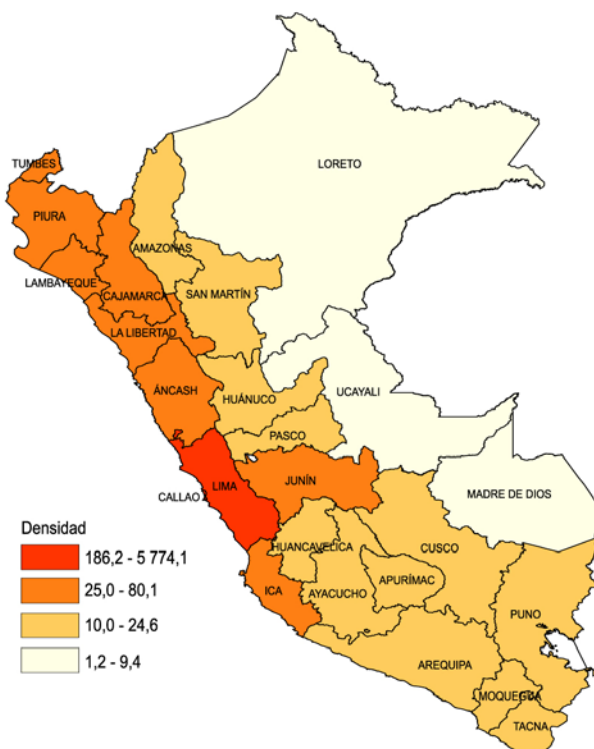

Figure 10. Geographical density per department

During the past years, the Peruvian Government, along with private enterprises, have made an important effort in order to bring infrastructure and services to rural areas. However, there still is a significant deficit that is related to the poverty levels in these areas. According to the Poverty Evolution Report 2007-2011 developed by INEI in 2012, national population poverty has decreased from a 42.4% in 2007 to a 27.8% in 2011, as shown by Table 2. In the same figure, we can see the poverty evolution by geographical area (urban, rural), natural region (coast, mountains and jungle) and geographical domain (urban jungle, rural jungle, urban mountain, rural mountain, urban coast, rural coast and Lima city).

In this chart it is observed that poverty is different and changes depending on the geographical area; Thus poverty in urban areas has reduced from a 30.1% to 18% between 2007 and 2011, while during the same period, poverty in rural areas has decreased from 74% to 56.1%. Considering poverty evolution by regions, the main remarkable thing is that poverty reaches the highest level in the mountains, affecting nearly a 41.5% of the population, followed by the jungle with a 35.2% rate of poverty and finally the coast with a 17.8% of poverty. Another notable aspect to observe is that the jungle is the region that registered the highest poverty alleviation during the period 2007-2011, with a 20.6% reduction. Finally if we analyse poverty evolution according to the geographical domains, we can observe that the rural mountains, with the highest poverty percentage of 62.3%, and rural jungle, are the geographical domains with the highest poverty alleviation between 2007 and 2011, being a 22.2% reduction.

PERU: EVOLUTION OF THE INCIDENCE OF TOTAL POVERTY, ACCORDING TO GEOGRAPHICAL AREAS (2007 - 2011)
(Percentage over the total population)

Geographical Scope	Years					Variation (Percentage)	
	2007	2008	2009	2010	2011	2011-2010	2011-2007
Total	**42.4**	**37.3**	**33.5**	**30.8**	**27.8**	**-3.0**	**-14.6**
Residential Area							
Urban	30.1	25.4	21.3	20.0	18.0	-2.0	-12.1
Rural	74.0	68.8	66.7	61.0	56.1	-4.9	-17.9
Natural Region							
Coast	29.3	25.3	20.7	19.8	17.8	-2.0	-11.5
Sierra	58.1	53.0	48.9	45.2	41.5	-3.7	-16.6
Jungle	55.8	46.4	47.1	39.8	35.2	-4.6	-20.6
Geographical Domain							
Urban Coast	31.7	27.4	23.7	23.0	18.2	-4.8	-13.5
Rural Coast	53.8	46.6	46.5	38.3	37.1	-1.2	-16.7
Urban Sierra	31.8	26.7	23.2	21.0	18.7	-2.3	-13.1
Rural Sierra	79.2	74.9	71.0	66.7	62.3	-4.4	-16.9
Urban Jungle	44.0	32.7	32.7	27.2	26.0	-1.2	-18.0
Rural Jungle	69.2	62.5	64.4	55.5	47.0	-8.5	-22.2
Lima City	25.1	21.7	16.1	15.8	15.6	-0.2	-9.5

Source: INEI 2012

**Table 2. Poverty evolution report 2007-2011**

Basic services and family access to infrastructures are still limited in the rural areas due to the scarce of coverage and the population poverty; nevertheless, it is showing a growing trend, as reflected in Figure 11, where it is appreciated the type of lighting source used in Peru by poverty level and residence area.
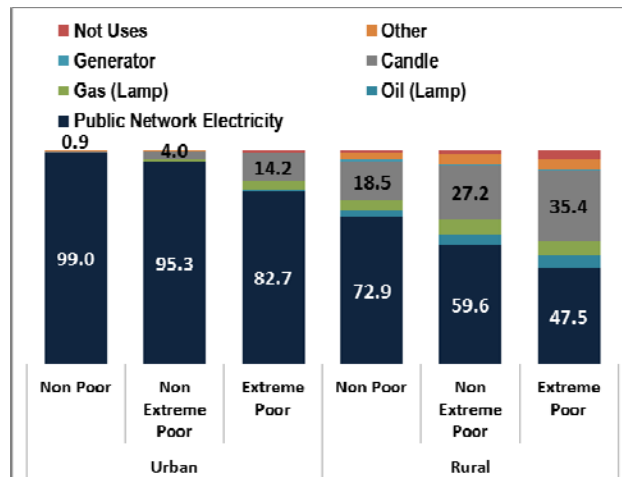
Source: Direction of Rural Electrification, MINEM 2012

Figure 11. Type of lighting source used in households by poverty level and emplacement
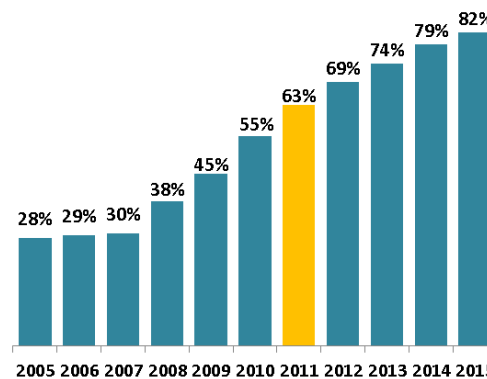
Source: Direction of Rural Electrification, MINEM 2012

Figure 12. Evolution of the rural electrification rate

Figure 12 shows that **in rural areas the electricity public service has improved significantly, covering more than the 60% of households**, which made possible the use of electrical and electronic devices, such as television, computers and eventually the possibility of hiring ICT services.

Regarding to the water supply and to the sewage in rural areas, which is an important development and welfare indicator, there is still a huge gap to overcome. About the access to drinking water through public services, more than the 30% of rural households have drinking water, while their access to sewage drain is less than 10%.
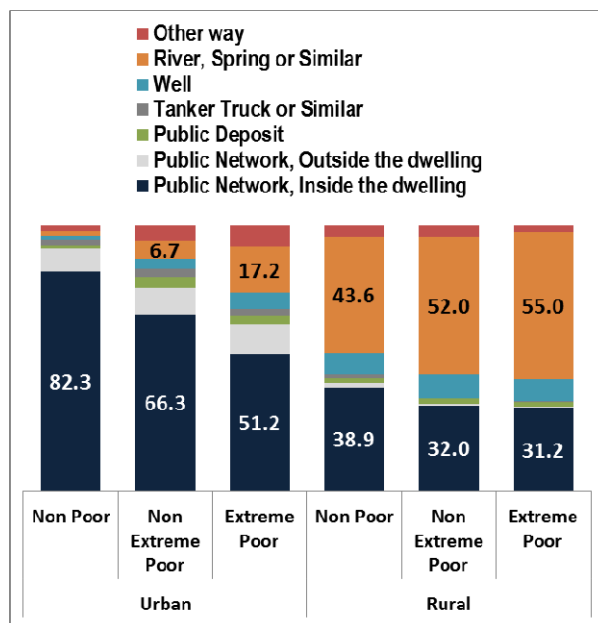
Figure 13. Drinking water supplies for human consumption according to the poverty level and area
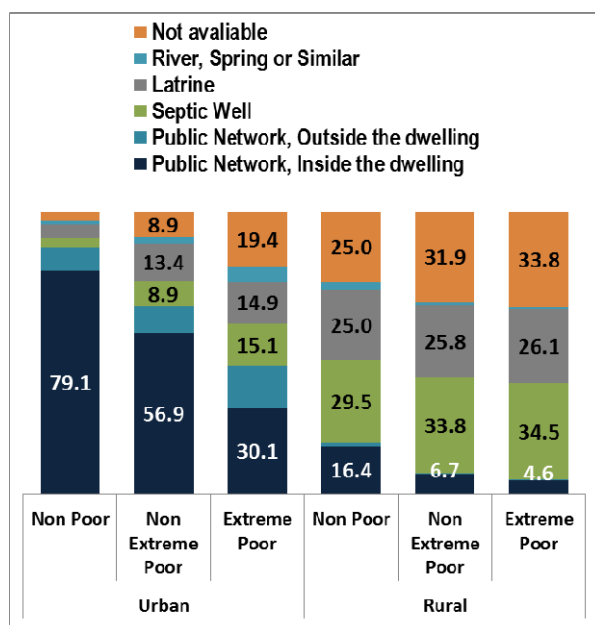
Figure 14. Types of sewage according to the poverty level and area

The average monthly expense per capita in Peru is S /. 548.9 soles (210 USD), according to a study developed by INEI in 2012, whose result is shown in Figure 15. However, this data has a possible variation depending on the residence area. It can be appreciated that the minimum value of the average monthly expenses in the rural mountains is S /. 273 (105 USD), while in Lima city the average is S /. 702 (about 270 USD). Withal, if we divide this average of expenses on tenths of the total, there is also see a big variation. As an example, in the case of the rural jungle, the average of monthly expenses is S /. 287.8 (about 111 USD), while at the first tenth of lower expenses, the population has an average expenses per capita of S /. 93.1 (about $35 USD), and at the tenth of highest expenses, the population has monthly expenses per capita of S /. 702.9 (about $270 USD), which is surprisingly close to the average in Lima city. From an economic point of view, **it could be drawn**

that this group of population in the rural jungle could consume similar services to the ones consumed in the metropolitan Lima.

| Geographic Scope	2007	2008	2009	2010	2011
National	483.3	496.6	515.6	532.1	548.9
Urban	581.9	592.3	614.2	626.9	639.6
Rural	229.8	243.7	247.0	266.1	287.8
Geographic Scope					
Lima City	644.8	646.2	701.0	694.3	702.3
Other Urban	536.0	553.2	551.8	578.3	594.9
Rural	229.8	243.7	247.0	266.1	287.8
Natural Region					
Coast	597.0	599.0	639.3	636.1	651.2
Sierra	356.8	381.0	391.0	413.0	428.0
Jungle	342.1	371.6	363.4	401.9	428.2
Domain					
Urban Coast	571.2	570.0	567.3	589.8	613.8
Rural Coast	313.3	331.9	324.0	349.6	373.2
Urban Sierra	534.1	564.7	568.2	590.7	597.4
Rural Sierra	214.3	228.6	239.0	255.2	273.1
Urban Jungle	439.3	481.8	473.0	219.6	537.4
Rural Jungle	231.9	241.9	231.0	255.6	287.8
Lima City	611.8	646.2	701.0	694.3	702.3
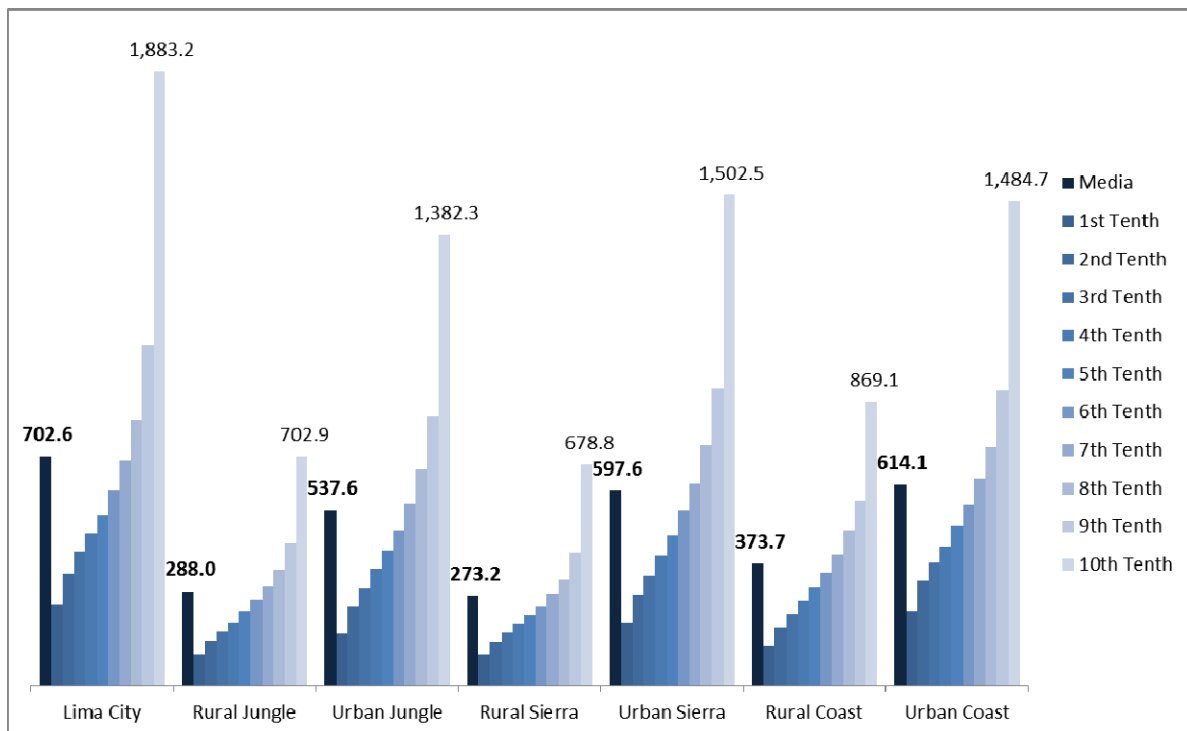
Figure 15. Monthly expense per capita by geographical area and by tenths

These great variations in the monthly expense averages by areas, and even inside the same area, is an indicator of the remarkable inequity and inequality that still exist in the Peruvian economy.

2.2.3.1 *Potential growth in rural areas*

There are two factors that lead us to conclude that the potential growth of ICT services in rural areas is high: the projection of economic growth and the low penetration of services currently.

The economic growth of the country in general and the rural area in particular can be clearly observed in Table 2, Figure 11, Figure 12 and Figure 15. This growth is aligned to a national plan that consolidates the CEPLAN, National Centre for Strategic Planning. The following goals have been established in the bicentennial Plan prepared by CEPLAN, seeking to set goals for the 200th anniversary of the independence of Peru in 2021:

- Poverty reduction to a 10% of the population.
- Extreme poverty reduction to a 5% of the population.
- Electricity coverage: 95%.
- Drinking water coverage: 85%.
- Sewage coverage: 79%.
- Per capita GDP: USD 10,000.

Population coming out of extreme and not extreme poverty will keep requiring access to ICT services in rural areas where there´s a still low penetration of ICT. It depends on the Government and the ICT operators to develop projects that expand the ICT services coverage in rural areas, where today there is no access to these services yet, to follow up this potential growth and to promote it, due to the relevance and influence of ICT in human and economic development.
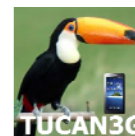
2.2.4 **Operators**

The telecommunications services supply to rural areas has traditionally been difficult for the operators due to their low profitability or negative return. This situation is accentuated in Peru because of the population dispersion, poverty and the particular geography of the country, regions with abrupt variations of its surface in the Andean mountain chain and a clogged forest region in the jungle. In this context, the role of the Peruvian Government through the FITEL has been important, providing support to development projects of public telephony services, fixed telephony, mobile telephony and Internet. However **the growing improvement of infrastructure and economy of the inhabitants of rural area in the recent years is generating higher levels of demand for ICT services** and is also increasing the interest of operators on finding alternatives that allow meeting this demand with a cost-effective and sustainable manner.

Below, the presence and participation of rural telecommunications operators all over the country is analysed, with a particular emphasis on rural areas, regarding the following services: public telephony, Internet, data and mobile telephony.

2.2.4.1 *Public Telephony*

This service commonly called TUP (Public Use Telephony) allows people to access to telephone service through an available phone to the public. The phone is managed by a dealer and installed in a public access site. The payment for this service is done with coins that are inserted on the phone purse or with prepaid cards that the user should buy.

There are 3 operators that provide TUP service in rural areas: Telefonica del Peru (TdP), Gilat to Home (GTH) and Rural Telecom (RT). The TUP introduction started in the mid-90s. However, from 2011 the system is decreasing due to the expansion of mobile networks coverage and the preference for mobile services in these rural areas. In Table 3 we can see the composition of market share of TUP

market, showing how the greater market share was in TdP hands, owning the 58% of the TUP system. The user accesses to TdP service with a use cost from S/. 0.20 per minute. Ror GTH service the call payment is done via prepaid cards.

Telefónica del Perú S.A.A	11.516	58%
Gilat to Home S.A	7.298	37%
Rural Telecom S.A.C.	957	5%
Total	19.771	100%

Source: OSIPTEL

Table 3. Rural Public Phones by operators in 2011.

2.2.4.2   *Internet*

In Rural areas, this service is provided mainly by the Government through public booths, due to its high cost, mainly because of the transportation cost which is usually via satellite. For example, in 2009 Telefonica del Peru installed Internet in 1,019 locations through the BAS project (Broadband for isolated villages). The licensee of this service costs approximately 50 dollars per month and is provided to the public through Internet public booths where the user pays for the time he uses the service, near S/. 1.00 per hour (less than 0.4 USD). Table 4 shows the operators awarded with Government Funding to develop Internet service projects in rural areas.

OPERATOR	Towns	% Participation
RURAL TELECOM S.A.C.	2.041	44%
TELEVÍAS ANDINAS S.A.C. (*)	1.050	22%
TELEFONICA DEL PERU S.A.A.	1.019	22%
WINNER SYSTEM	249	5%
GILAT TO HOME S.A.	198	4%
AMERICA MOVILES SAC	63	1%
DKR VISION SRL	49	1%
CONSORCIO OPTICAL	6	0%
Total	4.675	100%

Source: FITEL-MTC

Table 4. Locations included in Internet projects funded by the State to 2012

(*) In April 2011, the project awarded for Televías Andinas SAC was invalidated due to the non-payment to the satellite provider.

In business scope, the need for Internet satellite service is increasing because of the growth of many businesses in rural areas and they are willing to pay for a good service. For example TdP provides VSAT Internet service in Band KU (asymmetric 2:1 with 15% guaranteed), monthly cost ranges varies from US $ 475.00 (speed 128 Kbps) to US $1,225.00 (speed 1024 Kbps). According to the IDC study in 2012, the operator GTH from Israel is the company with more VSAT Internet (Figure 16) extension. However TdP leads the market as shown in Figure 17.
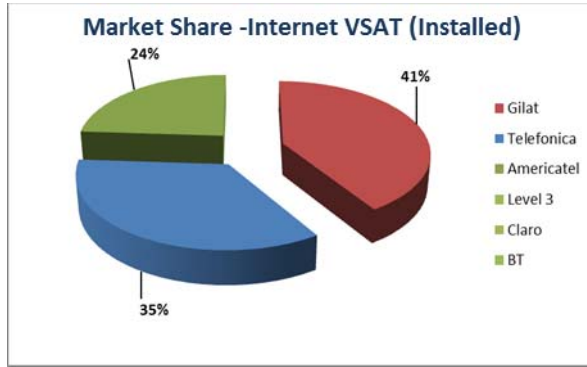
Figure 16. VSAT Internet –Ku Band (2012)
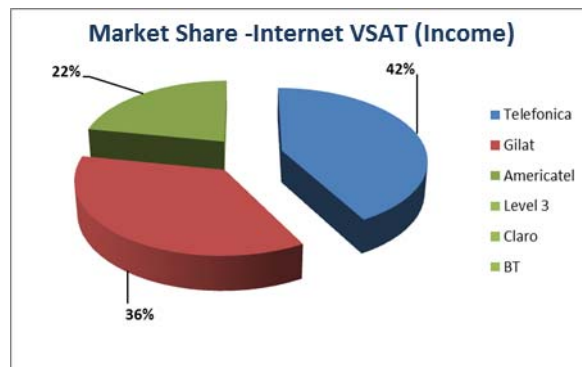
Figure 17. Incoming VSAT Internet –Ku Band (2012)

2.2.4.3 Data service

There is also a significant demand from companies (including the government) for private data services to have connectivity with branch offices in other cities. The main product traded is VSAT IP VPN (in Ku band). TdP leads this market (as shown by Figure 18 and Figure 19) providing VSAT IP VPN (MPLS extension) symmetrical 1:1 30% guaranteed, which have a monthly fee from US $1,000 (speed 128 Kbps) to US $6.500 (speed 1024 Kbps).
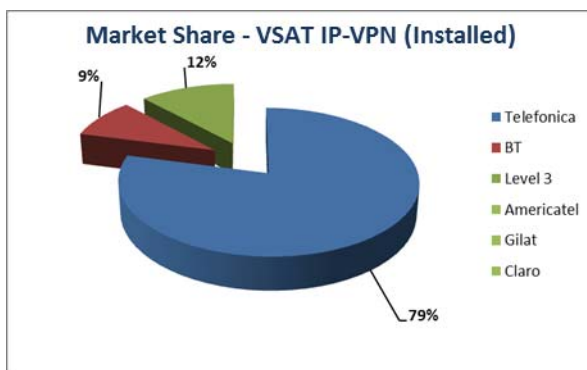
Figure 18. VSAT IP VPN installed (2012)
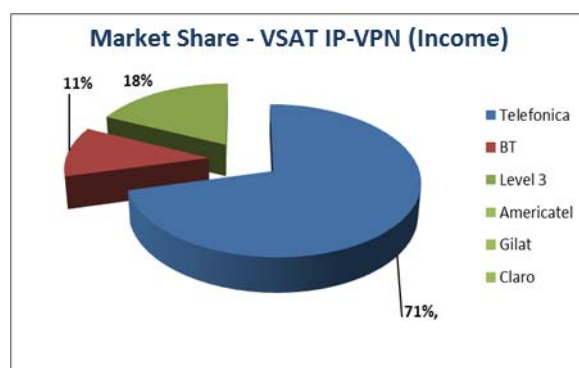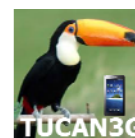
Source: IDC
Figure 19. Revenue-VSAT IP VPN (2012)

2.2.4.4 Mobile

Currently there are 3 operators in the Peruvian market of mobile services: Telefonica Móviles S.A.C. (Movistar), America Movil (Claro) and Nextel of Peru; being the largest Movistar and Claro, as shown in Table 5 you can see 3 end user modes of contract that exist in the market, where prepaid service is preferred by 81% of customers:

- Prepaid: Mobile lines where clients buy minutes or prepaid cards. There is no invoice emitted.
- Post-paid: Include a monthly fixed fee for a package of minutes. Extra minutes can be billed or through prepaid cards.
- Controlled lines: Include a fixed monthly fee for a package of minutes. And additional minutes only with prepaid cards.

Mobile Telephony	20,298,965	60.2%
Nextel	1,286,070	3.8%
America Movil	12,106,338	35.9%
Total in Peru	**33,691,373**	100.0%

Source: OSIPTEL

Table 5. Mobile lines by operator (2012)

Payment mode	Movistar	Claro	Nextel	Total
Prepaid	84%	80%	48%	81%
Post-paid	10%	20%	8%	13%
Controlled	6%	0%	44%	5%

Source: OSIPTEL

Table 6. Clients by user mode of contract (2012)

In Table 7, it is appreciated how Movistar leads almost all departments except Cusco, Huancavelica and Madre de Dios which are led by Claro. It also shows the density (lines per 100 inhabitants) per department, where we can see that Huancavelica and Loreto are departments with lower density (lines per 100 inhabitants).

Department	Lines	Density	Movistar	Claro	Nextel
Amazonas	209,537	47.7%	71%	29%	0%
Ancash	1,089,558	100.0%	75%	18%	6%
Apurímac	299,413	67.4%	54%	46%	0%
Arequipa	1,762,605	137.5%	60%	40%	1%
Ayacucho	560,163	77.8%	74%	26%	0%
Cajamarca	1,094,753	75.8%	81%	19%	0%
Cusco	1,294,481	102.6%	46%	53%	0%
Huancavelica	140,951	28.7%	41%	59%	0%
Huánuco	522,813	65.8%	60%	40%	0%
Ica	972,102	129.6%	73%	22%	5%
Junín	1,337,813	111.2%	71%	29%	0%
La Libertad	2,003,771	119.3%	69%	29%	2%
Lambayeque	1,338,516	111.6%	82%	17%	1%
Lima y Callao	15,304,980	159.2%	48%	45%	7%
Loreto	435,104	42.1%	76%	24%	0%
Madre de Dios	186,046	156.4%	10%	90%	0%
Moquegua	209,169	115.1%	75%	23%	1%
Pasco	201,534	67.3%	72%	28%	0%
Piura	1,545,923	85.2%	81%	17%	2%
Puno	1,461,305	105.3%	67%	33%	0%
San Martín	596,077	78.3%	81%	19%	0%
Tacna	449,288	138.3%	83%	16%	1%
Tumbes	258,213	115.2%	89%	10%	1%
Ucayali	417,258	88.2%	84%	16%	0%
Total Perú	33,691,373	116.1%			

Source: OSIPTEL

Table 7. Mobile lines and density (2012).

2.2.4.5 *Market potential in rural areas*

The main challenges which must be overcome by the telecommunications operators to attend the ICT market in rural areas are:

- Scattered and isolated places: there are more than 98.000 population centres in Peru, and more than 90,000 out of them are rural towns with less than 1.000 inhabitants.
- Geographical difficulties: the geographical diversity in the coast, mountains and jungle, together with population dispersion, makes it difficult to provide public services such as electricity, drinking water, drainage and ICT. In case of ICT services is generally used the satellite transportation with a high cost. In the other hand the roads and access times to rural areas make more expensive installation and maintenance.
- Lack of electricity: more than the 30% of rural localities do not have commercial electricity. To provide ICT services is necessary to implement alternative energy systems, as it is the case of the solar panel energy source, which increases the cost of every service.
- Poverty: while there is a trend towards the alleviation of poverty in rural areas, Peru still has an average poverty level above 50% of the population.

Peru is an attractive country for investments. Credit Rating Agencies as Standard & Poor's, Fitch Ratings and Moody's gave to Peru an "Investment Rate" of BBB with a stable trend. In the field of ICT, investments are also growing both from established domestic or foreign operators, and from new operators, as for example the Vietnamese company VIETTEL, which will begin operating this year 2013 as the fourth mobile operator, and also the Chilean company ENTEL, which just bought the mobile operator NEXTEL at the beginning of this year 2013.

Some indicators that show the potential and market opportunities of ICT in rural areas are:

- Poverty reduction: the trend in the recent years shows a significantly improvement.
  - Poverty indicators have decreased from 74.0 in 2007 to 56.1 in 2011.
  - Extreme poverty decreased from 32.7 in 2007 to 20.5 in 2011.

- Priority of cellular mobile service in rural areas:
  - The 76% of rural inhabitants have used mobile service in the past two months.
  - 2 of every 3 users own a cell phone. The rest use cell phones from relatives, friends or people who rent this service that are called "chalequeros".

- The technologic development let operators to improve the efficiency of the CAPEX and OPEX:
  - Telecommunications networks are more efficient and cost-effective in Core, transport, access and terminals.
  - In recent years technology has been improving efficiency of satellite transport equipment allowing them to carry more traffic per MHz.
  - The cost of alternative energy technologies such as solar panel (photovoltaic) systems or hybrid energy technologies (solar-diesel and wind-diesel) has decreased.

- Focus of the Peruvian Government on the development of rural areas.
  - Year 2013 was declared as the "Year of the investment on rural development and food safety".
  - Progress of road construction.
  - Progress of rural electrification: is expected to reach the 80% coverage in the next 3 years.
  - Households with electricity provided by the public energy network: it grew a 7% in the last year (from 60.9 in 2011 to 65.4 in 2012).

- Other indicators:
  - Households with at least one computer: it grew a 39% (from 3.1 in 2011 to 4.3 in 2012).
  - Households with Cable TV: it grew a 41% (from 4.4 in 2011 to 6,2 in 2012).

2.2.5   Manufacturers

This section describes the manufacturers and intermediate providers involved on enabling rural coverage solutions. Whilst global markets shares can be estimated for macro network infrastructure vendors, the shares of small cell/rural solution vendors are much harder to estimate and less reliable, mainly because they are either privately owned and not subject to detailed reporting requirements, or the small cell (or rural) market shares are not broken out within a vendor's revenue analysis. Consequently, it is not possible to give current market shares in the rural/isolated cell market segment.

The taxonomy of manufacturers involved on the supply of small cells for rural use can be derived from considering the elements involved in a system making a call.

Figure 20 shows the traditional legacy architecture used by microcells and macrocells for the purposes of medium area and wide area coverage. Two alternative backhauls are shown. These systems typically support higher capacity cells, have significant power consumption demands for each cell, and require a good quality backhaul to carry the IUB protocol which is not optimised for bandwidth or latency.
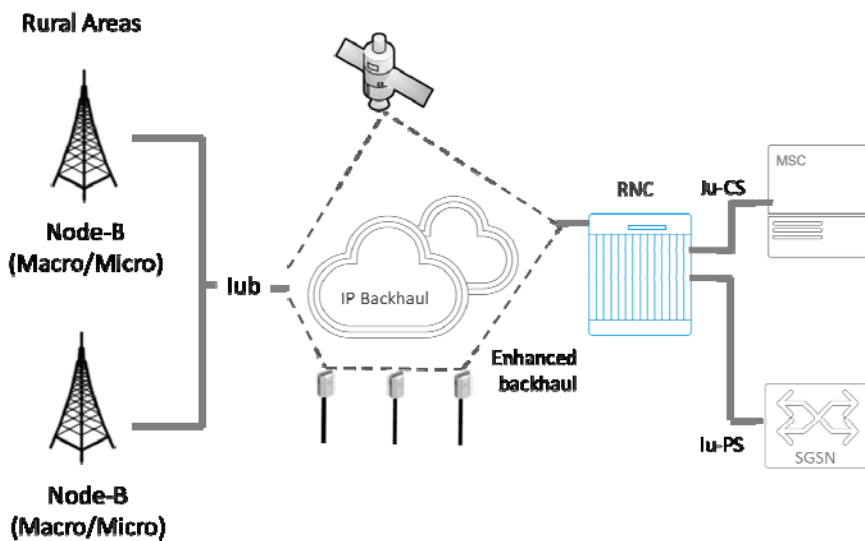
Figure 20. Traditional Macrocell Architecture.

In the case of this architecture, the Node B and the RNC will come from the same supplier because the OA&M link between RNC and Node B is not standardised.

In the case of a 3G HNB-based architecture, the standardisation of the HNB – HNB-GW link and the separate OA&M provisioning means that there is the possibility for separate manufacturers to supply the HNB and the HNB-GW, introducing an increased range of market pairings and competition.
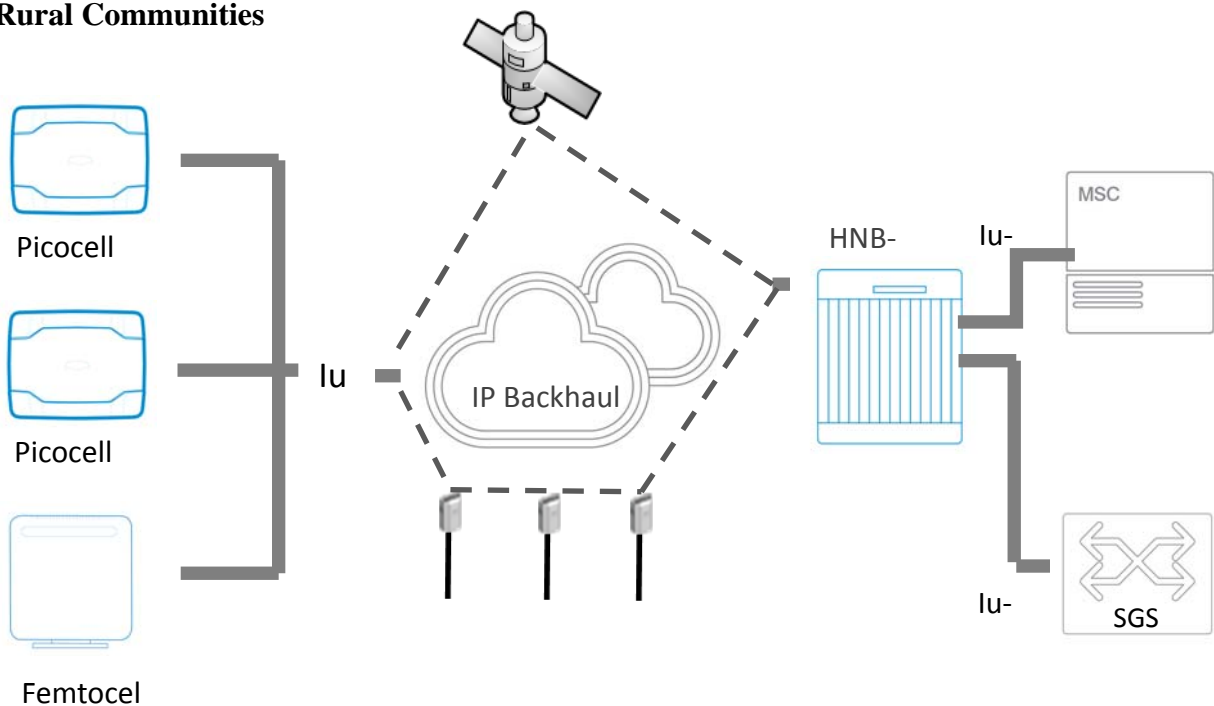
Figure 21. HNB-based architecture

From this the taxonomy may be determined based on how the components – radio node, backhaul and core network gateway – may be grouped.

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From the perspective of cellular infrastructure manufacturers these can be broken down in to a number of classes:

a) System Suppliers (vs individual element suppliers) of small cell solutions.
b) Suppliers of individual elements separately.
c) Suppliers of traditional macrocell architecture solutions only.

The arrival of TDMA-based Satellite systems operating in the Ka band has led to the ability of more than one stream to be multiplexed on the uplink to the satellite, and at reduced cost.

Further, the pricing for traffic can depend on the traffic load on the 'spot' beam(s) covering the relevant rural area, particularly if the primary market segment for the satellite system owner is not rural land-based communications, but other (e.g. maritime). For instance, for maritime satellite communications suppliers, the most loaded spot beams may be those that cover the entry to major ports such as Rotterdam, or dense narrow shipping lanes. If the satellite has spot beams that cover other areas where shipping is scarce (e.g. rural land-based), then the pricing for traffic on that spot may be significantly lower and nearer marginal cost than the most loaded beams. Some satellite vendors have partnered with companies to provide ground units with a linked satellite backhaul and are active in the market. A number have started with GSM voice and data solutions and are now moving into deploying 3G.

In addition there are individual element suppliers who are focusing on providing small cell equipment for outdoor use, sometimes focusing on a particular vertical segment (e.g. Public Safety, Authorities or Security). Consequently we add the two classes:

d) Backhaul suppliers with cellular offering.
e) Niche suppliers of elements and systems focused on outdoor/rural or particular vertical segment use.

In "ANEX I" the breakdown of suppliers of combined voice and data solutions that address the rural marketplace with 3GPP-based solution is presented. Note that the arrival of the 3GPP Long Term Evolution (LTE) standard has led to the expectation of large growth in outdoor 'metrocells' (urban microcells supplying high speed data coverage without the need for building full macrocell masts along with the associated planning permissions). This has led to the creation of a number of new companies offering LTE picocells for outdoor use as long as high bandwidth backhaul is available. These companies have been excluded from the analysis unless they also offer a solution including voice that can be deployed over lower backhaul bandwidths.

Next sections look at the questions that a manufacturer would ask before entering the rural market. The key question for a commercial manufacturer in deciding whether to include rural coverage as one of the market segments in its marketing mix is naturally whether the excess of the benefits – typically profitability – sufficiently overcome the risks. The approach considers a macro analysis of the forces on the market segment, then an analysis of marketing specifics for the segment, and then summarises the questions.

2.2.5.1 *Macro Analysis*

An initial approach is to consider the macro analysis of the classic 'Porter's 5 Forces' model for a market as shown below.
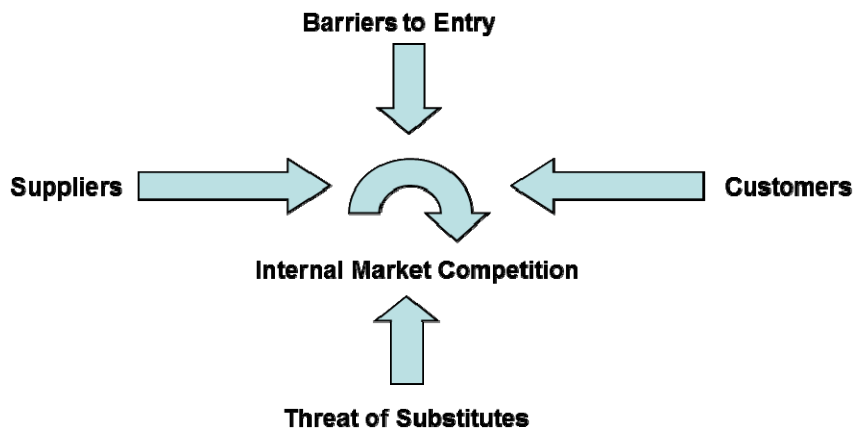
Figure 22. Porter´s 5 forces model

In this case, some specific examples within these forces giving rise to relevant questions for rural small cell suppliers are:

2.2.5.1.1 Supplier (manufacturers / vendors)

1. Supplier concentration. How many potential suppliers are there? The fewer suppliers, the greater potential for the market to deliver profit.
2. What is the importance of volume to the supplier? This is discussed further below, but is related to the volume and profitability needed to compensate the fixed and other non-volume-related costs in getting product to the market.
3. Are there specific features in the radio or chipset hardware or firmware needed to address the rural marketplace? (e.g. handling of range, power). This could require specialised chipsets, impacting cost but facilitating product differentiation.
4. Ability to differentiate? - is there some way that products may be differentiated? Are there certain power supply thresholds that can only be met by certain solutions?

2.2.5.1.2 Barriers to entry

Barriers to entry typically increase the risks or the cost of entering the market, or there may be means to lower them. In the case of the rural market place:

1. Are there absolute cost advantages of a small cell solution for rural coverage over the alternatives? This helps create a clearer opportunity.
2. Is the government or regulatory policy/pressure that assists or inhibits entry to this market?
3. Are there economies of scale that will reduce barriers to entry or alternatively, existing incumbents in the market that make economies of scale hard to achieve.
4. Are there high capital requirements to enter the rural market – e.g. investment in new product design, type approval costs, homologation costs for countries with small volume.
5. Technical barriers: is there sufficient backhaul capacity in the target regions available to make supplying 3G viable?
6. Technical barrier. Are the power sources for a cell (e.g. solar) sufficiently available at the right power and charge levels to be able to power a small cell

2.2.5.1.3 Customers (Operators)

For a manufacturer considering developing product for the segment, the customer's level of influence has to be considered:

1. What is the price sensitivity of the customer(s).
2. Is there a way for the product(s) from the candidate suppliers to be differentiated to the operator.
3. What is the availability of substitutes – e.g. WiFi, 2G+EDGE, Macrocellular solutions.

2.2.5.1.4 Threat of Substitutes

1. Cost of switching – are rural solutions deployed already that would be expensive to remove or replace?
2. What is the buyer (operator) inclination to substitute already deployed solutions?
3. Are there particular cost, regulatory or other reasons that would favour (or act to prevent) substitutes to 3G such as:
    a. Extending Macrocellular coverage.
    b. Providing carrier / higher powered WiFi.
    c. 2G+EDGE.

2.2.5.1.5 Internal Market Competition

Internal market competition represents the inherent level of competition can be assessed using questions such as:

1. Exit barriers – if the manufacturer/supplier had to exit the market, would there be significant obstacles to be overcome such as:
    a. Specialist manufacturing or test equipment that could not easily be sold or relocated?
    b. Closure costs and asset write-offs involved in closing down a market segment?
    c. Negative impact on inter-related business (e.g. macro network or fixed network equipment sales).
    d. Would there be significant loss of customer goodwill.
2. Industry growth and what phase is the rural cellular market in? – e.g.
    a. Introduction phase. This implies initial slow growth, high prices and low volume. Margins are required to support promotion, and profit is low or negative. Customer acceptances are needed to result in repeat purchases and move towards growth.
    b. Growth phase. This is characterised by a rapid climb in sales. Profits start to be made. New competitors enter and prices can be maintained.
    c. Maturity phase – this is indicated by a slowdown in growth rate. This leads to overcapacity. There is intense competition to grow market share and potential saturation of the market.
    d. Decline phase. New technology substitutes may be available and customer preferences are changing.

3. Is there overcapacity (related to determining the state of maturity of the rural market).
4. Diversity of Rivals – indicates the breadth of interest and potential competition in the market, or possibility to create a differentiated approach if the rivals are not diverse.

2.2.5.2 *Market Segment Analysis*

In terms of a more detailed marketing analysis, once a market segment has been identified, it has to meet key criteria before it can be considered further. The basic criteria to ask concerning the segment are whether it is:

      a) Accessible
      b) Identifiable
      c) Profitable
      d) Actionable
      e) Effective

Subsequently, there is the decision on whether the segment is profitable enough to be in the marketing mix, or whether some form of marginal benefit can be gained from cross-selling with other products in a different segment. These key criteria are now examined in more depth.

2.2.5.2.1 Accessibility

Can the rural segment be reached and serviced? What are the barriers to entry for rural cellular in a particular area?

1. Is there an incumbent supplier of a rural solution?
2. What are the difficulties / costs occurred in establishing interoperability with any existing macro network infrastructure?
3. Regulatory barriers – Are there regulations that facilitate or inhibit access to the market? - e.g. at least one South American country regulator charges a common annual fee per cellular base station, including small cells, thus intrinsically favouring macro-cell deployment.

2.2.5.2.2 Identifiable

Is there a clear understanding of the composition of the segment? This is crucial in enabling a common set of products to be usable to address the whole segment.

Can the segment be classified across a small set of parameters – e.g. coverage solutions, capacity solutions, user population density, that aids definition of a suite of products.

2.2.5.2.3 Profitable

Without looking at particular quantitative business case methodologies (e.g. discounted cash flow), a basic formula used in assessing the business case for a manufactured product is:

$$Total\ Profit = Volume * Profit\ per\ Unit - Base\ Cost,$$

Where:

- Volume = total size of the market for the product.
- Base Cost includes indirect labour, initial design, test and production setup, type approval and homologation as well non-volume related costs such as selling. As a consequence of this, the break-even point (the volume at which the product becomes profitable) can be estimated as Base Cost / Profit per Unit.

Note that in the case of a small cell, costs such as getting a new PCB design working, electrically and RF safety tested and type approved will cost several tens of thousands of Euros. Further, small cells are intended to be lower-cost units relative to microcells and macrocells. Consequently, changes to

existing product need significant volume or increased margin (per unit profit) in order to break even and then become profitable.

In terms of specific questions for each of the determining parameters, we have:

Volume:

1. What are the likely volumes for each product?
2. Can the same product be sold across a number of markets?
3. Can a framework supply agreement be set up with operator groupings? This would give greater volume expectancy as well as reducing the total cost of sales.
4. Are any products in the rural product mix already being manufactured for other segments?

Profit per unit:

1. What does a business analysis show that the elements of market segment will accept as a price? Is there particular demand or added-value for some customers that will allow higher pricing?
2. Are there indicative prices from competitors that limit pricing (related to competition)?
3. What is the cost of materials and per-unit assembly costs to produce one or more distinct products that are acceptable to the market?
4. What is the distribution channel – is it bigger than direct to operator? - And what share of gross profit will channel members need.
5. Transportation costs per unit from point of manufacture.
6. Import taxes or other local taxes that affect the cost

Keeping the base costs under control:

1. Will a product used in other market segments be able to address the rural market segment(s)?
2. Are significant parts of products, in the rural product mix available from products addressing other segments? This will reduce start up and tooling costs.
3. What is the cost of modification of existing product (or developing new ones)?
4. Are there additional testing costs for a rural product over an indoor one?
5. Cost of sales – can it be managed?
    a. How many operators are there with rural cellular goals, and what is the potential volume/market size for each operator?
    b. Are there sufficiently common requirements between operators that allow for one or more products in the mix to be widely applicable?
    c. Can a global framework supply agreement be signed with operator groupings that has a common product specification and commonality in operator or regulatory approval, thus keeping costs down as product volume is boosted?

Other issues:

Can the profitability include Cross-Selling and interlinked products (e.g. satellite service subscription with a HNB)? Rural pico required as part of a macro deal, etc.

2.2.5.2.4   Actionable

One of the goals of marketing is to come up with a product mix that maximises profit subject to the available resources, whilst minimising risk. As a result, it has to be checked that the resources are enough to address the segment, and whether the level of profitability is sufficient for it to appear in the marketing mix.

1. Does the manufacturer have enough resources to address the segment? – e.g. staff, manufacturing capacity. If no, what is the deficit?
2. In the case of limited resources, what level of profit or profitability would need to be seen to select the rural segment over a currently served segment?

2.2.5.2.5   Effective

This is more an internal set of questions for the manufacturer to ask, to enable measurement of performance of the product within its target segment. These are focused on understanding whether Does the segment contains customers with homogeneous characteristics and needs – i.e.

1. Can the size of segment be measured?
2. Can the purchasing power of the buyers for rural solutions be well estimated?
3. Can the likely buying behaviour of rural providers be assessed?
4. Are the requirements well understood?

3   METHODOLOGICAL TOOLS FOR MARKET RESEARCH

After analysing different actors' perspective, and considering the research questions identified in ANEX II, the methodological tools that would be used to define the market research will be presented. Previously, an in deep analysis of the research tools available for the market research was performed, and its results are available in ANEX III - Research Tools for the Market Survey.

3.1   Choice of Research Tools

Evaluating the methodological guide presented in ANEX III - Research Tools for the Market Survey, the choice and justification of research method for each stakeholder group is presented in the following paragraphs.

3.1.1.1   Research Tools for Public Sector

The public sector as identified in section 2.2.1.1 consists of two separate target groups. To this end since these two groups have distinctive characteristics, we should treat them as separate and choose appropriate research tools for each.

Regarding general questions-oriented to telecommunication officials of sectors with presence in the isolated rural locations the following characteristics occur:

- The population is limited.
- The desired knowledge is not framed and expected.
- The usage of open ended tools will allow us to gather information not anticipated by the researchers.

To this end the usage of semi-structured interviews that will allow the researchers to better capture knowledge that will be available to the interviewed and better design specific plans for developing the Tucan3G Business Model.

Regarding specific questions aimed at those responsible for public institutions with presence in isolated rural areas the following characteristics occur:

- The population is larger.
- The desired knowledge is not framed and expected.
- The number of research questions is extended.
- The usage of structured tools will allow us to gather information from more subjects and better estimate the actual needs.

To this end the usage of semi-structured interviews that will allow the researchers to form a structured questionnaire will better capture knowledge that will be available to the subjects. This two phase approach will allow an increase reliability of results.

3.1.1.2   Research Tools for Business Users

Business users as described in previous sectors vary significantly between rural and non-rural areas. To capture the specific characteristics of the users in this group we have to take into consideration the following characteristics.

- The population is large
- The desired knowledge is not framed and expected

- The usage of un-structured tools will allow us to gather information from subjects that will be driven by innovative thinking and not everyday operations and enhance the disruptive nature of the project.

To this end the usage of focus groups is rendered as the most appropriate since it will better capture not only the individual views of participants, but also the collective view of small businesses on how this project can alter or help their business models.

3.1.1.3 Research Tools for Private Users

Private users is the largest group under consideration and as mentioned in the previous section a group that also affects most the usage of mobile services and correlates with business usage.

- The population is large
- The desired knowledge is partially framed and expected
- The usage of un-structured tools will allow us to gather information from subjects that will be driven by innovative thinking and not everyday operations and enhance the disruptive nature of the project.
- The usage of structured tools will allow us to gather information from more subjects and better estimate the actual needs

To this end we propose a dual usage of research tool for this group. Initially, a participant observation should take place by using researchers already established in rural areas and studying the behaviour of the local population. This will give us insight of the actual behaviour and help us frame the research questions in a relevant way. This should be applied ideally to two different research sites.

The next phase will consist of the development of a structured questionnaire that will be administered to a larger population. The questionnaire should be administered by researchers visiting the rural population and not self-administered questionnaires in order to avoid non-response due to limited understanding or limited educational background.

3.1.1.4 Research Tools for Operators

Operators are a limited group that has to take into consideration certain limitations in order to better adjust to a new business case. To this end and taking into account the fact that the group is limited in numbers and has developed a good insight on the deployment of rural services, a series of semi-structured interviews should be applied in order to better capture their visions on the future of this and analogous projects. The results of these interviews combined with information presented in this document can result in enough data to analyse and propose a strategy that will benefit this group as well as the others.

3.1.1.5 Research Tools for Manufacturers

Analogous characteristics that apply to mobile operators, apply to this group as well. This dictates also the usage of semi structured interviews in order to capture both needs and vision of manufacturers as well.

3.1.1.6 Summary of research tools

The above analysis leads us to the presentation of the following table that takes into consideration all the before-mentioned proposals.

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Group	Type	Tools	Proposed Sample*
Research Tools for Public Sector (Officials)	Qualitative	Open Interviews	5 Officials
Research Tools for Public Sector (Institutions)	Qualitative and Quantitative	Semi – structured Interviews, Structured Questionnaires	5 Interviews, 30 structured Questionnaires
Research Tools for Business Users	Qualitative	Focus Group	2 Focus groups in different areas
Research Tools for Private Users	Qualitative and Quantitative	Participant observations, Structured Questionnaires	2 participant observations in rural communities 400 Questionnaires
Research Tools for Operators	Qualitative	Semi – structured Interviews	3 Semi – structured Interviews
Research Tools for Manufacturers	Qualitative	Semi – structured Interviews	6 Semi – structured Interviews

* Since no specified numbers have been given for the population the proposed sample is an estimation of number of responses that will give the consortium a good estimation of the studied phenomenon.

Table 8. Summary of research tools proposal.

The choice of the research tools presented above can be changed according to circumstances that may rise during the research. The usage of a combination of methods and tools will provide different data sets that will be able to better capture the different views and aspects of the project and thus increase the validity and generalizability of the research results. The analysis however should be executed with caution in order to avoid misperceptions or extraction of biased results.

3.2   Market research plan

The market research plan will be based upon the choice of research tools mentioned in the previous section. A step by step approach is presented for each group since the research is expected to run simultaneously from different research units.

3.2.1.1   Research Plan for Public Sector

The research plan for the public sector consists of two separate phases. The first phase includes the interviews with telecommunication officials of sectors with presence in the isolated rural locations. This set of interviews has to be conducted before the actual development of the research structured questionnaire in order to better capture the relativity of the questions and issues addressed.

The next phase will include the development, testing and deployment of the structured questionnaires to responsible for public institutions with presence in isolated rural areas. The sampling method proposed is snowball sampling since responsible persons are more likely to point out to other that have a good understanding of the situation and have developed awareness on the issues under consideration.

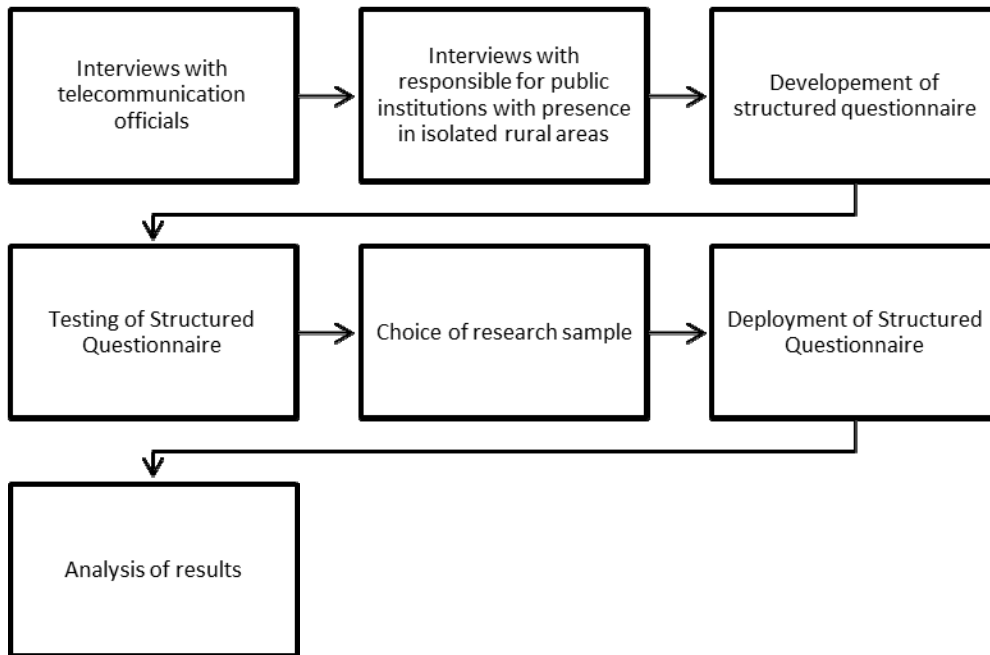The research plan is depicted bellow.

Figure 23. Scheme of research plan for Public Sector.

3.2.1.2   Research Plan for Business Users

Analogous to the previous group, a preliminary stage will help the formulation of the questions to be discussed in the focus group and produce results that will be taken into consideration in the next phases of the project. The research sampling method proposed is stratified sampling in order to get more representative results.
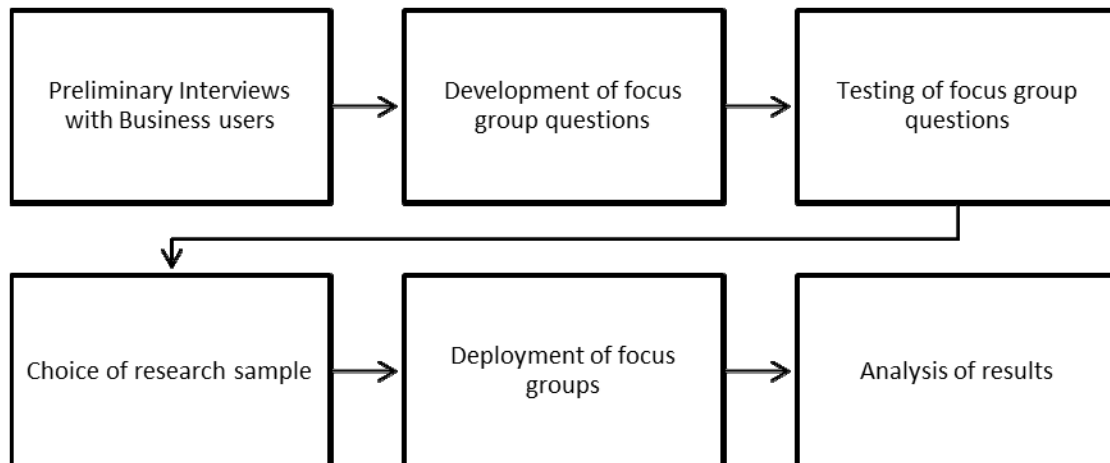

Figure 24. Scheme of research plan for Business Users.

3.2.1.3   Research Plan for Private Users

The steps of the research plan for private users are also depicted bellow. Initially two appropriate research sites will be selected and observed. These results will be analysed and help in the production of a fully structured questionnaire that will be tested and administered to the selected sample. Then the results will be analysed and compared against the ones produced in the first phase of the research (observation). The sampling method proposed is stratified sampling for this case in order to get more representative results that can be generalized across the country.
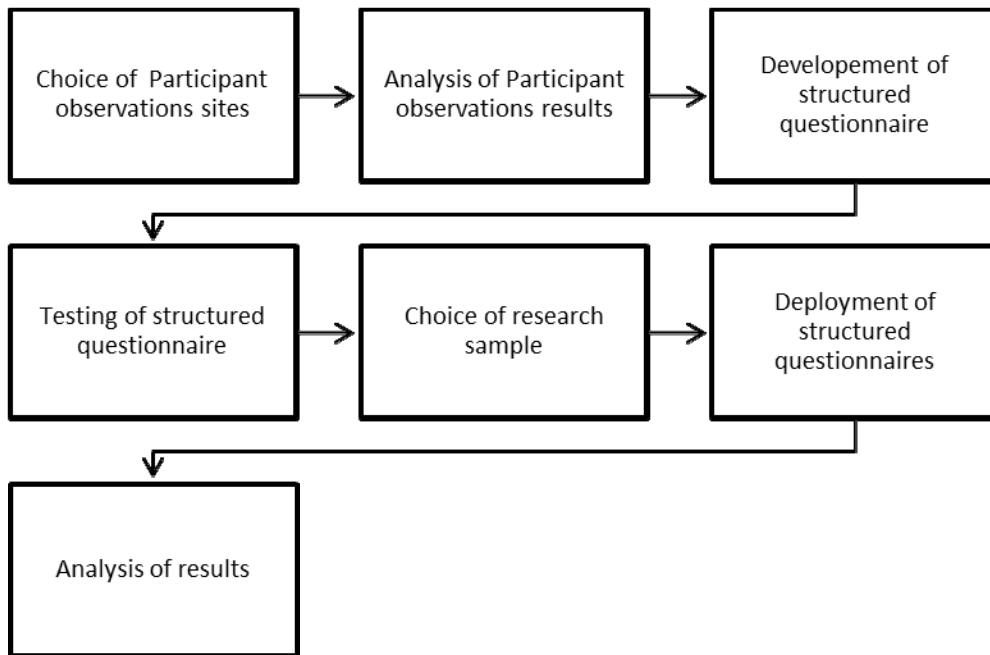
Figure 25. Scheme of research plan for Private Users.

3.2.1.4   *Research Plan for Operators*

Research plan for operators consists of the development and testing of research instrument and administration to a specific predefined sample. The sampling method proposed is snowball sampling since responsible persons are more likely to point out to other that have a good understanding of the situation and have developed awareness on the issues under consideration.
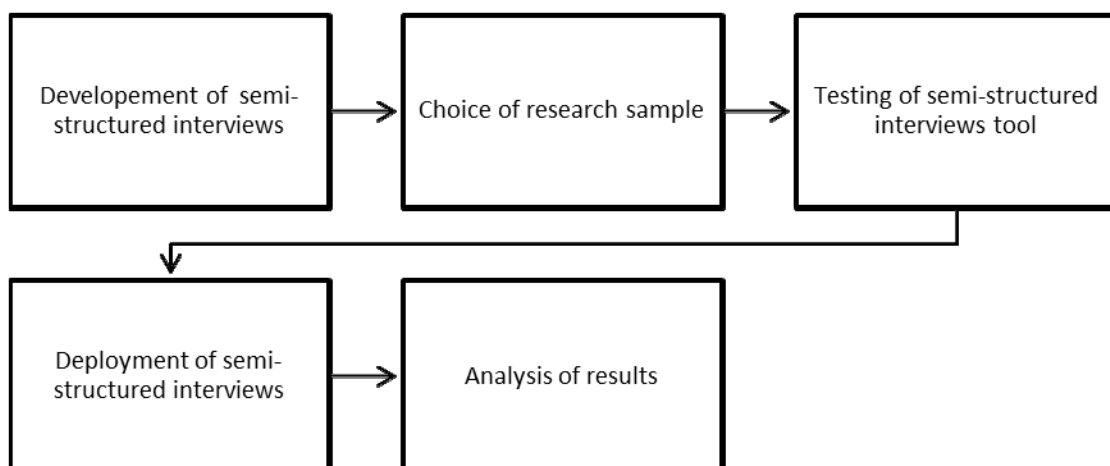

Figure 26. Scheme of research plan for Operators.

3.2.1.5 Research Tools for Manufacturers

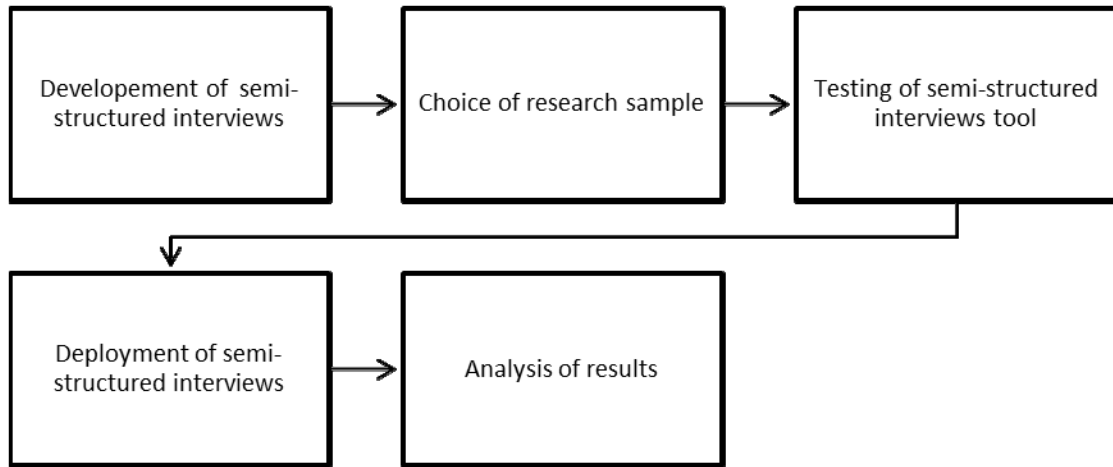The research plan and sampling method for manufacturers is analogous to the one presented for operators.

Figure 27. Scheme of research plan for Manufacturers.

4   PROPOSAL OF BUSINESS PLAN

This section will focus on explaining the approach that TUCAN3G will use for developing a business plan. Again, this section won´t present the final business plan, but will serve to favor the ideas exchange among WP3 partners mainly and to build a common base for WP3 work.

4.1   Business Model Structure plan

The business model is a simplified representation of its business logic. It describes what a company offers its customers, how it reaches them and relates to them, through which resources, activities and partners it achieves this and finally, how it earns money. The business model is usually differentiated from the business process model and the organization model.

Business models can be described in a more or less formal way. We use a simple approach that consists of nine basic business model building blocks that allow us describe and draw all the aspects of a business model in a simple way.

A business model can be described by looking at a set of nine building blocks. To get a good picture of our business model we should describe our:

- Customer segments: Our groups of customers with distinct characteristics.
- Value proposition: The bundles of products and services that satisfy our customer segments' needs.
- Distribution channels: The channels through which we communicate with our customers and through which we offer our value propositions.
- Customer relationships: The types of relationships we entertain with each customer segment.
- Revenue streams: The streams through which we earn our revenues from our customers for value creating and customer facing activities.
- Key resources: The key resources on which our business model is built.
- Key activities: The most important activities performed to implement our business model.
- Partner network: The partners and suppliers we work with.
- Cost structure: The costs we incur to run our business model.

Process:

DESCRIBE	**ASSESS**	**IMPROVE / INNOVATE**
• Set-up a team from different WP with diverse views on the TUCAN3G business model • Apply an unambiguous and joint definition of what a business model is • Get the team to draw a clear picture of how your current business model looks	• Drill down on every described business model building block and analyze them. • Flag strengths and opportunities for each building block • Flag weaknesses and threats for each building block • Draw an overall conclusion on the evaluation of your business model	• Build on the conclusion of your business model assessment • Brainstorm freely on how the building blocks of your business model could be improved. Don't limit your imagination and come up with crazy ideas. • Synthesize your ideas into feasible projects and draw an improved or even new business model

The process starts with setting up an ad-hoc task force. The business model approach requires a holistic look at the business logic of our organization. Therefore we should consider the inputs from different parts.

Thus, the first step in a business model project is the composition of a multidisciplinary team with people from different parts and from different hierarchical levels. Obviously, the choice and number of persons participating depends on the size of the project and of the goals and ambitions of the project. The description of a business model should always be a joint description, which is understandable by everybody and based on a common language.

4.1.1 BUSINESS MODEL DESCRIPTION

This subsection will describe the different blocks of the business model.

4.1.1.1 Customer segments

WHO ARE OUR CUSTOMERS?

Business Model Building Block	**Customer segments**
Description	Our groups of customers with distinct characteristics
Objective	List the customer groups we are serving. Regroup them in terms of different needs and ways of reaching them or as to profitability.

Customers are the livelihood of every company since the revue streams come from them. Successful organizations understand their customers. They strive to propose them an adequate offer that caters to their needs. They recognize how to create value for them. They know how to reach them and they are aware of which relationships to build with them. Most importantly, from the enterprise perspective,

successful companies know how to turn satisfied customers into revenue streams.

A clear description and understanding of a company's customers is an integral part of every business model. More precisely every company must ask itself if it is serving distinct customer groups with different needs and/or characteristics. In this manual we will start describing our business model by asking ourselves a number of key questions to identify who the customers and customer segments of our business model are.

Key questions:

- Who do we create value for?
- Do any of these customers merit to be grouped into a distinct category, because...
- We propose them a distinct offer?
- We reach them through different communication and distribution channels?
- We entertain different relationships with them (e.g. more personal)?
- They have a substantially different profitability?

Once we have answered these questions and identified the different customer segments which our business model is serving, we should describe each of them in a little more detail. This description can include various characteristics, such as demographic and geographical information, core needs and aspirations. This can be done for both, private as well as business customers. Visualizing the characteristics of one of our existing customers can help us to come up with a generic description for each of our segments.

After completing the descriptions of our different customer segments we should classify our existing customers among the identified segments. This is a good test of the segments we have come up with. Finally, we should add some statistical information on each segment, such as the number of current customers, profitability, growth potential, etc.

The full process looks as follows:

Brainstorm to identify customer segments by answering the above question.	Describe each customer segment and their characteristics, for example by imagining existing customers.	Classify existing customers among the identified customer segments.	Add statistical information for each customer segment, such as number of customers margins and growth.

4.1.1.2 *Value proposition*

WHAT DO WE OFFER EACH OF OUR CLIENT SEGMENTS?

Business Model Building Block	Value proposition
Description	A bundle of products and services that satisfies a specific customer segment's needs
Objective	Identify the value you create for each distinct customer segment by describing the bundle of products and services you offer them.

Our offer is what attracts our clients. It is the value that they are willing to pay for. This value can be described as a value proposition for each customer segment. It portrays a specific bundle of products and services. A business model may consist of one or several value propositions for each of its customer segments.
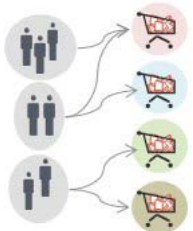
In the next step of describing our business model we outline the value proposition we offer each customer segment by answering another set of questions

Key questions to identify the value proposition building blocks:

- What do we offer the market?
- What is the specific bundle of products and services you offer each of our customer segments?
- Which customer needs does each value proposition cover?
- Do we offer different service levels to different customer segments?

With the description of our client segments and the corresponding value propositions we have already outlined the heart of our business model. This is the kernel of our business model, but yet only the most basic part. A holistic view of our business comprises more building blocks, which we will describe in the following pages.

The full process of outlining a value propositions looks as follows:

For each customer segment describe what value propositions you offer them. A segment may have several value propositions. A value proposition may be offered to several segments.	For each value proposition add the most important product and service attributes, such as service level.

4.1.1.3 *Channels*

HOW DO WE REACH EACH OF OUR CLIENT SEGMENTS?

Business Model Building Block	Communication and distribution channels
Description	The channels through which we communicate with our customers and through which we offer our value
Objective	Identify the channels through which we offer our value propositions to each customer segment

A company reaches its customers through various communication and distribution channels. They represent the interface between a company, its value propositions and its customers. These customer touch points include advertising, retail outlets, sales teams, websites, conferences, sales affiliates and many more. The means a company can use to reach its customers have multiplied over the years. This has left managers with a large set of design choices to reach their customers.

Communication and distribution channels have become increasingly important in business model design. A good and integrated channel design can be a powerful tool for differentiation and competitive advantage. For example, cost intensive channels should be used for very profitable clients, while unprofitable clients should be served through cost efficient channels.

Key questions:

- Through which communication and distribution channels do we reach our markets?
- How well does each channel work?
- How expensive or cost efficient is each of our channels?
- Through which communication and distribution channels do we promote and deliver each value proposition?
- Through which channels do we reach each customer segment?

Choose our main value proposition and outline through which channels you promote and deliver it to which customer segments.	Repeat the previous step for each value proposition until you have described all our communication and distribution channels. Add information about success rate and cost efficiency for each channel.

4.1.1.4 Customer relationships

HOW DO WE RELATE TO OUR CLIENTS OVER TIME?
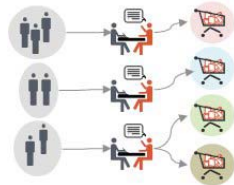
Business Model Building Block	Client relationship
Description	The types of relationships you entertain with each *customer segment*
Objective	Identify which types of relationships you have built and which you maintain with each customer segment

Getting relationship management right in our business model is crucial today to satisfy customer's expectations. For instance, customers paying a high price for a product or service will expect a high touch relationship, while customers paying a cheap price do not expect more than automated, yet customized relationships. A sound business model has a clear strategy for customer relationship management for each customer segment.

Key questions:

- Do we develop and maintain different types of client relationships in our business model (e.g. more or less intense, more or less personal)?
- How resource intensive is each of these client relationship types in terms of time consumption and other costs?
- For each client segment, which client relationship types and mechanisms do we develop and maintain?

The process of describing a business model's customer relationships may look as follows:

Choose our most important customer segment and outline which types of relationships you maintain with them for each value proposition you offer them	Repeat the previous step for each customer segment until we have described all our customer relationships. Add information about the resource intensiveness in terms of time consumption and other costs

4.1.1.5 Revenue streams

HOW DO WE EARN MONEY?

Business Model Building Block	Revenue streams
Description	The streams through which we earn our revenues from our customers for value creating and customer facing activities
Objective	Identify which types of revenue streams we earn from each of our customer segments and value propositions

Our business model's sustainability depends on the revenues we can capture from our value creating and customer facing activities. Revenue streams come from one or several segments of clients who are willing to pay for the value they get from our offer. These revenue streams come in the form of selling, lending, licensing, commissions, transaction fees or advertising fees.

Key questions:
- What are our revenue streams?
- What are the revenue streams from each customer segment and value proposition?
- How much is each revenue stream's contribution to overall revenues in terms of percentages?

Outlining the revenue streams for each customer segment carefully will help us draw a clearer picture on each segment's contribution to overall revenues. This provides the basis for further reflection on how to innovate in our business and revenue model.

Steps to outline our revenue streams consist of:

Choose our most important customer segment, describe each revenue stream originating from it and indicate for which value proposition. Specify the contribution in percentages of each revenue stream for this particular segment.	Repeat the previous step for each of our customer segments. Specify the contribution in percentages of each customer segment to the overall revenues

4.1.1.6 *Key resources*

BASED ON WHICH ASSETS ARE WE RUNNING OUR BUSINESS?

Business Model Building Block	Key Resources
Description	The key resources we need to make our business model function
Objective	Identify the key tangible and intangible resources which are the fundament of our business model
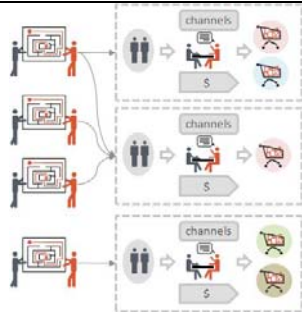
At the basis of every business model there is a set of key resources a company must dispose of to make its business model work. These *key resources* include classical ones such as human resources and tangible assets. Increasingly, business models are also built on intangible assets that are difficult to quantify, such as brand equity and expertise of a specific domain.

For a retail bank, for example, some of the general key resources of their business model are brand, people and reliable IT systems.

Key questions:

- What are the key resources we rely on to run our business model?
- How does each of these resources relate to our value propositions and their corresponding customer segments, channels and relationships?

We will use the following process to describe the resources in our business model:

Choose our most important value proposition and its related customer segments, channels, relationships and revenue streams. Then outline the key resources you rely on to deliver this value proposition.	Repeat the previous step until you have covered all value propositions and outlined all key resources

4.1.1.7 *Key activities*

WHAT KEY ACTIVITIES DO WE NEED TO RUN OUR BUSINESS MODEL?
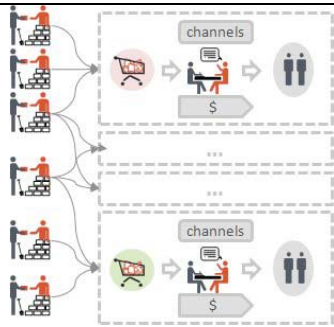
Business Model Building Block	**Key activities**
Description	The most important activities that have to be performed to run our business model
Objective	Identify which key activities we cover in our business model

To implement a business model a company needs to perform a number of *key activities.* It may perform these activities itself or get them done through a network of partners.

Key questions:

- What are the main activities we operate to run our business model?
- On which *key resources* do they rely?
- To which value propositions, channels or relationships do they contribute?

The process of capturing the main activities required in our business model looks as follows:

Start with our most important value proposition and its related channels and relationships. List the required key activities necessary to offer the value proposition.	Repeat the previous step for each of our value propositions and its related channels and relationships (many activities will probably serve several value propositions)

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4.1.1.8 Partner network

WITH WHICH PARTNERS DO WE LEVERAGE OUR BUSINESS?

Business Model Building Block	Partner network
Description	The partners and suppliers we work with
Objective	Outline with which partners and suppliers we work to implement our business model

Today's Business Models are more and more the result of a network of partnerships, joint ventures, cooperation and alliances between different companies. Partners are involved, for example, to complement the value proposition, to bring in specialist competencies or to help deliver to clients.

Every company must ask itself if and how it can leverage its own business model by partnering with other companies. This includes the question of what a company wants to do by itself and what it wants to do with partners. It also includes the question of levering one's own value proposition by combining it with the value proposition of strategic partners.

Key questions:

- Which partners and suppliers do we work with.
- Which *key resources* do they relate to?
- To which value propositions, channels or relationships do they contribute?

The process to describe our partnership network looks as follows:

Start with our most important partner or supplier and describe which key resources he supplies and which key activities he performs.	Repeat the previous step for each important partner and supplier in our business model. Identify for each partner if he is easily substitutable, outline how closely you are integrated with him and ask ourself if he could become a competitor.

4.1.1.9 Cost structure
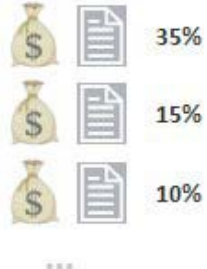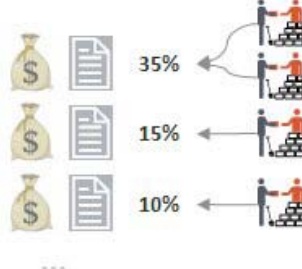
WHERE ARE OUR MOST IMPORTANT COSTS?

Business Model Building Block	Cost structure
Description	The costs we incur to run our business model
Objective	Identify our most important cost positions resulting from our business model

The cost structure is a direct result of all the other building blocks of the business model. Ideally costs should be traceable back to each business model block. In this manual we will use a light approach by simply listing the most important costs incurred and only if easily possible will we link them to a building block.

Key questions:
- What are the most important cost positions in our business model?
- Can the cost positions be easily connected to a business model building block?
- Can costs be calculated for each customer segment?

The process to capture the cost structure of our business model looks as follows:

Point out the most important cost positions of our business model, such as, for example, marketing, customer relationship management, production, R&D, etc.	Connect each cost position with resources and activities or other business model building blocks if easily possible. If possible trace costs back to each customer segments to analyze their profitability

4.1.2 BUSINESS MODEL ASSESSMENT

Once we have a clear description of our business model we can start assessing it. We achieve this by asking a number of key questions that crystallizes a business model's strengths, weaknesses and highlights opportunities and threats. This analysis will give us the basis to reflect on an improved business model, maybe even including some major innovations.

The following questions give us a good start to assess our business model. Feel free to add more, which are specific to your unique context:
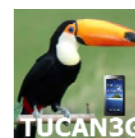
KEY QUESTIONS TO ASSESS OUR BUSINESS MODEL	
Customer Segments	•Do we know our customers and their needs good enough? •Are some customer groups likely to defect soon? •Do we regroup different customer segments well enough?
Value Proposition	•Does our value proposition still cater well enough to our clients' needs? •Do we know how our customers perceive our value proposition? •Are our competitors offering similar value propositions at similar or better prices?
Revenue Streams	•How sustainable are our current revenue streams? •How diversified are our revenue streams? •Do we depend on too few revenue sources (e.g. from some big clients or one single business)? •How well do we price our value proposition?
Communication and Distribution Channels	•Do we have a well thought-through communication and distribution channel design? •How well do we reach our clients? •Do we know how successful our channels are in terms of customer acquisition? •How well are our different channels integrated?
Customer Relationships	•Do we have a customer relationship strategy? •How good are our relationships with our best customers? •Do we spend too much time and money in relationships with unprofitable clients?
Key Resources	•Do we dispose of the right key resources in terms of quality and quantity? •Do we dispose off too many resources internally, leading to a lack of focus?
Key Activities	•How efficient are we in performing our activities? •Do we perform too many activities ourselves, leading to a lack of focus?
Partner Network	•Do we use partners enough? •How well do we work with our existing partners and suppliers? •How dependent are we on our existing partners and suppliers?
Cost Structure	•Is our cost structure appropriate (e.g. low cost business model = low cost structure)? •Do we clearly understand which parts of our business model have the highest costs?

Table 9. Summary of questions for the business model.

4.1.3 BUSINESS MODEL INNOVATION AND IMPROVEMENT

After having assessed and described one's business model the challenge remains its renewal. The good news is that we have already made the most important steps towards business model improvement and innovation once we have drawn a clear picture of our current business model. We can now build on the conclusions of our business model assessment, including strengths, weaknesses, opportunities and threats.

Based on the above conclusions we should ask ourselves if and how we want to change each

business model building block to arrive at a better business model. At this stage it is very valuable to let your imagination flow freely before narrowing down ideas to feasible projects.

To achieve business model improvement and innovation the business model team should ask itself the following questions:

KEY QUESTIONS TO IMPROVE AND INNOVATE OUR BUSINESS MODEL	
Customer Segments	•Are there new customer segments we could serve? •Could we regroup/segment customers better according to their needs?
Value Proposition	•Could we offer our different customer segments more tailored needs? •Do our customers have other needs we could satisfy relatively easily by ourselves or with partners? •Could we complement our value proposition through agreements with partners (e.g. joint value propositions)?
Revenue Streams	•Could we introduce new revenue streams (e.g. lending/renting instead of selling)? •Could we do more cross-selling (e.g. offer our customers other products of our company or of partner companies)?
Communication and Distribution Channels	•Could we increase our customer base by better using our channels? •How can we better use expensive channels for highly profitable clients and cost efficient channels for unprofitable clients? •Can we better integrate our channels (e.g. better link websites with physical outlets)?
Customer Relationships	•What level of personalization do each of our customer relationships require (e.g. dedicated relationship manager or automated self-service)? •How can we spend less time and resources on unprofitable clients? •Should we introduce frequent buyer programs?
Key Resources	•Are there some key resources we could get rid of or substitute? •Are there some key resources that could be better supplied by partners and
Key Activities	•Are there activities we would better outsource to partners? •Are our activities adapted perfectly to our value proposition? •How could we streamline activities?
Partner Network	•Which partners could help us complement our value proposition? •Which suppliers could help us streamline our business model?
Cost Structure	•Are there ways we could reduce our cost structure (e.g. partnering, outsourcing, new suppliers, etc.)?

4.1.4 OTHER COMPONENTS AND KEY ISSUES

Components and Key Issues		
Component	**Element**	**Key Issue**
Value propositions	Choice of focal customer benefits	Core products/services: • What value or benefit do we provide for our customers? • How unique is the value or benefit? • Do those values satisfy customer's demand? • Do the products or services have strong network effects? • Are there substitutes for our products or services? Supplement products/services: • How important are the supplement products or services? • How do we increase customer value by improving or redesigning business processes? • How important is it to provide product instructions, user training, and customer services?
	Target segment	Market attractiveness: • How substantial is the market segment? • Is the market under- or over-served? • What is the growth rate of the market segment? • Which stage is the product in the product lifecycle? Intensity of market competition: • What is the market or industry structure? • How intense is the competition? • How large are the entry and exit barriers?

Components and Key Issues		
Component	**Element**	**Key Issue**
Scope of offerings	Customer decision process	Pre-purchase: • How do we make it easy for customers to obtain and compare product- or service-related information? • How important is the advertising to inform or persuade customers to make the purchase? • Do we need to obtain a third-party certificate or verification (e.g., VeriSign) in order to build a trust relationship with our customers? Purchase: • When, where, and how do customers make the purchase? • What kinds of service are required to assist customers in purchasing the product or service? • Is the delivery of products or services efficient? Postpurchase: • Do we understand customer's evaluation and satisfaction of the product or service? • Do the majority of the customers make repeat purchases? Purchasing process: • How important is it to offer customer assistance in the whole process of purchasing a product? • Can we identify the customer decision process and be able to provide effective assistance? •Do we have an effective e-commerce site that is user friendly? • How do we lower the transaction costs to make it easy for customers to do business with us?
	Product or service contents	Core product or service: • Do we understand which business we are in? • Do our products or services solve the customers' problems? Supplementary product or service: • Do we build and maintain a set of digital assets in order to know our customers better? • How do we leverage on a single set of digital assets to provide value across many different and disparate markets? • How do we increase customers' switching costs from using our company's products or services? Core delivery process: • Do we understand and take advantage of the economies of scope in production and distribution of the product or service? • What kinds of channel (digital and/or physical) do we need to deliver our products or services? • How efficient and effective are the products or services being delivered?

Components and Key Issues		
Component	**Element**	**Key Issue**
Unique resource system	Resources and capabilities	Specifying a resource system: • Do we identify the resources (e.g., labor, capital, assets) needed to build our core competencies or capabilities? • Do we have all the necessary core capabilities to support our scope of product or service offerings? • Do we need to outsource and/or partner with others to gain missing capabilities? • Can we identify key players who can fill out the missing capabilities? • How important is the role of intellectual property rights (e.g., patents and trademarks) in building capabilities? Assessing the quality of the resource system: • How unique is our resource system? • How difficult is it for competitors to imitate our system? • Does each of the capabilities support the delivery of a customer benefit? • How well do the capabilities complement and support each other? • Are the specific resources mutually reinforcing? Are they complementary? • Does the online resource system support the offline system?
	Logistics and delivery systems	Integration: • Can we deliver a unique customer experience through e-commerce? • Are we able to achieve supply chain integration and synchronization (e.g., applying Internet-based collaborative planning, forecasting, and replenishment, CPFR)? • Are we able to collaborate with business partners across a common technical platform using common e-business applications? Fulfillment: • Can we match the performance of the physical activities to the virtual world? • Can we develop a flexible and reliable channel to reach the end customers? • Can we radically reduce the order-to-delivery time to customers?

Components and Key Issues		
Component	**Element**	**Key Issue**
Revenue and growth	Revenue models	Product/service sales models: • Are our revenues primarily deriving from product sales or from complementary products or services? • Can we generate revenues from utilizing intellectual properties? E-commerce-related revenues: • How do we identify new sources of revenues from e-commerce (e.g., advertising, referrals, subscription, membership, commissions, transactions, etc.)? • How do we use information to create value both online and offline (e.g., FedEx's packaging tracking system)? • How do we develop cross-selling opportunities to achieve synergy? • Do our customers value the benefit of one-stop shopping? Pricing: • How do we test prices, segment customers, and adjust to changes in supply and demand in real time? • How do we analyze digital assets and experiment with new ways of pricing? • Are we able to implement innovative e-commerce pricing methods (e.g., reverse auction, one-to-one bargaining)? • How do we build online brand equity to enhance loyalty and to reduce price sensitivity?
	Financial growth models	Growth strategy: • How should we develop new revenue growth (e.g., deeper penetration into the current market, new product development, new market development, and/or completely new products and markets)? Growth model: • Do we need to spin off an online division to establish a new company? • Do we need to establish strategic alliances or merge with other online/offline companies?

Components and Key Issues		
Component	**Element**	**Key Issue**
Competitive strategy	Value chain positioning	Value system or network • Where do we position our products or services in an industry value chain? Can we integrate or move upstream or downstream to increase added values? • How do we create value? Do we create customer value as a partner in a supply chain (e.g., manufacturer or retailer), as a value shop (e.g., professional service), or as a central player of a network (e.g., intermediary service)? • Can we join a business ecosystem [Gossain98] (e.g., online mega sites such as Amazon.com) as a member to provide products or services to the final customers?
	Generic Strategy	Competitive advantage: • Do we have advantages over our competitors in terms of marketing, cost structure, and product or service differentiation? • Do e-commerce and the Internet redefine the competitive advantage in the market or industry we are in? Generic strategy: • Which strategy should we pursue in order to sustain our competitive advantages (e.g., increase entry barriers or block strategy, innovation or run strategy, and/or alliance or team-up strategy)?

4.2 Business Model Development plan

The business model to be produced by the TUCAN3G will have to be developed in parallel to the other WP activities of the project and exchange information with them. The development of the business plan will start after completion of market research activities in month 8 and will conclude just before the business model validation phase. The development plan follows the steps depicted in the figure below.
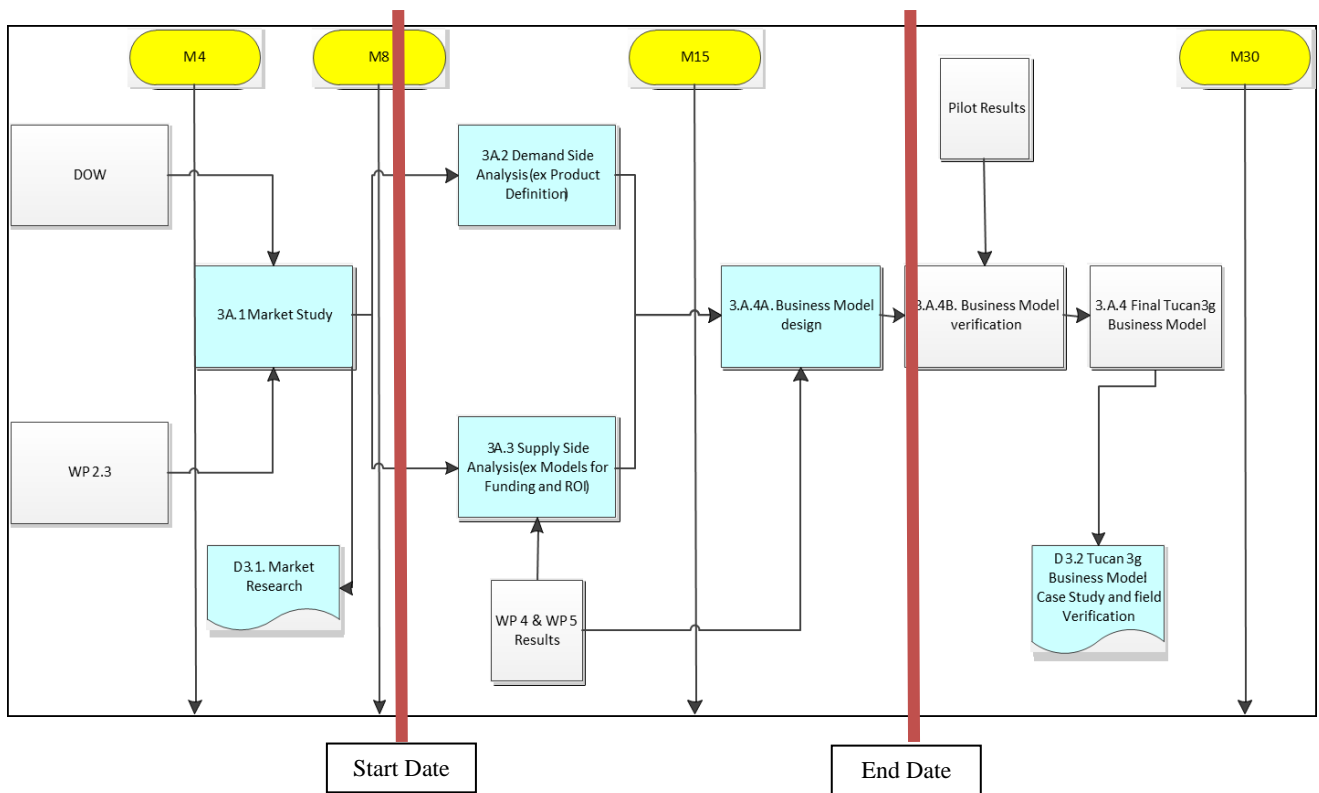
Figure 28. Business model development plan

Within this period the business model will utilize as input information gathered the market research phase that will feed the two parallel streams of work, the demand side analysis and the supply side analysis. The multivariate data gathered within this phase will allow the consortium to develop a better understanding regarding involved stakeholders and key issues regarding both supply side (provision of services) and demand side (consumption of services). More specifically the work will consist the two building blocks presented in Figure 29 and are directly associated with the previous section presenting the components of the business model. The activities will be developed in parallel and interrelated in order to be able to cover all the basic needs of all associated business model stakeholders, especially end users.
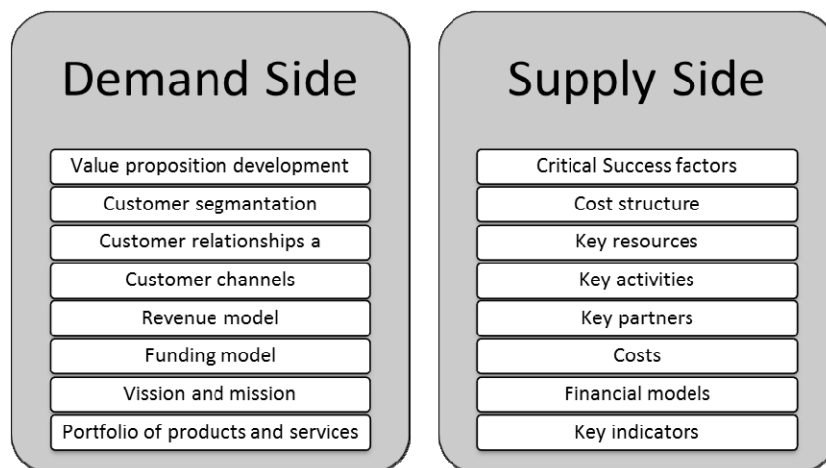
Figure 29. Task division.

These parallel activities will lead to the development of the initial business plan that will in turn be validated and lead to the final business model, following the path shown in Figure 30.

Figure 30. Development path to the business model.

ANNEX I – MANUFACTURERS REVIEW

Description of Manufacturers

Class A. System suppliers of low power small cell solutions:

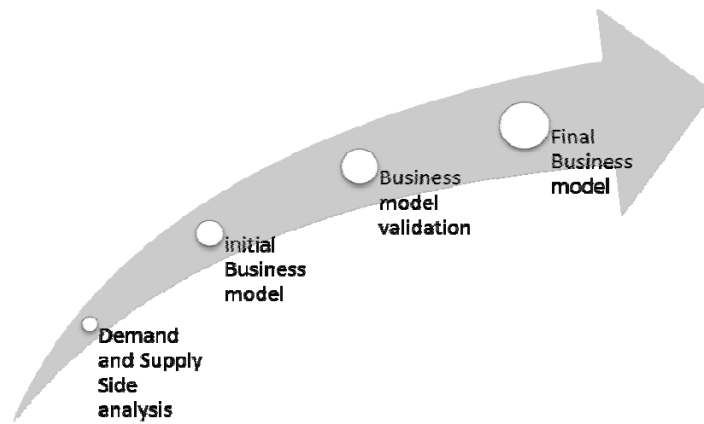| Company / Combination	Link	Comment
ALCATEL-LUCENT	http://www.alcatel-lucent.com	Many solutions deployed. Adding to macro cell portfolio
ARGELA	http://www.argela.com/	Initial solutions have been deployed
IP.ACCESS	http://www.ipaccess.com	Many solutions deployed
CISCO	http://www.cisco.com	Uses ip.access or Ubiquisys Home NodeB
NEC	http://www.nec.com/en/global/solutions/nsp/sc/	Adding to macro cell portfolio. Uses ip.access or Ubiquisys Home NodeB
NOKIA SIEMENS NETWORKS	http://www.nokiasiemensnetworks.com/portfolio/products/small-cells	Adding to macro cell portfolio. Uses ip.access or Ubiquisys Home NodeB
SAMSUNG	http://www.samsung.com/global/business/telecommunication-systems/telecommunication-systems/lte/small-cells	Principally focusing on IS-95/ CDMA 1X and LTE solutions

Class B suppliers of individual elements:

In this list we also include ODM manufacturers who have licensed software and have announced intention to produce small cells, but who we are not aware have product actively used in the market.

Company	Link	Comment
ABLAZE	http://www.ablazewireless.com/	Not known to have deployed. Home NodeB.
ALPHA	http://www.alphanetworks.com/	Not known to have deployed. Home NodeB
ARGELA	http://www.argela.com	Home NodeB deployed
ASKEY	http://www.askey.com.tw/	Not known to have deployed. Home NodeB
CONTELA	http://www.contela.com	Home NodeB deployed
IP.ACCESS	http://www.ipaccess.com	Home NodeB deployed, HNB-GW deployed
MITSUBISHI	http://www.mitsubishielectric.com/	3G small cell using legacy Iub/RNC architecture only. Custom solution only for NTT DoCoMo
SERCOMM	http://www.sercomm.com/SWI/GUI/HOME.htm	ODM manufacturing of Home Node B, licences software from Ubiquisiys
UBIQUISYS	http://www.ubiquisys.com	Supplies product via Sercomm. Being acquired by Cisco

Class C Suppliers of traditional macrocell architecture solutions only

Company	Link	Comment
ERICSSON	http://www.ericsson.com	
HUAWEI	http://www.huawei.com	
ZTE	http://wwwen.zte.com.cn/en/products/wireless/	
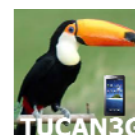
Class D Backhaul Suppliers and Operators with Cellular Interests

Company	Link	Comment
ELARA	http://www.elara.com.mx http://www.idirect.net/Company/Press-Room/Press-Releases/2013/Release-512-Elara-Comunicaciones-Brings-Internet-Voice-Service-To-Towns-In-Mexico-Over-iDirect.aspx	Currently deploying WiFi and Cellular to rural areas of Mexico using iDirect satellite link
IDIRECT	http://www.idirect.net/Applications/Cellular-Backhaul.aspx	Satellite operator (TDMA, Ka band). Already deploying cellular backhaul (e.g. Elara, Mexico)
INMARSAT	http://www.inmarsat.com/	Interests via Stratos Global
PACTEL INTERNATIONAL	http://www.pactelint.com/products/gsm-mobile.php	Satellite coverage mainly focused on the Pacific, not Latin America
SHIRON (ELBIT)	http://www.elbitsystems.com/elbitmain/satcom	InterSky solution. Now part of Elbit systems
THURAYA	http://www.thuraya.com	Satellite communications solution with land roaming. No satellite coverage of Latin America
RACOMSTAR	http://www.rascomstar.com/news.php?id=239	Working with Viasat on African 2G/3G solutions
VIASAT	http://www.viasat.com/applications/broadband-satellite-ip	Provides a backhaul service (e.g. working with Racomstar)
TELEFÓNICA GLOBAL SOLUTIONS	http://www.internationalservices.telefonica.com/en/services_satellite.html	Provides cellular backhaul services over satellite, with networks deployed in Brazil, Ecuador, Argentina and Colombia. Mainly with Comtech/Memotec technology.

Class E Specialist suppliers of elements and systems focused on outdoor, rural or particular vertical segment use

Company	Link	Comment
ALTOBRIDGE	http://www.altobridge.com/	Specialist rural coverage solution provider via satellite backhaul
AOMYX	http://www.aomyx.com/	Antenna and Outdoor unit supplier, working on 2G & 3G solutions
HARRIS	http://harris.com	Public Safety / Security
PROXIMUS	http://www.proximus.com.ua/	Outdoor, Land and Military
PUBLIC WIRELESS	http://www.publicwireless.com/	Urban Outdoor. Principally more developed markets
STRATOS GLOBAL	http://www.stratosglobal.com/	Maritime. Formerly Blue Ocean Wireless, now part of Inmarsat Group
TECORE	http://www.tecore.com/ http://www.tecore.com/solutions/rural.cfm	Enterprise, US and Government focus, but with details of a rural solution
TYCO ELECTRONICS	http://www.te.com/en/industries/wireless-infrastructure.html	Principally Distributed Antennas Systems for Urban outdoor or Indoor

Company	Link	Comment
CONNECTIVITY		use
VIHAAN NETWORKS (VNL)	http://www.vnl.in/	Solar powered GSM and backhaul for rural coverage

Current Role in Isolated Areas

This section identifies those manufacturers or solution providers who are currently believed to have a role in an isolated area deployment.

Under the classes defined above, the current role of the actors is identified as follows:

Class A (System suppliers of low power Home NodeB solutions)
Alcatel-Lucent, Ip.access, NEC, and Nokia Siemens Networks are known to have system deployments with a rural area element.
It is not clear whether Samsung or Argela have deployed a system solution with a rural area element (but see Class B below).
Cisco has not deployed a system with a rural area component.

Class B (Suppliers of individual elements)
Argela has supplied small cell technology to be integrated into a rural outdoor solution.
Ip.access supplies to partners with Home NodeB (& 2G) solutions for rural area deployments.
Sercomm and Ubiquisys have jointly deployed an outdoor Home Node B solution.
It is not certain whether any of the other suppliers have deployed any rural solution node.

Class C (Traditional macro-architecture vendors)
Ericsson has deployed isolated area coverage in a number of areas, including parts of Africa and America.
Huawei has deployed rural solutions (including GSM microcells for Telefonica de Peru)
If Information on ZTE has deployed rural microcells or macrocells is unavailable information, but it is assumed that this has happen.

Class D (Backhaul suppliers and Operators with cellular interests)
It is certain that all of these companies have active deployments for rural and outdoor cellular coverage, but possibly Elbit, although may be limited by the regions of satellite coverage. Thuraya has own rights of its satellite phone system.

Class E (Specialist Suppliers)
The following specialist suppliers have already deployed in rural areas: Altobridge, Vihaan (VNL).
Aomyx has developed an outdoor cell for rural coverage.

The providers of the Government, public safety, security, and defence solutions are expected to have limited interest in the public commercial isolated market – their solutions are targeted at the high value-add market with advanced or ruggedized features, with a radio node typically costing much more than would be feasible for commercial deployment.

Potential Role in Isolated Areas

Class A (System suppliers of low power Home NodeB solutions)
It is expected that all the system suppliers identified in the previous section as having deployed rural solutions, and Argela, will wish to deploy rural solutions   The intention of Cisco, which has a

significant focus on the enterprise market and is in the process of taking over Ubiquisys, is not currently clear.

Class B (Suppliers of individual elements)

Individual element suppliers who are expected to continue to be interested in a role in isolated rural areas include ip.access and Contela.

The future rural deployment of Ubiquisys-based elements may be affected by the takeover of Ubiquisys by Cisco, which in turn could lead other system vendors who use the Ubiquisys solution, and consider Cisco a competitor, to select an alternative supplier.

It is expected that Sercomm will wish to continue to supply an outdoor HomeNode B, having already done so in at least two deployments.

Class C (Traditional macro-architecture vendors)

All of the traditional architecture vendors are expected to remain interested in the rural coverage market as long as the business is sufficiently profitable or for strategic reasons. They may be faced with disruptive substitute technology such as lower power, lower cost small cells that invalidate their business model, or if the penetration and density of mobile handsets in certain regions

Class D (Backhaul suppliers and Operators with cellular interests)

All the satellite operators will look to develop their offerings to facilitate rural coverage, subject to satellite coverage. Elara already intend to deploy cellular over satellite in their Mexican deployment, whilst iDirect is an active participant in the Small Cell Forum Backhaul group. Those suppliers who supply 2G solutions (including 2G voice + EDGE data) can be expect to consider adding 3G to their offering as:
   a) the mobile-using population densities in their coverage area increase (leading to the need for greater spectral efficiency on the ground);
   b) demands for mobile data increase, and;
   c) the necessary satellite backhaul capacity becomes available

Class E (Specialist Suppliers)

Altobridge and Vihaan are focused on providing rural coverage, so will be seeking to continue their role in this area, as it is the purpose of their businesses.

Aomyx is expected to continue to develop its outdoor/rural product offering, probably starting in South East Asia, but seeking global opportunities.

The suppliers of government/public safety and military solutions seem unlikely to seek an enlarged role in the public commercial isolated cell market, for the same business model reasons that they are not currently involved in the market – they are focussed on specific custom features and ruggedness for a target market that will pay the higher price for those custom features.

ANEX II - RESEARCH QUESTIONS PER TARGET GROUP
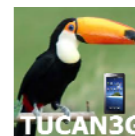
Research Questions for Public Sector

a) General questions oriented to telecommunication officials of sectors with presence in the isolated rural locations:

Question #	Question
1	What public entities invest on telecommunications?
2	What public entities have formulated telecommunications projects?
3	What public entities have financed telecommunications projects?
4	What public entities have regulated the interventions on telecommunications?
5	What is the monthly amount that your institution pays for the mobile telephony service per terminal equipment in isolated rural locations?
6	What is the monthly amount that your institution pays for the Internet service per connection in isolated rural locations?
7	What is the broadband hired per connection in isolated rural locations?
8	What is the monthly amount that your institution could pay for the 3G mobile telephony service per terminal equipment in isolated rural locations?

b) Specific questions for the responsible of public institutions with presence in isolated rural areas. The interviewed are the responsible of health posts, directors of schools, responsible for police stations and local authorities:

Question #	Question
1	Is there coverage of mobile telephony in your village?
2	Does your institution have mobile telephony service?
3	How long have your institution had mobile telephony service?
4	What is the use that your institution gives to mobile telephony?
5	What is the importance of mobile telephony for your institution?
6	What is the monthly amount that your institution pays for mobile telephony service?
7	Is there Internet in your village?
8	Does your institution have access to Internet service?
9	For how long have your institution had access to Internet service?
10	What is the use that your institution gives to the Internet?
11	What is the importance of Internet for your institution?
12	What is the monthly amount that your institution pays for the Internet service?
13	What is the contracted broadband?
14	Do you know what 3G mobile telephony is?
15	Would you be interested on having 3G mobile telephony services?
16	Would the 3G mobile telephony service improve the work of your institution to the benefit of the rural population?
17	What is the monthly amount that your institution could afford to pay for the 3G mobile telephony service?

(*) It must be explained to the interviewed, textually and graphically, what is 3G mobile telephony.

Research Questions for Business Users

Targeting sectors with greater presence and projection in rural areas that are resource companies (mining, oil, Gas, Agriculture), utilities (transportation, tourism), marketing companies, banking and finance sectors (banks, rural banks) and Government sector (Safety, Health, Education, Social Inclusion):

Question #	Question
1	Which is the expected growth regarding to the presence in rural communities, through offices or centers?
2	Which are the communication needs identified in these centers or offices in the rural areas?
3	Which are the requirements that the services needed in rural areas must meet?
4	What is the importance level of the telecommunications services for you to be able to operate in rural areas?
5	How much do you expect to spend per year on voice/data telecommunications service?

Research Questions for Private Users

The information we would need to obtain from potential private users in rural areas is related to the following subjects, and these are some sample questions:

a) How relevant are ICT services for potential users? In particular regarding Internet access:

Question #	Question
1	Do you know the advantages of Internet?
2	Have you or a family member ever used the Internet?
3	Do you think continuous Internet access would benefit your family?
4	Do you or any member of your family have a PC, Laptop, Tablet or Smartphone?

b) Payment affordability:

Question #	Question
1	Household expenditure or individual expenditure (per capita).
2	Access to basic services (electricity, water, sewage).
3	Which electronic devices do you have at home?
4	Which sector do you work on?
5	How is your income (fixed-variable, frequency: monthly, weekly)?
6	How much do you spend on phone every month if you are a user (Cell Phone, borrowed phone, pay phone)?
7	How much do you spend every month on Internet if you are a user? (booths)
8	How much would you pay every month to have access to continuous Internet service?

c) Understanding the use of these services (to measure):

Question #	Question
1	If you are an Internet user, what are the websites that you visit more often?

2	If you are a mobile phone user, how do you use this service? Reasons of your calls, how often, etc. (An alternative is that the interviewee check the call record on the cellular and explain last month calls).
3	How many children do you have and how old are they?
4	Do you have relatives living in other cities or countries?
5	How do you communicate with your relatives who live out of town?
6	Do your family members living in other cities have Internet access?
7	How do you get informed of the news?
8	How do you get information to do homework or to work?
9	Do you watch TV or listen to the radio? What kind of programs? Which are your favourite shows and channels?

Research Questions for Operators

Question #	Question
1	What is the level of your current annual investment plan for the next three years?
2	What is the level of investment planned to be done this year and in the next three years in rural areas?
3	Which challenges do you have to overcome in the rural market?
4	What opportunities do you see in the rural areas?
5	What do you consider that should be the role of the Government for reducing the ICT gap in rural areas?

Research Questions for Manufacturers

This section provides a summary list of the questions in the earlier sections with duplications removed. The categories that the question came from are given in the right hand column.

Question #	Question	Categories
1	How many potential suppliers are there?	Supplier forces
2	What is the importance of volume to the manufacturer?	Supplier forces
3	Are there specific features in the radio or chipset hardware or firmware needed to address the rural marketplace	Supplier forces
4	Is there some way that products may be differentiated	Supplier forces, Operator forces
5	Are there certain power supply thresholds that can only be met by certain solutions	Supplier forces
6	Are there absolute cost advantages of a small cell solution for rural coverage over the alternatives	Barriers to entry
7	Is the government or regulatory policy/pressure that assists or inhibits entry to this market	Barriers to entry Segment Accessibility
8	Are there economies of scale that will reduce barriers to entry	Barriers to entry
9	Are there existing incumbents in the market that make economies of scale hard to achieve	Barriers to entry
10	Are there high capital requirements to enter the rural market - – e.g. investment in new product design, type approval costs, homologation costs for countries with small volume	Barriers to entry
11	Is there sufficient backhaul capacity in the target regions available to make supplying 3G viable	Barriers to entry

| 12	Are the power sources for a cell (e.g. solar) sufficiently available at the right power and charge levels to be able to power a small cell	Barriers to entry
13	What is the price sensitivity of the customer	Operators
14	What is the availability of substitutes – e.g. Wifi, 2G+EDGE, Macrocellular solutions	Operators
15	Cost of switching – Are there rural solutions already deployed that would be expensive to remove or replace?	Substitutes
16	What is the operator opinion about replacing already deployed solutions?	Substitutes
17	Are there particular cost, regulatory or other reasons that would favour (or act to prevent) substitutes to 3G such as a) Extending Macrocellular coverage; b) Providing carrier / higher powered Wifi; c) 2G + EDGE	Substitutes
18	What are the exit barriers to entering the rural marketplace (if any) ? Specialist manufacturing or test equipment that could not easily be sold or relocated? Closure costs and asset write-offs involved in closing down a market segment? Negative impact on inter-related business (e.g. macro network or fixed network equipment sales) Would there be significant loss of customer goodwill	Internal market competition
19	Industry growth and In what phase is the rural cellular market? Introduction, Growth, Maturity, Decline	Internal market competition
20	Is there any overcapacity in the market?	Internal market competition
21	Diversity of Rivals	Internal market competition
22	What are the barriers for the introduction of rural cellular in a particular area?	Segment Accessibility
23	Is there an incumbent supplier of a rural solution?	Segment Accessibility
24	What are the difficulties / costs occurred in establishing interoperability with any existing macro network infrastructure	Segment Accessibility
25	Is there a clear understanding of the composition of the segment?	Segment Identification
26	Can the segment be classified across a small set of parameters	Segment Identification
27	What are the likely volumes for each product	Profitability - volume
28	Can the same product be sold across a number of markets	Profitability - volume
29	Can a framework supply agreement be set up with operator groupings	Profitability - volume
30	Are any products in the rural product mix already being manufactured for other segments	Profitability – volume Base Costs
31	What does a business analysis show that the elements of market segment will accept as a price	Unit profit
32	Is there particular demand or added-value for some customers that will allow higher pricing	Unit profit

33	Are there indicative prices from competitors that limit pricing (related to competition)	Unit profit
34	What is the cost of materials and per-unit assembly costs to produce one or more distinct products that are acceptable to the market	Unit profit
35	What is the distribution channel – is it bigger than direct to operator	Unit profit
36	If there is a non-direct channel, what share of gross profit will channel members need	Unit profit
37	What are the transportation costs per unit from point of manufacture	Unit Profit
38	Are there Import taxes or other local taxes that affect the cost in particular country	Unit Profit
40	Are significant parts of products, in the rural product mix available from products addressing other segments	Base costs
41	What is the cost of modification of existing product (or developing new ones)	Base costs
42	Are there additional testing costs for a rural product over an indoor one.	Base costs
43	How many operators are there with rural cellular goals, and what is the potential volume/market size for each operator	Cost of Sales
44	Are there sufficiently common requirements between operators that allow for one or more products in the mix to be widely applicable	Cost of Sales
45	Can a global framework supply agreement be signed with operator groupings that has a common product specification and commonality in operator or regulatory approval	Cost of Sales
46	Can the profitability include Cross-Selling and interlinked products	Profit – other
47	Does the manufacturer have enough resources to address the segment? If no, what is the deficit	Actionable
48	In the case of limited resources, what level of profit or profitability would need to be seen to select the rural segment over the currently served segment	Actionable
49	Does the segment contains customers with homogeneous characteristics and needs	Effective
50	Can the size of segment be measured	Effective
51	Can the purchasing power of the buyers for rural solutions be well estimated	Effective
52	Can the likely buying behaviour of rural providers be assessed	Effective
53	Are the requirements well understood	Effective

ANEX III - RESEARCH TOOLS FOR THE MARKET SURVEY

The research design concerns the overall plan for connecting the conceptual research problems to the relevant empirical research. Since empirical research is undertaken to answer research questions, the appropriate research design needs to be effective in producing the required answers within the constraints placed on the research. Furthermore, since the choice of research design influences subsequent research activities, for example, what and how, data is to be collected, it is essential that the research problem is understood if errors and/or irrelevant design choices are to be avoided.

To this end, in the previous sections research questions related to all the recognized relevant stakeholders have been expressed (and summarized in ANEX II). These research questions included the following stakeholders recognized by the partnership to be the most influential ones to the business model and viability of this research endeavor.
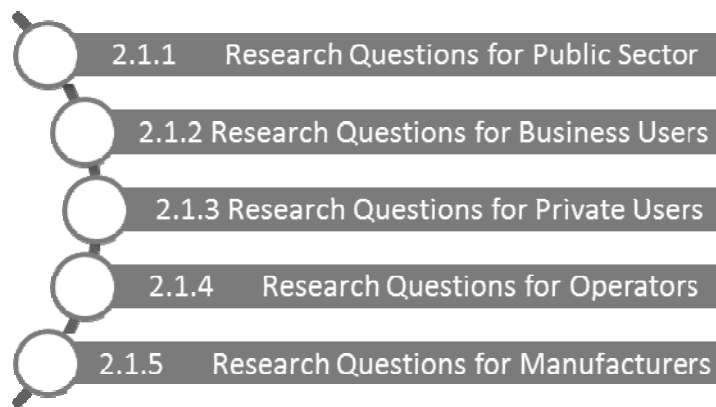
After examining these research questions, the overall design of the research will be crafted in this section, leading in the choice of the research tools and the analysis to be contacted, in order to produce the best possible results, based on both the scope and limitations of this research project.

Research Design Methods

Research can be divided into three main categories: exploratory, descriptive and causal. Each has its advantages and disadvantages and should be used in certain types of situation for optimal results. As the spectrum of research category is traversed from exploratory, through descriptive, to causal, there tends to be an increasing degree of formality, and a decreasing degree of flexibility, in the way in which the research can be carried out. [Ghauri95], relate research design and the three categories, in terms of the problem structure as shown in the following table.

Research Design	Problem Structure	Aim
Exploratory	Unstructured	Discover the important variables in a given situation
Descriptive	Structured	Provide an accurate and valid representation of variables
Casual	Structured	Establish a "cause and effect" relationship between one or more variable with other variables

Table 10. Research categories.

Exploratory research is most useful in the preliminary stages of a research project when the levels of uncertainty and of general ignorance of the subject in question are at their highest, when the problem is not very well understood and unstructured. Such research is characterized by a high degree of flexibility and a lack of formal structure. The main aim of exploratory research is to uncover the boundaries of the environment in which the problems, opportunities or situations of interest are likely to reside and to uncover the salient variables that may be found there and which are relevant to the research project [Webb92].

If the primary aim of exploratory research is to discover the important variables in a given situation, then the aim of descriptive research is to provide an accurate and valid representation of those variables; where exploratory research discovers something of interest and gives directions, descriptive research encapsulates it. Importantly, descriptive research does not attempt to show or establish any causal links between variables, it merely describes them [Webb92]. In causal research, the problem under investigation is structured; the aim being to establish a "cause and effect" relationship between one or more variable with other variables.

The methodological approach selected for any research, therefore, needs to be relevant to the specific demands and constraints of the subject and elicit the optimum data and insight from the available sources. Often, given the substantial volume of work, both theoretical and empirical, on a particular topic, the research can appear to suggest a descriptive approach, however, the investigation could equally be pursued via an exploratory approach, with the main priority being to plot and depict phenomenon from grounded, empirical observation. From a methodological point of view, it is feasible to use a combination of exploratory and descriptive research, so that the objectives of the research can be fulfilled. Such a multi-facet approach can, in many cases, enhance the validity of research.

Qualitative and Quantitative Methodologies

An important issue following on from above is what methodology to use. Choosing a methodology determines what can be studied, as well as the range of possible results and conclusions. Often the choice is whether to use a qualitative, quantitative or even an ethnographic approach to obtain data. Depending on the subject matter and constraints faced by the researcher-both in terms of time and resources-the ethnographic approach can be very useful. However, given the requirements in funding and research time, a realistic and practical choice therefore is often between quantitative or qualitative research. However, as mentioned above, the choice does not have to exclude one or the other.

Quantitative methods measure or count data. They attempt to answer the question "How much?" using statistical analysis such as averages, means, percentiles, etc. Use quantitative methods for questions that involve:

    d) Understanding quantities or frequency.
    e) Determining cause-and-effect.
    f) Comparing different things.
    g) Establishing numerical baselines.

Different authors use different terms to define qualitative research such as descriptive study, field study, participant observation, case study, naturalistic research, etc. [Wright95] describes qualitative research to mean any research where number counting and statistical techniques are not the central issues, where an attempt is made to get close to the collection of data in their natural setting. She includes an array of methods which include participant observation and case studies, content analysis, formal and informal interviewing, videotaping, unobtrusive measures, archival data surveys, frame analysis, issue-area analysis, ethnomethodology, and discourse analysis. Because qualitative research emphasis's comprehensive, interdependent, holistic structures that are dynamic and predictive, it can reconcile contradictory findings of individual studies because the role of any given variable is seen as

the outcome of different combinations of variables, and what is important is the interaction. A distinguishing feature of much qualitative research is that it usually utilizes multiple sources of data, rather than one.

In addition to the theoretical reasons for using qualitative research, not discussed here, there are several practical reasons such as disordered problems and complex issues. Qualitative research gives the researcher more flexibility, allows one to take advantage of the richness of data and thus to obtain more meaningful results. It affords the opportunity to examine the process of "why" and "how", not just "what"; to explore the complex, interdependent issues that constitute managerial problems. The "what" are the factor that need to considered; the "how" refers to how they are related; and the "why" are the underlying dynamics that justify the selection of those factors and their relationship.

Qualitative methods use direct or indirect contact with people. They can consist of interviews, observation, or review of relevant documents. Qualitative methods can be quite rigorous and be excellent for studying processes and meanings, but they do not measure. Use qualitative methods for questions that involve:

a) Understanding the feelings or opinions of people.
b) To gain insight into relationships or patterns.
c) To gather multiple perspectives on a particular subject or problem.
d) To identify approximate, rather than exact, information.

Quantitative research methods entail the use of systematic and sophisticated procedures to test, prove and verify hypotheses, the main focus being in quantitative research on matters pertaining to structural rather than on more complex issues of the process. Quantitative methodology is applicable where the aim of the research is to ascertain how many, what and where. In seeking such answers, a quantitative approach relies on the use of predetermined response categories by means of standardized data collection instruments such as mail survey, or structured or semi-structured interviews so as to enable statistical techniques to be used to assist in the interpretation of data. The standardized measurement and sampling procedures are intended to enhance the reliability of observation, facilitate replication studies, and allow generalization to a larger population.

In comparing qualitative and quantitative methods it is not easy to know when to use a qualitative approach and when to use a quantitative approach to a study. Although some researchers argue that because quantitative methods by themselves are not sufficient, what is required is the capability to study the non-linear, interactive, interdependent phenomena that makes up the field of management. Qualitative methods provide such capability and in order to avoid the dangers of hypothesising in advance of data in unknown areas, we also need the inductive approach that is more common to the qualitative methods.

A choice between research methods rests fundamentally on a set of decisions about the questions a researcher wants to answer and the practicality of gathering the kind of data that will answer those questions. The first step is to look for an obvious fit. Although there are a number of soft differences between the two types of methods, there is one very important distinction. Quantitative research is deductive and hinges on the presence of hypotheses, which is identified before research begins. Qualitative research is inductive and does not require hypotheses in order to start the research process. Quantitative research looks at the general case and moves toward the specific. This deductive approach to research considers a potential cause of something and hopes to verify its effect. Since the phrase cause and effect is part of nearly every child's history of parental lectures, we are all familiar with the concept. In research, cause and effect is all about the strength of the relationship. If a very strong relationship exists between two variables, the cause and effect relationship may be said to be highly probable or highly likely. There is still room to say that the effect does not occur as a result of the cause, but this is considered not very probable.

Qualitative research begins with the specific and moves toward the general. The data collecting process in qualitative research is personal, field-based, and iterative or circular. As data are collected and organized during analysis, patterns emerge. These data patterns can lead a researcher to pursue different questions or concepts, in a manner similar to rolling a snowball downhill.

Throughout the data collecting process, researchers typically record their thoughts and impressions about the emerging data patterns. Qualitative researchers gather data about their research in several different ways or from many different sources. This expanded view of relevant data is called triangulation and is a very important way of ensuring that data can be verified. When the data set is considered large enough or deep enough, the researcher will interpret the data.

In management research generally and perhaps more so in international management, there is a widespread view that the process of asking the right questions has only recently begun, and by only taking a straight-jacketed approach at what is measured, much that is of importance may be missed out. To this end it is heavily suggested to use quantitative and qualitative methods together. Research methodologists have for many years advocated triangulation-using more than one method in conducting a research study to gather more reliable results. By combining qualitative research techniques to the arsenal of quantitative techniques, one is guarded against the danger of research driving us in the direction of knowing more about less. Furthermore, larger questions and complex issues that are important areas of inquiry in management are not always amenable to neat statistical analysis and measurement can add to the sum total of knowledge, particularly when paired to more qualitative methods.

The overall factors affecting the choice of research methods include:

a) Time and money available – large surveys or observations can be time consuming and expensive to complete and take a long time to analyse.
b) Aims of the research and effort to twist the data. This can lead to a choice of method that may give more desired results.
c) What is known about the field under investigation – if someone has already carried out a survey in one field a sociologist might choose to interview participants instead.
d) Whether the research is ethical or not – it could be that in one scenario using a certain method could be unethical. For example, interviewing a recently abused family could be unethical.
e) Whether the method is suitable - for example using a written questionnaire could be difficult for investigating poor populations, many of whom could be illiterate. Theoretical beliefs of the researcher – different researchers will have different views on what research type to use. For example positivists are more likely to choose something that will yield quantitative results such as a closed survey.

Sampling method

Every piece of research requires a sample, and there are many ways of finding a suitable sample. Before choosing a method the researcher must find a 'sampling frame', this is the collection of people the researcher will then choose their sample from. An example of this could be school or college.

Random sampling – an example of random sampling would be picking names out of a list. In random sampling everyone in the population has the same chance of getting chosen. This is easy because it is quick and can even be performed by a computer. However, because it is down to chance you could end up with an unrepresentative sample, perhaps with one demographic being missed out.

Systematic sampling – an example of a systematic sample would be picking every 10th person on a list or register. This carries the same risk of being unrepresentative as random sampling as, for example, every 10th person could be a girl.

Stratified sampling – this method attempts to make the sample as representative as possible, avoiding the problems that could be caused by using a completely random sample. To do this the sample frame will be divided into a number of smaller groups, such as social class, age, gender, ethnicity etc. Individuals are then drawn at random from these groups. If you are observing doctors and you had split the sample frame into ethnic groups you would draw 8% of the participants from the Asian group, as you know that 8% of doctors in Britain are Asian.

Quota sampling – In this method researchers will be told to ensure the sample fits with certain quotas, for example they might be told to find 90 participants, with 30 of them being unemployed. The researcher might then find these 30 by going to a job centre. The problem of representativeness is again a problem with the quota sampling method.

Cluster sampling – This is taking a random sample at various stages of the sampling process. For example you might take a random region, take random areas from this county and take random people from this area to find your sample.

Snowball sampling – With this method, researchers might find a few participants, and then ask them to find participants themselves and so on. This is useful when a sample is difficult to obtain.

Research Tools

The following research tools are the most commonly used, as discussed by [Cook11].

A. Questionnaires

A questionnaire is a list of pre-set questions to which the participants are asked to answer. A written questionnaire will require the participant to answer the questions in writing. A spoken questionnaire is an interview.

Closed questionnaires – are very structured with the participant having a few set answers to choose from.

Advantages of closed questionnaires:

- Quick to complete.
- Data is quantitative so easy to analyse and compute.
- They allow comparisons to be made with other sets of data.
- The research is easy to repeat.

Disadvantages of closed questionnaires:

- You cannot explain a questionnaire to a participant so it could be confusing.
- You cannot follow up with extra questions to gain richer data.
- The participant might not agree with any of the answers they have to choose from.

Open-ended questionnaires – are less structured than closed questionnaires. There will normally be a set number of questions, but there is no pre-set choice of answers, so the participant can say whatever they want. This method will often involve an interview rather than written question.

Advantages of open questionnaires:

- The participant isn't limited by set answers, so they can express what they really mean and explain why they think this.
- The interviewer can follow up with more questions, meaning you get richer data.
- In general you get richer data because the answers will be longer and more in depth.

Disadvantages of open questionnaires:

- You get qualitative data, which is hard to quantify and analyse.
- This makes it hard to compare one set of data with another.
- The interviewer has to interpret the data, and they could interpret it differently to how the participant meant it.

Postal or self-complete questionnaires – are when the participant picks up or is sent a questionnaire which they fill out themselves and return by post or via the Internet.

Advantages of postal or other self-completion questionnaires:

- They are cheap, especially if done over the Internet.
- Results are obtained quickly.
- People can respond whenever they want, not just when an interviewer is present.
- Participants are more likely to give personal or embarrassing responses if they have the privacy of a self-completion questionnaire.
- There is less risk of interviewer bias.

Disadvantages of postal or other self-completion questionnaires:

- There is a very low response rate with self-completion questionnaires as there is no real pressure to complete them.
- You are likely to get a certain group of people, for example the unemployed or elderly that answer the questionnaire as many other people might be too busy, and so you won't get a particularly representative sample.
- There is no way of knowing whether the right person actually completed the survey or if someone else did it for them.
- The interviewer isn't there to ask follow up questions and explain questions the participants if they don't understand.

B. Structured interviews

Structured interviews are interviews that are based on a list of predefined issues or questions to be discussed.

Advantages:

- Interviewer can explain the questions and overcome illiteracy problems.
- Data can be seen as reliable as all the participants are answering the same questions.
- These interviews use pre-coded questions, which make the data easier to compute and analyse than the data gained in unstructured interviews.
- The interviewer has little interaction with the participant so there is less chance of interviewer bias than in unstructured interviews.

Disadvantages:

- The structure of the interview means the interviewer can't probe and ask further questions, so the data isn't as rich.
- They are more time consuming and expensive than other methods such as postal questionnaires.
- There is still the risk of interviewer bias.

C. Unstructured interviews

Unstructured interviews are interviews that are not based on a list of predefined issues or questions to be discussed. Instead they rely on a general topic that can lead to many different issues during the conversation.

Advantages:

- The interaction between the participant and the interviewer allows for richer, more valid data. This is because the interviewer can ask follow up questions.
- Also the interaction allows the interviewer to develop a relationship with the participant, which could mean they are more open and honest with their answers.
- Ambiguities in an answer can be probed to further understand the meaning of that answer.
- The interviewer can change the questions if, over the course of the study they think the hypothesis should change or they want to take the study in a new direction.

Disadvantages:

- With unstructured interviews you need a trained interviewer who can only interview one participant at a time, this means this method is time-consuming and costly.
- The interviewer won't ask exactly the same question every time, so it could be said that this method is less reliable.
- The changing questions also mean it is difficult to replicate the study.
- The data is qualitative which means it is hard to analyse and compare with other pieces of data.

D. Participant Observation

Participant observation is where the researcher joins in with the group she or he is studying. This method is usually favoured by interpretivists as they can understand the meaning behind the behaviour of the group they observe. By putting themselves in the place of the participants they can understand why people act in certain ways. This could be particularly helpful in understanding behaviour which is very removed from our normal lives, for example gang behaviour. There are two types of observation, covert and overt. In a covert observation the participants do not know you are observing them for research. In overt observations the participants do.

Advantages:

- You get a primary source of data. It's first-hand information which hasn't been interrupted by anyone else.
- The participants are likely to develop a relationship with the researcher so are more likely to be truthful and honest.
- You gain rich, insightful qualitative data as you are effectively finding out more information the whole time you are observing the participants.

Disadvantages:

- Gaining entry to the group and being accepted by the other members of the group can be difficult
- The presence of the researcher may affect the behaviour of the group. This is also known as the Hawthorne effect and is a big problem with overt observations.
- The observations may lack structure, this means the quality of the observations by sociologist rely upon their skill as an observer.
- This lack of structure also makes the method unreliable as it is difficult to replicate.
- Only a small number can be observed at one time, this could mean the sample may be unrepresentative.
- There are also ethical issues, especially with covert observations as you will normally have to lie to the participants to ensure you remain undercover.

E. Non-Participant Observation

Some observations are carried out without the researcher participating. There are several reasons the researcher might choose to do this, one because it eliminates the risk that people will be affected by the presence of a researcher, or it could be that the groups might be unwilling to cooperate in research if you participate in the experiment.

Advantages compared to participant observations

- By reducing the level of interaction between the researcher and the participants you can reduce the risk of the Hawthorne effect. However, this only happens if the observation is covert.
- It is also easier to record information and observations if you do not are not participating, so you can record data more easily.

Disadvantages compared to participant observations

- If the observation is overt you are more at risk from the Hawthorne effect as people know they are being watched.
- You do not gain as much information as participant observations as you are not so submerged in the group you are observing.